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**Feasibility Study**  
**on**  
**The Rural Road Network Development Project**

FINAL REPORT (Volume 6)

**PROJECT EVALUATION**  
**IN**  
**THE PROVINCE OF NUEVA ECIJA**

OCTOBER, 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

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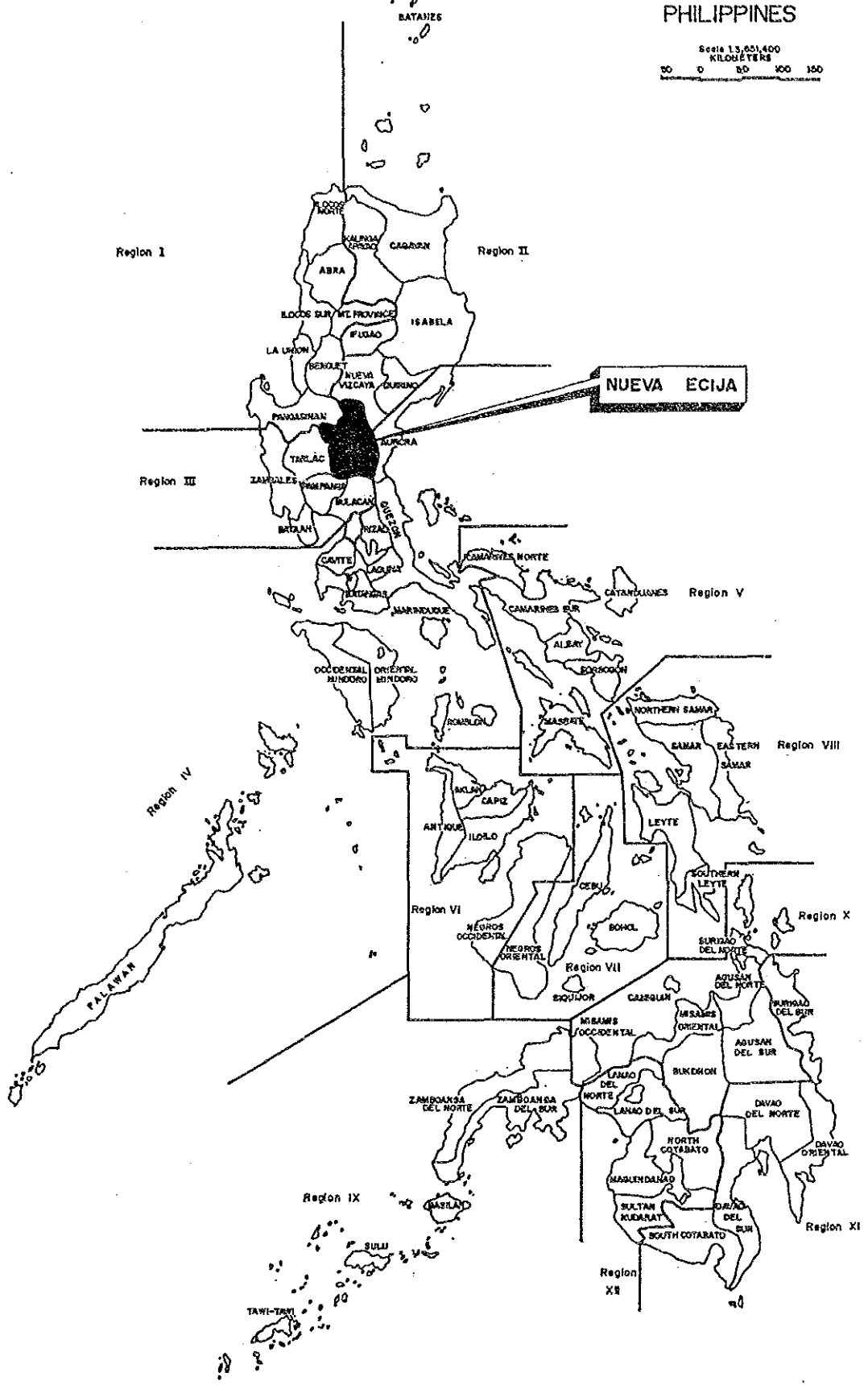
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VOLUME - 6  
PROVINCE OF NUEVA ECIJA

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CHAPTER 1  
SOCIO-ECONOMIC PROFILE OF THE PROVINCE

1.1 GENERAL

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

- . Economically less developed
- . Average level in road development
- . Topographically flat

1.2 GEOGRAPHY AND TOPOGRAPHY

The province is located in the northern part of Central Luzon, bounded on the north by Nueva Vizcaya and Pangasinan Provinces, on the east by Aurora Province, on the south by Bulacan and Pampanga Provinces and on the west by Tarlac Province.

As the province is situated in the Central Luzon Plain, a vast expanse of wide fertile plain occupies most areas of the province. The Caraballo Mountains and the Southern Sierra Madre Ranges are situated near the boundaries of Nueva Vizcaya and Aurora Provinces, respectively, only where the terrain is mountainous. Due to these topographical characteristics, the province is one of the typical inland flat provinces.

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

1.3 POPULATION

The province is composed of three (3) cities and 29 municipalities and the provincial capital is located at Palayan City but the set of provincial government is located at Cabanatuan City.

Population in 1990 is estimated at 1,325,000. The average annual population growth rate for the period of 10 years from 1980 to 1990 was estimated 2.1% which is lower than the national average of 2.4%. Population density of the province in 1990 is 250.8 persons per square kilometer which is higher by 1.2 times than the national average of 205 persons per sq. km.

Population, the average annual population growth rate and population density by city/municipality are presented in Table 1.3-1. Distribution of cities and municipal towns together with their population is shown in Figure 1.3-1. Cities and municipal towns are widely distributed in the province and the biggest urban center is Cabanatuan City, of which population density is 920.8 persons per sq. km.

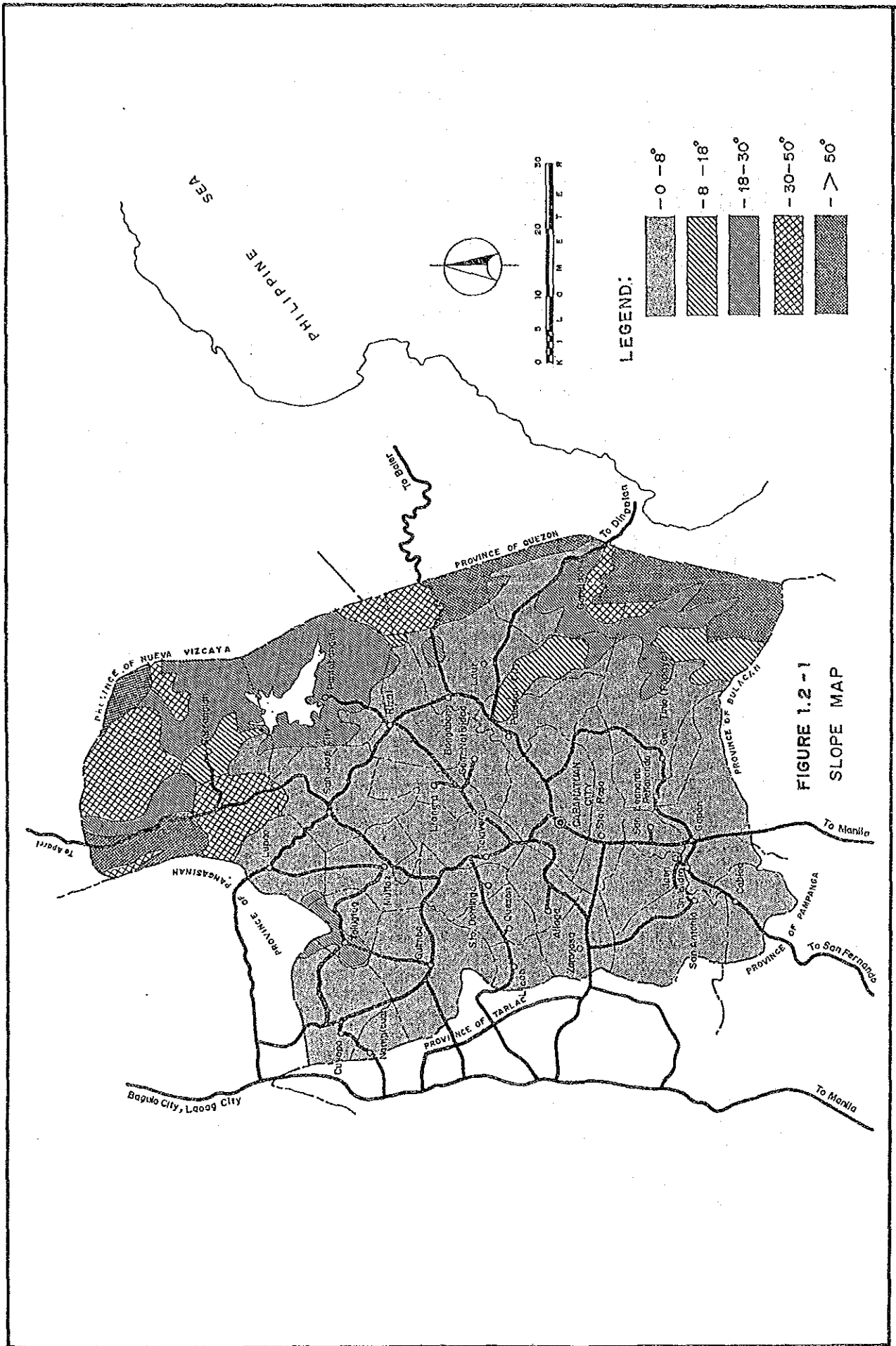


FIGURE 1.2 - 1  
SLOPE MAP

Table 1.3-1  
POPULATION, LAND AREA AND DENSITY (1990)  
Province of Nueva Ecija

City/Municipality	Projected Population (1990)	Annual Growth Rate (%)	Land Area (km <sup>2</sup> )	Density
1. Cabanatuan City	174,487	2.3	189.5	920.8
2. Palayan City	21,663	3.7	35.1	617.2
3. San Jose City	75,640	1.6	177.5	426.1
4. Aliaga	40,871	2.3	113.6	359.8
5. Bongabon	39,989	2.1	255.8	156.3
6. Cabiao	49,024	2.6	110.6	443.2
7. Carranglan	24,511	2.1	738.4	33.2
8. Cuyapo	48,865	2.1	164.8	296.5
9. Gabaldon	20,592	1.8	224.4	91.8
10. Gapan	77,574	2.6	132.0	587.7
11. Gen. Natividad	21,427	2.1	93.5	229.2
12. Gen. Tinio	27,992	1.8	670.7	41.7
13. Guimba	72,065	2.0	92.9	775.7
14. Jaen	48,313	2.1	94.1	513.4
15. Laur	20,433	1.4	56.5	361.6
16. Licab	17,427	1.8	55.4	314.6
17. Lupao	23,951	1.9	149.2	160.5
18. Llanera	28,002	2.5	116.0	241.4
19. Munoz	52,453	1.9	315.9	166.0
20. Nampicuan	9,261	2.0	51.7	179.1
21. Pantabangan	11,985	-1.5	370.3	32.4
22. Penaranda	19,918	1.7	92.6	215.1
23. Quezon	25,688	2.1	73.9	347.6
24. Rizal	37,850	1.8	156.1	242.5
25. San Antonio	53,021	2.1	168.8	314.1
26. San Isidro	35,182	2.1	55.5	633.9
27. San Leonardo	43,459	2.2	59.2	734.1
28. Sta. Rosa	40,252	2.1	141.8	283.9
29. Santo Domingo	36,289	2.2	73.6	493.1
30. Talavera	82,484	2.8	109.9	750.5
31. Talugtug	14,460	2.1	50.9	284.1
32. Zaragosa	30,151	2.1	94.1	320.4
<b>T O T A L</b>	<b>1,325,279</b>	<b>2.1</b>	<b>5,284.3</b>	<b>250.8</b>

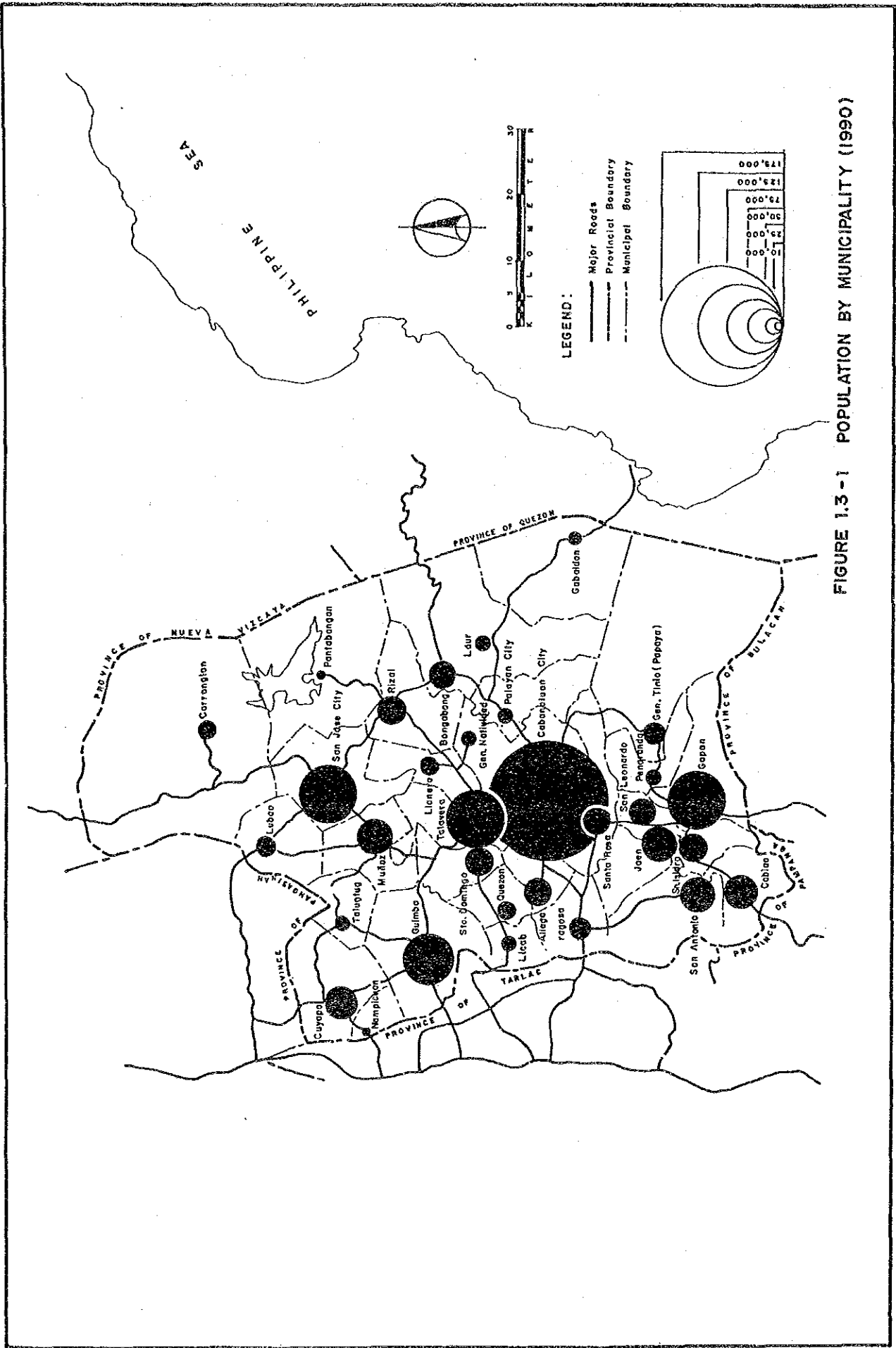


FIGURE 1.3-1 POPULATION BY MUNICIPALITY (1990)

#### 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 1.6% 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 the level of national average.

Per capita income of the province is lower than the national average. Incidence of poverty shows almost the same level as the national average. Unemployment and underemployment rates also shows almost the same level as the national average.

Agriculture is the predominant industry of the province and shares 62% in terms of number of workers.

TABLE 1.4-1  
MAJOR SOCIO-ECONOMIC DATA OF PROVINCE OF NUEVA ECIJA

	Nueva Ecija (A)	Philippines (B)	(A)/(B)
1. Total Land Area (sq.km.)	5,284	300,000	0.018
2. Population in 1990 (1000 persons)	1,325	61,483	0.022
3. Population Density (persons/sq.km.)	251	205	1.22
4. GRDP (Million ₱ at 1000 prices)	10,028	623,051	0.016
5. Per Capita Income in 1985 (₱/person)	5,014	5,593	0.90
6. Number of Workers by Industrial Sector in 1980 (1000 persons)			
* Agricultural	175.8 (62%)	7,303 (51%)	0.024
* Industry	22.6 ( 8%)	2,177 (15%)	0.010
* Service	74.2 (26%)	4,552 (32%)	0.016
* Total <u>1/</u>	282.4 (100%)	14,197 (100%)	0.020
7. Incidence of Poverty in 1985 (%)	55.1	59.3	-
8. Unemployment Rate in 1988 (%)	6.9	8.3	-
9. Underemployment Rate in 1988 (%)	11.4	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

Nueva Ecija has a total land area of 5,284 square kilometers, representing 1.8% of the total land area of the Philippines. Table 1.5-1 shows general land use of the province. About 70% of the province are occupied by agricultural land and about 25% by forest land.

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, corn, mango, onion and green vegetables. The province is a major source of palay and onion production and accounts for 9% and 60% of Philippine production, respectively.

TABLE 1.5-1  
LAND USE OF NUEVA ECIJA

Land Use	Area in sq.km.	%
Agricultural Land	3,677.9	69.6
Fores	1,299.9	24.6
Fishpond	15.8	0.3
Built-up Area	95.1	1.8
Others	195.6	3.7
Total	5,284.3	100.0

Source: Socio-economic Profile of Nueva Ecija

TABLE 1.5-2  
MAJOR CROPS OF PROVINCE OF NUEVA ECIJA

Major Crops	Area Utilized (ha.)		Production (M.T.)	
	1985	1986	1985	1986
Palay	218,180	235,640	652,790	805,060
Corn	5,830	6,360	3,585	4,220
Mango	3,084	5,145	5,100	2,300
Onion	3,720	3,505	29,219	32,391
Green Vegetables	1,260	1,424	617	641

Source: Bureau of Agricultural Statistics



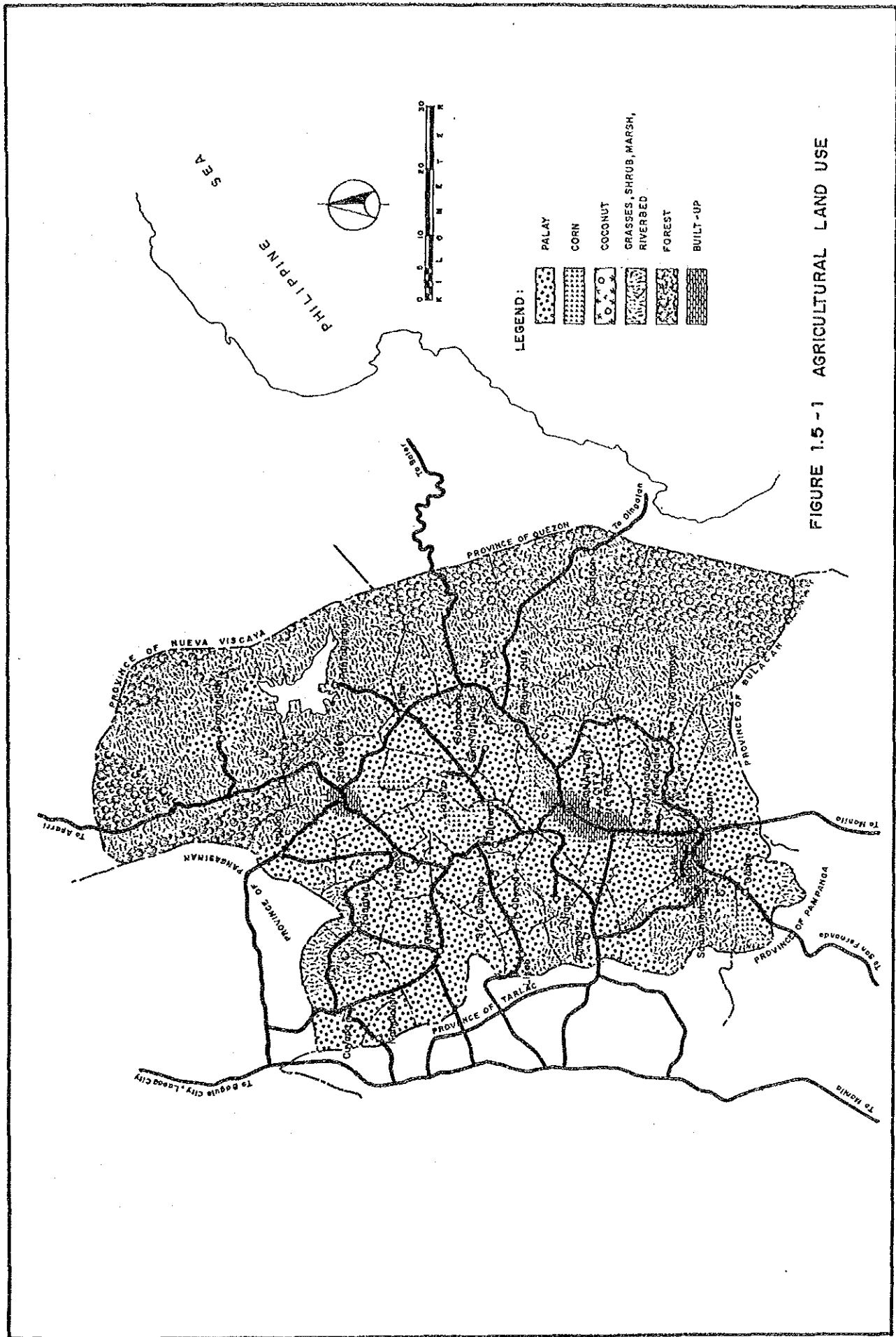


FIGURE 1.5 - 1 AGRICULTURAL LAND USE

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 average level of 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

Nueva Ecija has a total of 3,228.4 kms. of roads, comprising 427.4 kms. of National, 697.6 kms. of Provincial, 39.6 kms of City, 324.3 kms. of Municipal and 1,739.5 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 road extension is summarized as follows:

National roads .....	lower than the national average (84% of national average)
Provincial roads.....	higher by 1.23 times
Barangay roads.....	almost same as national average
All roads.....	almost same as national average

National road development is in lower level than the national average, however, provincial road development is in higher level than the national average. As a result, the combined road development level of national and provincial roads is almost the same level as the national average. Barangay road development level is also the same level as the national average. In terms of road extension, the Province is one of the typical provinces which represent the national average level of road development.

TABLE 2.2-1  
EXISTING ROAD LENGTH AND ROAD DENSITY  
Province of Nueva Ecija

Road Class	Road Length In 1987 (kms.)	Road Density		
		N. Ecija	Philippines	N. Ecija/Philippines
National Rd.	427.4 (13.2)	0.1666	0.1994	0.84
Prov'l. Rd.	697.6 (21.6)	0.2720	0.2211	1.23
Sub-Total	1,125.0 (34.8)	0.4386	0.4205	1.04
City Rd.	39.6 (1.2)	0.0154	0.0304	0.51
Municipal Rd.	324.3 (10.1)	0.1264	0.0981	1.29
Barangay Rd.	1,739.5 (53.9)	0.6781	0.6536	1.04
TOTAL	3,228.4(100.0)	1.2585	1.2026	1.05

SOURCE: DPWH Infrastructure Atlas, 1989

TABLE 2.2-2  
EXISTING SURFACE CONDITION (SURVEYED ROADS ONLY)  
Province of Nueva Ecija

Road Class	Pavement Type	Surface Condition <u>1/</u>			% of Pavement Type <u>2/</u>	
		Good/Fair	Bad/Very Bad	Total (%)	Nueva Ecija	Phils.
National Road	PCC	194.7 (67.5)	93.9 (32.5)	288.6 (100.0)	54.9	23.6
	Bituminous	25.3 (44.9)	31.0 (55.1)	56.3 (100.0)	3.9	22.3
	Gravel	9.3 (6.3)	137.3 (93.7)	146.6 (100.0)	41.2	51.3
	Earth	-	-	- (100.0)	-	2.8
	Total:	229.3 (46.7)	262.2 (53.3)	491.5 (100.0)	100.0	100.0
Provincial Road	PCC	84.6 (69.5)	37.2 (30.5)	121.8 (100.0)	5.0	2.5
	Bituminous	-	1.4 (100.0)	1.4 (100.0)	0.3	8.9
	Gravel	50.1 (19.4)	207.2 (80.6)	257.3 (100.0)	94.7	70.6
	Earth	-	37.7 (100.0)	37.7 (100.0)	-	18.0
	Total:	134.7 (32.2)	283.5 (67.8)	418.2 (100.0)	100.0	100.0
National and Provincial Road	PCC	279.3 (68.1)	131.1 (31.9)	410.4 (100.0)	24.0	12.5
	Bituminous	25.3 (43.8)	32.4 (56.2)	57.7 (100.0)	1.6	15.3
	Gravel	59.4 (14.7)	344.5 (85.3)	403.9 (100.0)	74.4	61.4
	Earth	-	37.7 (100.0)	37.7 (100.0)	-	10.8
	Total:	364.0 (40.0)	545.7 (60.0)	909.7 (100.0)	100.0	100.0

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

### 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.

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

#### National Roads

- . About 59% of national roads in the Province are paved with either PCC or bituminous surfaces which is in higher level than the national average of 46%.
- . More than one half (or 53%) of national roads are in bad/very bad condition
- . In terms of road quality, national roads in the province are still in low level, particularly surface condition.

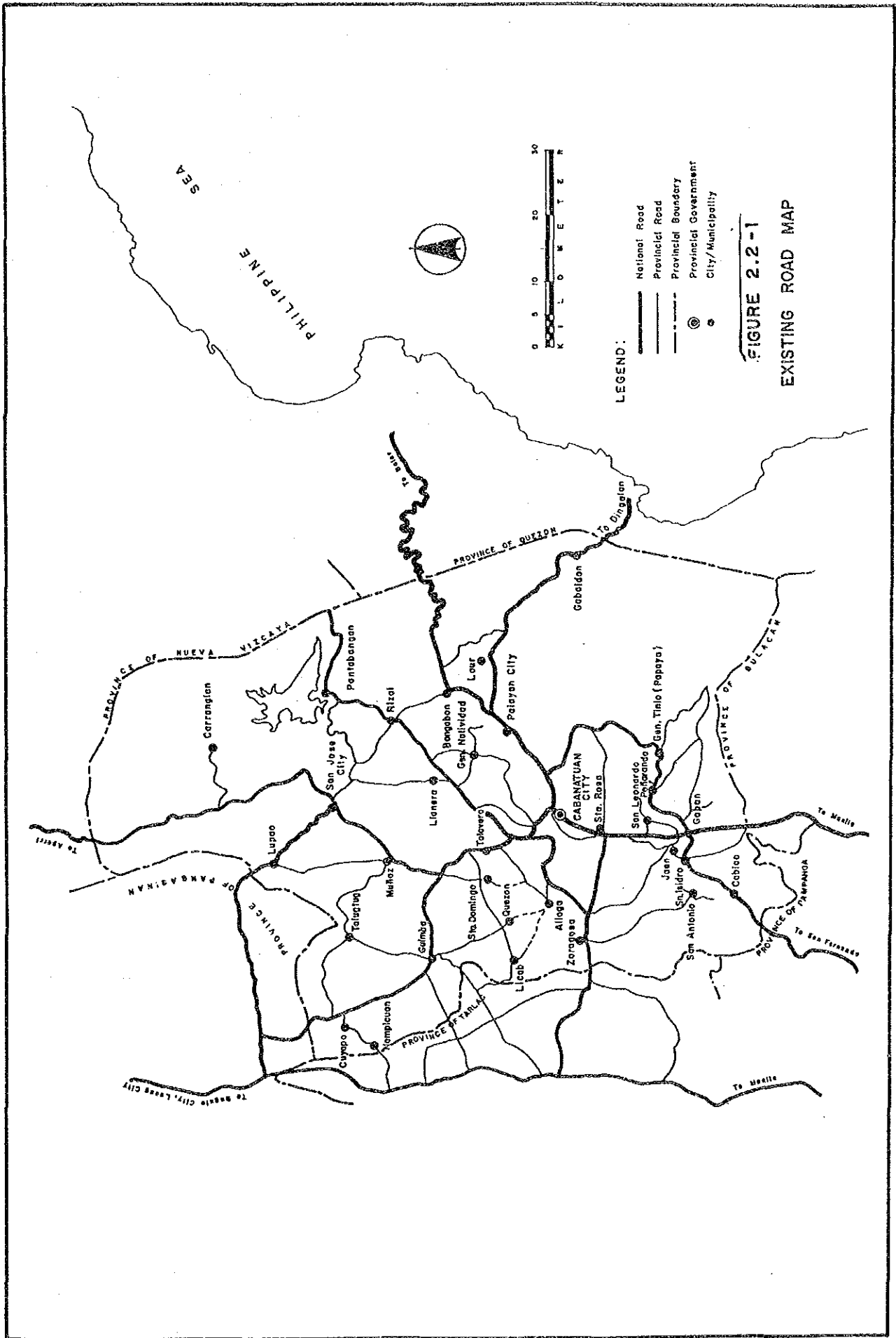
#### Provincial Roads

- . Only about 5% of provincial roads in the province are paved with either PCC or bituminous surfaces, which is in quite lower level than the national average of 11%.
- . Surface condition of provincial roads in the province is also quite poor, and only 32% of roads were rated good/fair.
- . In terms of road quality, provincial roads of the province are still in very low level.

### 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:

- . Favored by wide flat plain, fairly fine mesh (grid) type road network is formed within the Province.
- . Inter-provincial linkages are well developed in the southern and western area, however, there is only one (1) road linking Nueva Vizcaya and two (2) roads linking Aurora, primary due to steep mountains terrain.



- . Pan-Philippine Highway which runs from the north to the south at the almost center of the Province and Manila North Road which runs in Tarlac Province and almost parallel to Pan-Philippine Highway are the two (2) axis of north-south direction. These two (2) axis are linked with four (4) east-west roads and smaller meshes are also formed:

North-South Axis

- . Pan-Philippine Highway
- . Manila North Road

East-West Axis

- . Gapan - Cabiao - San Fernando Road
- . Sta Rosa - Zaragoza - Tarlac Road
- . Sto Rosario - Guimba - Rosales Road
- . San Jose - Lupao - Villasis Road

- . All city centers and municipal towns are linked with either national or provincial roads.

### 2.3 GENERAL DIRECTION OF ROAD NETWORK DEVELOPMENT

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

- . In terms of road extension, all classes of roads are in the level of national average.
- . In terms of surface type and conditions, even national and provincial roads are still in low level.
- . Fairly fine mesh type of road network is formed within the Province, however, linkage between Nueva Viscaya is made by only one (1) road and between Aurora by only two (2) roads.

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

- (1) Priority should be placed on improvement of existing roads, particularly on improvement of national and provincial roads in order to make the existing road network functions efficiently.
- (2) Construction of new roads must be carefully studied and implemented only on a case to case basis.
- (3) Inter-provincial roads going to Nueva Viscaya and Aurora should be always kept in good condition, because access to the said provinces are only through these roads.

## 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

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

$$\text{Average Accessibility} \quad A_{ave} = \frac{\sum pl}{P}$$

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
Primary Major Road	<ul style="list-style-type: none"> <li>Major inter-provincial roads.</li> <li>Intra-provincial roads linking two (2) or more municipal towns to the Provincial Capital</li> <li>Intra-provincial roads which form a skeleton road network of a province</li> </ul>	<ul style="list-style-type: none"> <li>Provides the highest level of service at the high speed for the long uninterrupted distance</li> <li>Serves for long distance trips</li> <li>Mobility is given the highest consideration</li> </ul>	●				
Secondary Major Road	<ul style="list-style-type: none"> <li>Roads linking municipal towns each other</li> <li>Roads linking a municipal town to the Provincial Capital</li> <li>Roads linking one (1) or more municipal towns to the primary major road network</li> </ul>	<ul style="list-style-type: none"> <li>Provides high level of service</li> <li>Serves for medium distance trips</li> <li>Mobility is given high consideration</li> </ul>	●	●	●		
Collector Road	<ul style="list-style-type: none"> <li>Roads linking secondary major roads each other or a primary road with a secondary road</li> <li>Roads linking two (2) or more barangays to the municipal town or to the higher level network</li> </ul>	<ul style="list-style-type: none"> <li>Provides rather low level of mobility</li> <li>Serves for short distance trips</li> <li>Collects traffic from feeder roads and connects them with major roads</li> <li>Mobility and land access</li> </ul>			●	●	●
Feeder Road	<ul style="list-style-type: none"> <li>Roads linking one or more barangays centers to the higher level network</li> <li>Roads linking farm areas to their respective barangay centers or to the higher level network</li> </ul>	<ul style="list-style-type: none"> <li>Primarily Provides access to abutting land with little or no through traffic</li> <li>Serves for local traffic</li> <li>Land access is given high</li> </ul>			●		●
Street	<ul style="list-style-type: none"> <li>Roads within built-up population centers (Poblecion) with essentially urban rather than rural rural functions</li> </ul>	<ul style="list-style-type: none"> <li>Primarily provides access to abutting land in urban areas</li> <li>Through traffic usage discouraged</li> </ul>			●		●

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 Nueva Ecija was proposed as shown in Figure 2.4-1. For establishing the major road network, the following were taken into consideration:

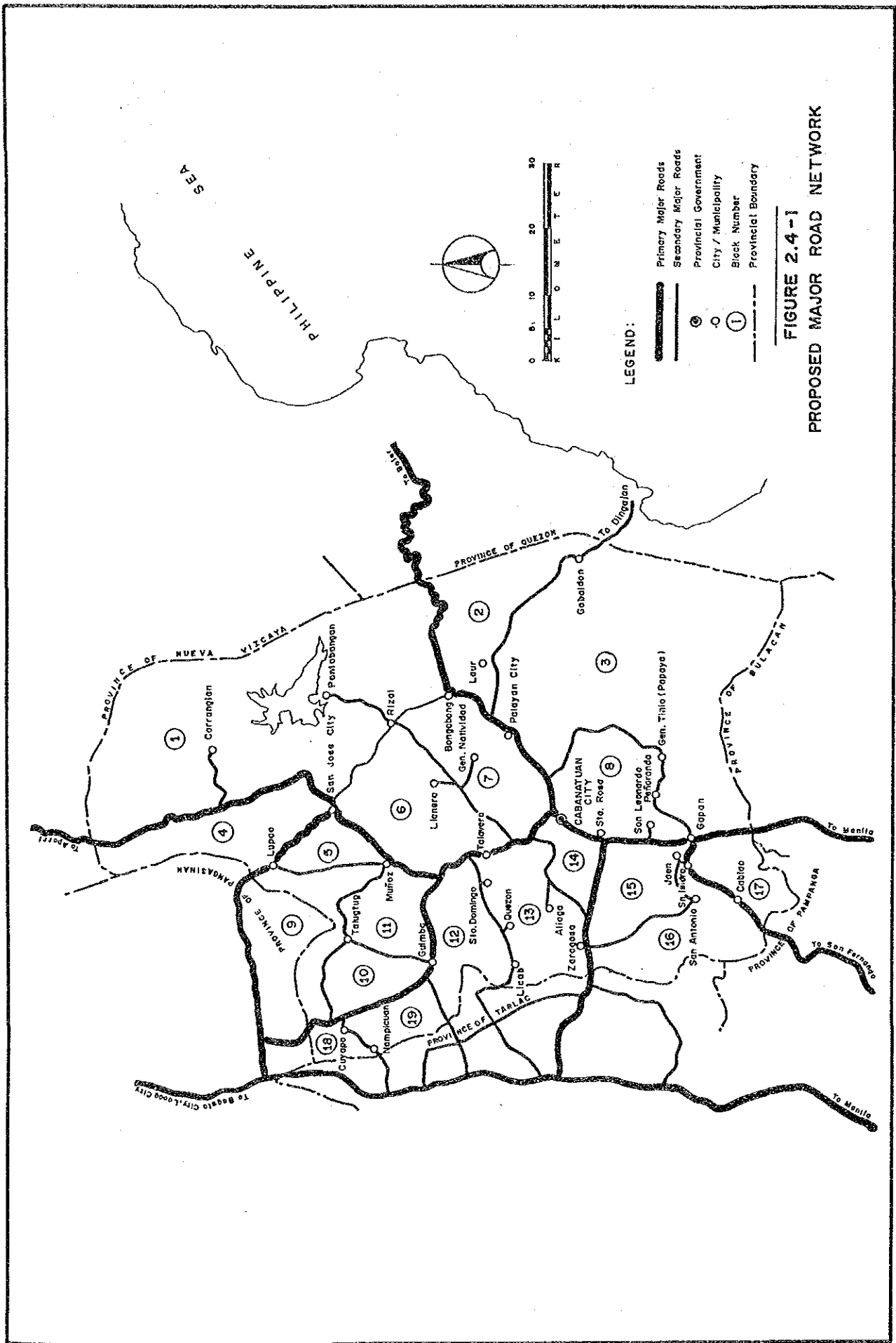
- . Present network of mesh type was based to formulate major road network.
- . Pan-Philippine Highway, Manila North Road (which runs Province of Tarlac), the national road going to Baler in Province of Aurora and four (4) other east-west roads were identified to function as axis. Based on these axis, smaller meshes were formulated.
- . Existing national roads were mostly included in major road network.
- . An existing mesh type of road network is well formed, 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 735.1 kms. and composed of the following roads.

National Road	492.9 kms.
Provincial Road	242.2 kms.
-----	
Total	288.9 kms



**FIGURE 2.4-1**  
**PROPOSED MAJOR ROAD NETWORK**

Table 2.4-2

NETWORK VALUE/ACCESSIBILITY  
Province of Nueva Ecija

Block No.	Population (1990)	Land Area (km <sup>2</sup> )	Road Length	Network Value	Access (p.km)	Average Access. (km.)
1	75,477	1,152.4	157.6	0.534	176,774	2.342
2	47,226	283.4	72.0	0.622	54,130	1.146
3	123,640	1,120.8	102.0	0.274	183,575	1.485
4	18,370	239.2	66.6	1.005	4,419	0.241
5	50,333	93.2	48.0	0.701	26,744	0.531
6	110,283	300.4	83.6	0.459	157,249	1.426
7	118,721	280.5	85.5	0.468	166,635	1.403
8	97,584	236.0	73.7	0.486	29,129	0.298
9	30,904	162.8	56.5	0.797	38,012	1.230
10	28,164	130.6	48.3	0.796	21,827	0.775
11	41,292	124.4	54.0	0.753	41,223	0.998
12	76,643	178.5	51.1	0.437	113,067	1.475
13	105,981	234.4	64.3	0.408	157,148	1.483
14	107,327	92.4	46.6	0.468	54,836	0.511
15	116,610	175.2	60.4	0.423	133,945	1.149
16	81,082	221.4	47.9	0.357	74,671	0.921
17	45,540	117.5	29.8	0.407	29,591	0.650
18	26,556	43.9	15.3	0.448	26,707	1.006
19	23,546	97.3	30.4	0.635	48,034	2.040
Ave.	69,752	278.1	62.8	0.451	80,932	1.160

## 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.

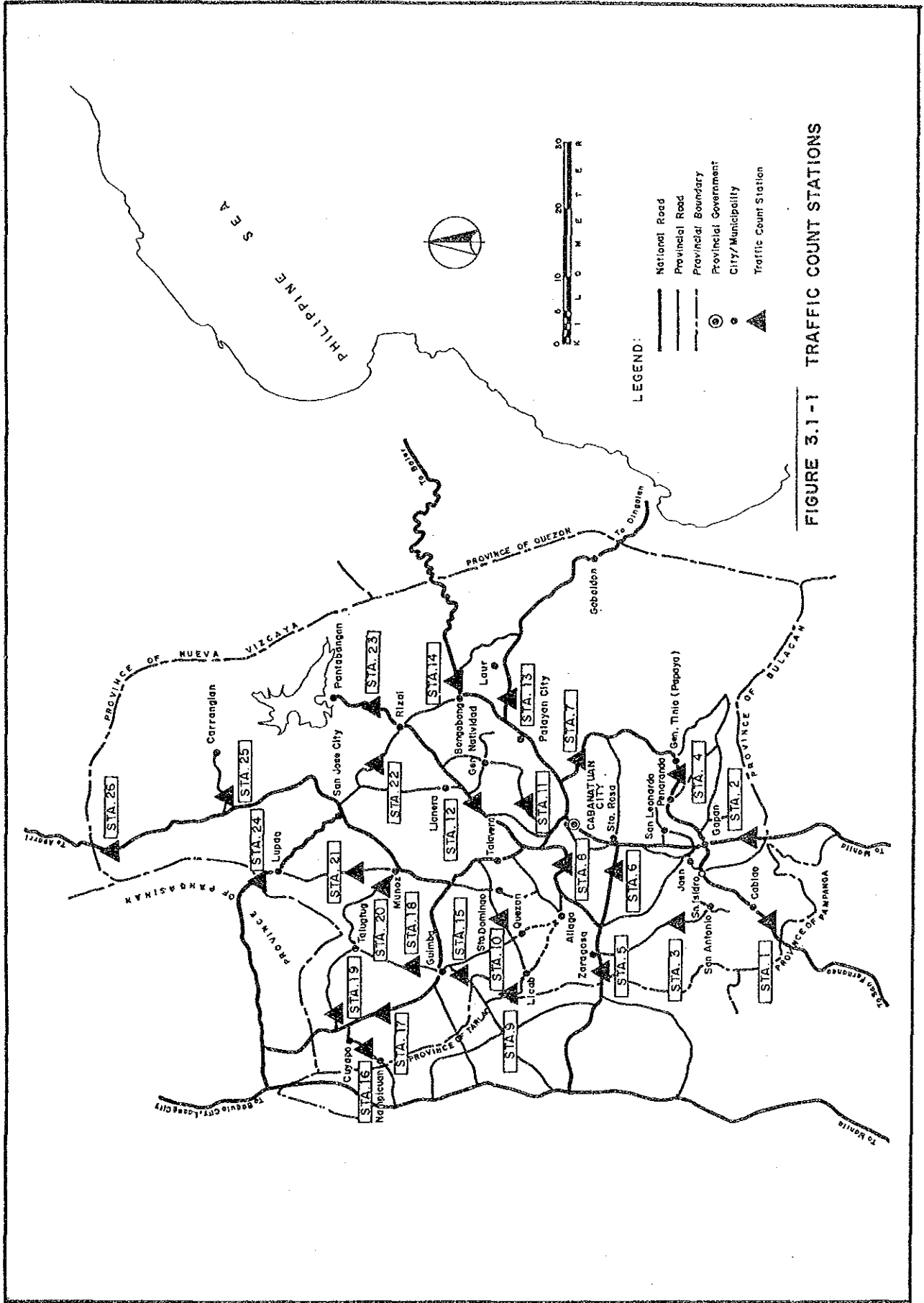


TABLE 3.1-1 SUMMARY OF TRAFFIC SURVEY RESULTS  
 - NUEVA ECIJA -

(ADT as of Feb. 1990)

Station No.	Car	Jeep	Pickup /Van	Jeepney	Bus	Truck	Sub-Total	Tri-cycle	Motor-cycle	Animal Drawn	Total
1	553	315	417	641	290	435	2650	376	95	2	3123
2	542	452	981	693	692	1176	4536	319	70	0	4925
3	5	32	6	127	1	34	206	602	91	65	963
4	66	122	77	336	8	94	701	397	91	0	1190
5	179	175	155	743	36	227	1515	1060	144	4	2722
6	297	431	237	914	14	570	2462	929	203	2	3596
7	81	296	66	683	0	45	1171	38	97	5	1311
8	23	114	33	46	266	125	606	131	82	24	842
9	10	29	4	13	0	23	78	147	30	9	264
10	74	164	63	388	9	141	838	475	125	1	1439
11	17	62	22	214	23	41	380	96	58	1	535
12	63	188	147	563	6	168	1134	208	91	13	1446
13	10	86	35	218	14	78	442	12	31	1	486
14	7	42	40	121	12	74	296	409	53	15	773
15	2	35	14	40	5	17	114	218	37	4	374
16	41	72	44	158	65	74	453	341	78	17	889
17	29	54	27	59	72	78	319	85	47	7	458
18	12	38	10	79	4	56	200	384	65	0	648
19	4	7	7	62	0	10	90	260	48	3	401
20	4	43	22	83	9	52	212	281	84	1	578
21	13	48	8	82	0	28	179	436	108	2	725
22	12	52	17	240	3	74	398	164	176	23	761
23	2	49	48	129	5	34	267	316	73	1	657
24	32	66	87	274	98	167	723	654	50	25	1453
25	12	35	22	69	16	20	173	19	41	2	235
26	203	50	161	191	195	327	1127	11	11	0	1149

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.

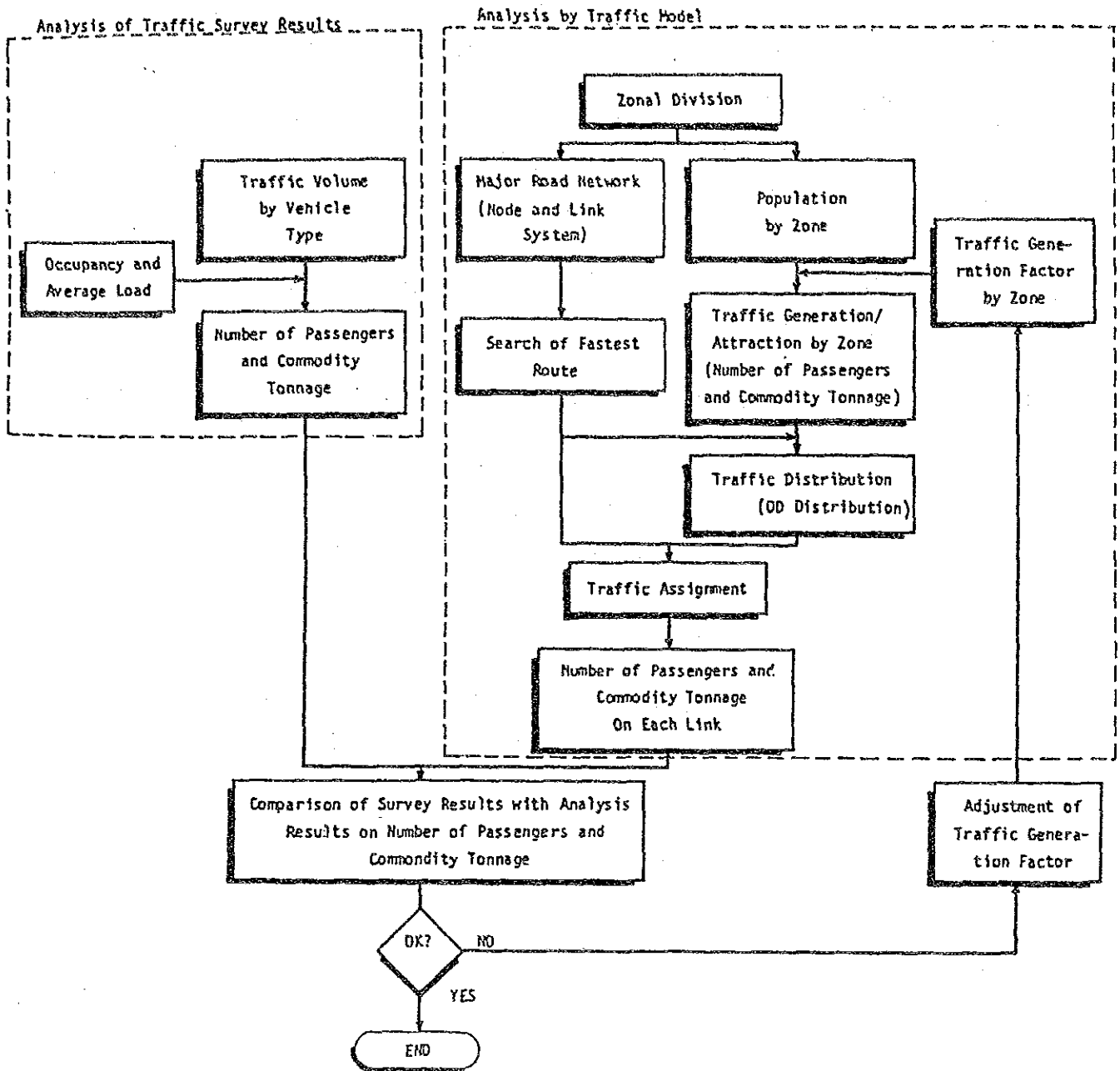


FIGURE 3.2-1  
 PROCEDURE OF ANALYSIS OF PRESENT TRAFFIC  
 ON MAJOR ROAD NETWORK



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 Nueva Ecija

	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	4.00
Motor-tricycle	2.90	0.30
Motorcycle	1.60	0.10
Animal Drawn	1.50	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.

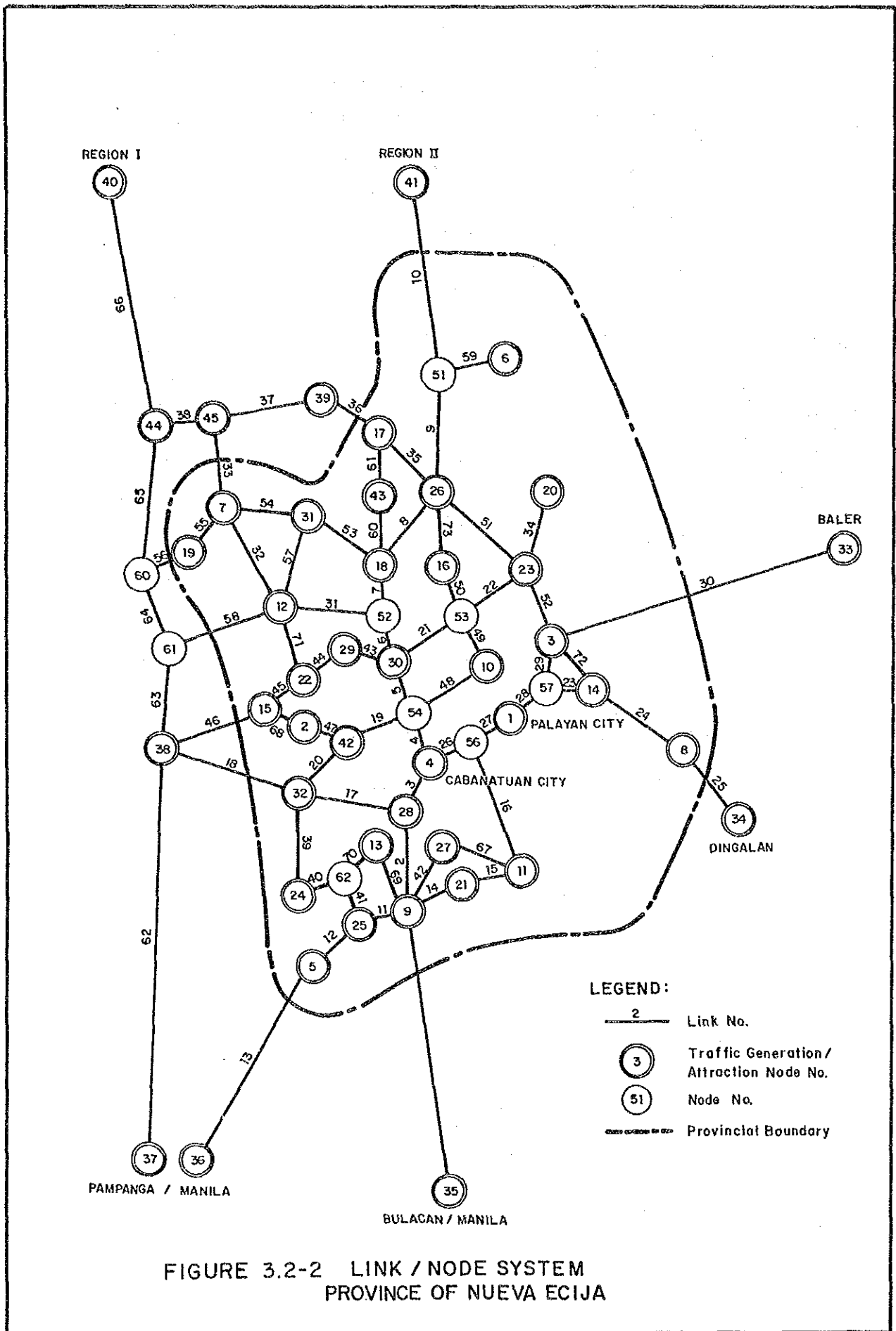
iii) Search for the Fastest Route:

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



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 Nueva Ecija

	Passenger Movement (trip/person/day)	Commodity (kg/person/day)
Range	0.050 - 0.250	5.7 - 37.7
Mean Value	0.216	32.3

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:

$$X_{ij} = k \frac{G_i \cdot A_j}{t_{ij}^2}$$

Where,  $X_{ij}$  = Traffic from zone i to zone j

$k$  = Parameter

$G_i$  = Traffic generation in zone i

$A_j$  = Traffic attraction in zone j

$t_{ij}$  = 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:

$$G_i = \sum_{j=1}^n X_{ij}$$

$$A_j = \sum_{i=1}^n X_{ij}$$

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.

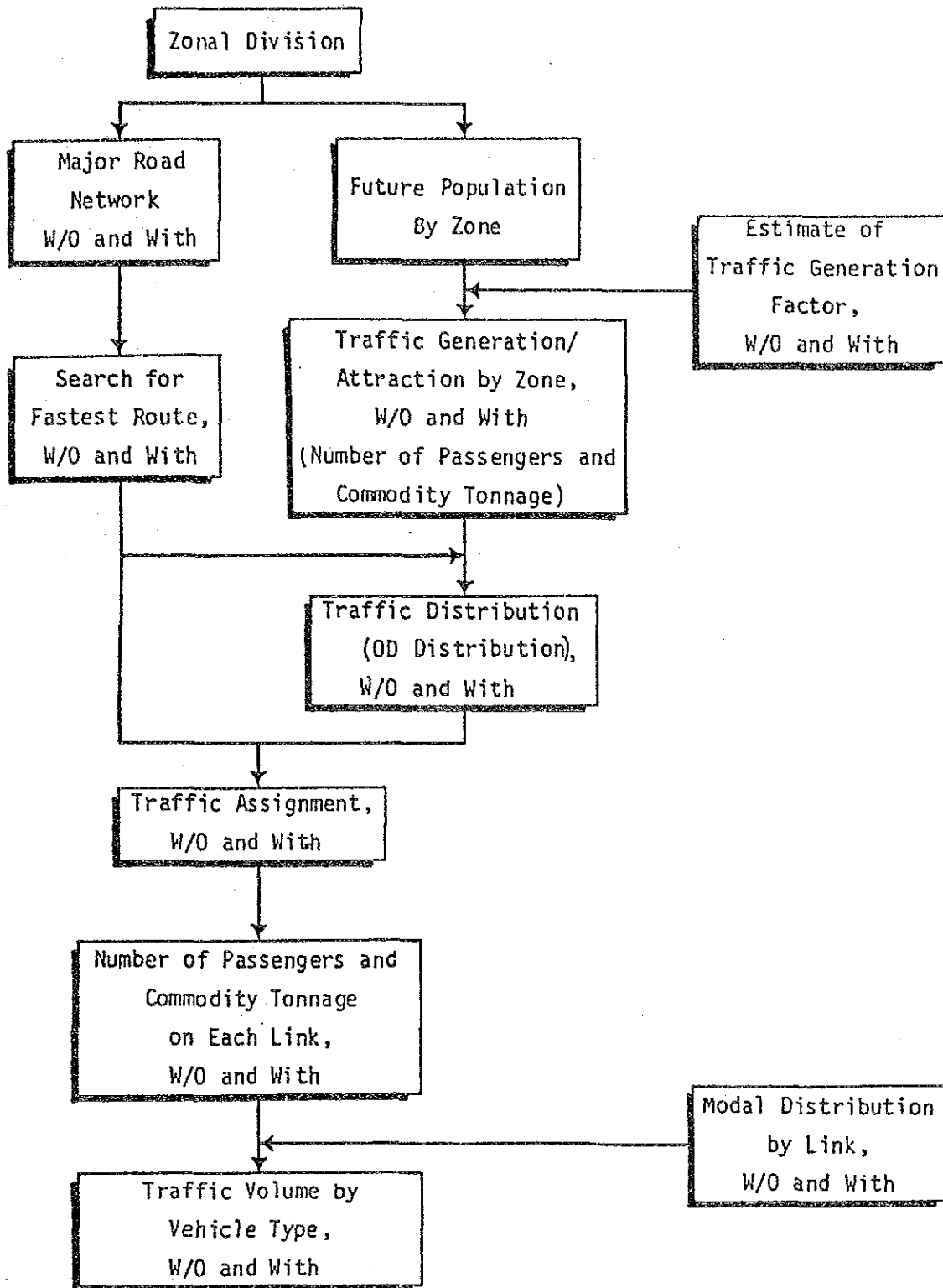


FIGURE 3.2-3  
 PROCEDURE OF FORECASTING TRAFFIC  
 ON MAJOR ROAD NETWORK

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 Nueva Ecija

	Passenger Movement (trip/person/day)	Commodity (kg/person/day)
Range	0.065 - 0.250	7.9 - 37.7
Mean Value	0.218	32.5

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 referring 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.

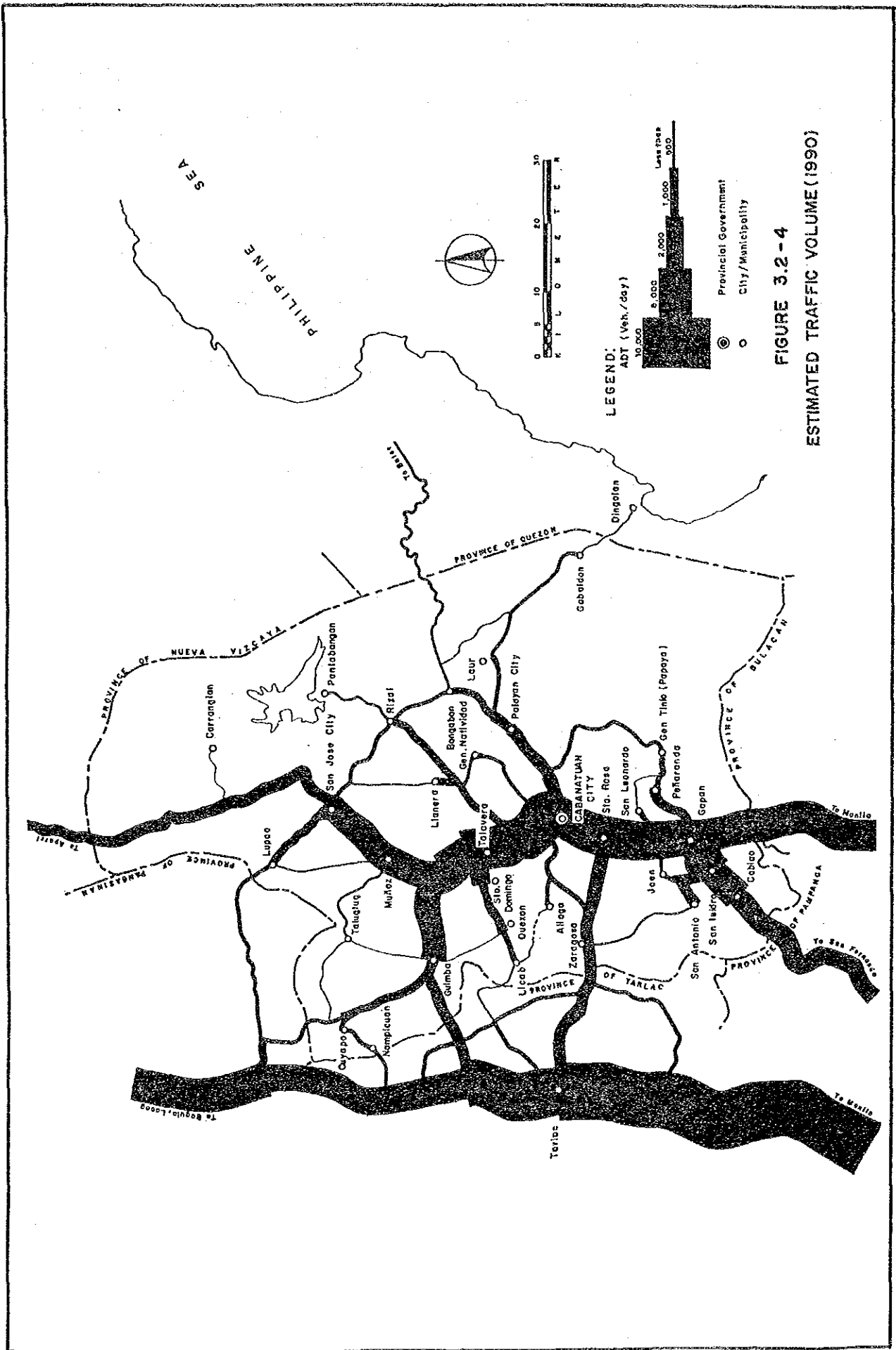
**Diverted Traffic-2:** Traffic which changes destination as a consequence of road improvement but for the same trip purpose as in the "w/o" case. This is possible in the case of improvement of the access road to the nearest town which is at present barely accessible due to poor conditions. This traffic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

**Generated Traffic:** Increased traffic brought about by road improvement.

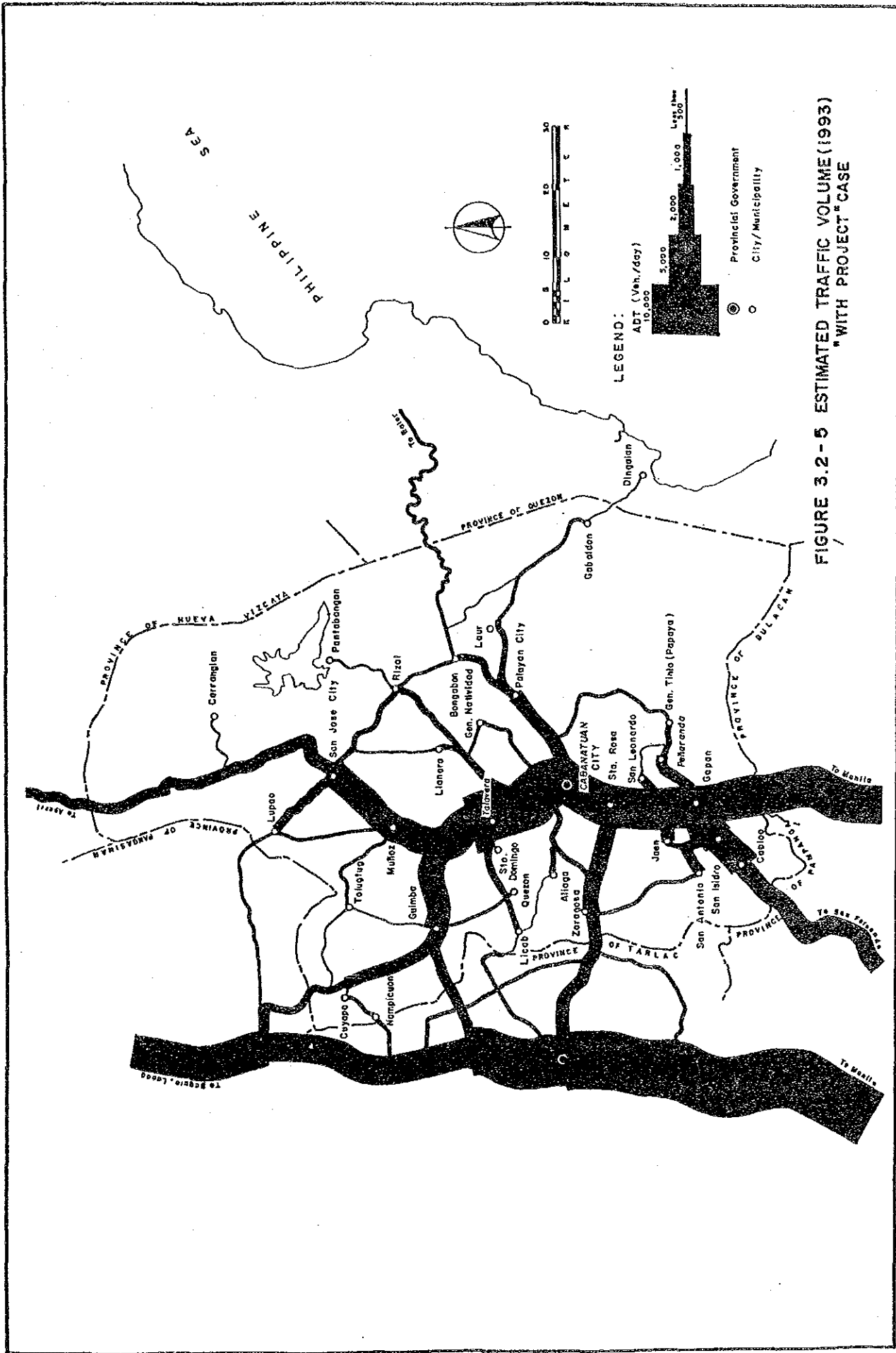
### 3.2.3 Estimated Present and Future Traffic

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.







TRAFFIC PROJECTION NUEVA ECIJA

TABLE 3.2 - 4 (i)

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	29928				29928	6047.06				6047.06
1993	35008		2		35011	6870.54		.38		6870.93
1997	43149		3		43152	8145.54		.46		8146.00
2007	70177		5		70182	12022.16		.68		12022.83
2017	109805		9		109813	17070.23		.96		17071.19
1990	37856				37856	6130.88				6130.88
1993	44324	-1054	-827		42442	6971.50	-165.67	-118.04		6687.79
1997	54702	-1293	-1021		52388	8274.87	-195.59	-140.02		7939.26
2007	89208	-2078	-1669		85461	12242.15	-235.87	-207.01		111749.27
2017	139859	-3222	-2620		134017	17411.70	-402.75	-294.32		16714.53
1990	37498				37498	6097.83				6097.83
1993	49908	107	-750		43265	6935.80	-55.44	-105.75		6773.61
1997	54194	145	-925		53414	8235.53	-65.66	-125.48		8044.39
2007	88387	280	-1512		87156	12192.01	-92.77	-185.72		11913.52
2017	138571	491	-2375		136687	17348.58	-127.12	-264.46		16956.99
1990	44682				44682	7058.63				7058.63
1993	52430	-495	-1099	5	50840	8044.83	-153.91	-158.18	.76	7733.50
1997	64902	-595	-1354	18	62972	9578.84	-180.79	-187.36	2.99	9213.76
2007	106531	-914	-2201	40	103457	14268.83	-261.25	-276.18	5.62	13737.02
2017	167953	-1358	-3443	79	163221	20411.86	-355.14	-391.91	9.23	19668.54
1990	45319				45319	7249.08				7249.08
1993	53171	146	-1290	5	52032	8260.61	-43.90	-185.50	.76	8031.97
1997	68810	190	-1585	18	64434	9833.86	-50.94	-219.21	2.99	9566.70
2007	108027	347	-2561	40	105853	14645.65	-71.69	-321.43	5.62	14258.15
2017	170268	582	-3988	79	166941	20943.50	-98.34	-454.31	9.23	20400.09
1990	33187				33187	5411.12				5411.12
1993	38802	-206	-1014	5	37585	6146.45	-83.08	-144.02	.76	5920.11
1997	47798	-238	-1244	18	46334	7285.22	-96.88	-170.03	2.99	7021.31
2007	77631	-332	-2003	40	75336	10744.51	-137.96	-248.61	5.62	10363.56
2017	121310	-459	-3108	79	117822	15243.54	-190.79	-350.43	9.23	14711.55
1990	26098				26098	4596.66				4596.66
1993	30458	-1308	-603	5	28552	5213.47	-211.99	-77.19	.76	4925.05
1997	37425	-1480	-740	18	35223	6166.51	-250.07	-91.23	2.99	5828.21
2007	60442	-2376	-1196	40	56911	9052.40	-364.96	-133.76	5.62	8559.30
2017	94002	-3678	-1860	79	88543	12793.35	-513.54	-188.99	9.23	12100.05
1990	24753				24753	4444.23				4444.23
1993	28772	-1808	-343	34	26656	5024.22	-278.00	-43.58	4.97	4707.60
1997	35165	-2220	-418	125	32652	5917.03	-328.00	-51.19	17.24	5555.07
2007	56142	-3580	-664	189	52088	8605.60	-479.07	-74.07	23.80	8076.26
2017	86522	-5560	-1019	275	80218	12073.42	-674.37	-103.61	32.00	11327.44

TRAFFIC PROJECTION NUEVA ECIJA

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
9	1990	12533	-	-	143	12533	2930.58	-	-2.23	20.97	2930.58
	1993	14558	-	-13	530	14788	3329.46	-	-2.62	74.49	3348.21
	1997	18063	-	-16	860	18577	3947.02	-	-3.80	109.34	4018.89
	2007	23863	-	-25	1339	30198	5824.52	-	-5.31	154.93	5930.05
	2017	45927	-	-39		47228	8269.25	-			8418.87
10	1990	12076	-	-2	-	12076	2914.07	-	.01	-	2914.07
	1993	14126	-	-2	-	14124	3310.92	-	.02	-	3310.93
	1997	17410	-	-3	-	17408	3925.37	-	.02	-	3925.39
	2007	28317	-	-5	-	28314	5793.64	-	.04	-	5793.66
	2017	44307	-	-	-	44302	8226.53	-	-	-	8226.57
11	1990	32218	-2436	-288	-	32218	4883.17	-414.98	-27.18	-	4883.17
	1993	37763	-2995	-334	-	35088	5559.41	-490.67	-32.65	-	5117.25
	1997	46672	-4843	-557	-	43342	6609.37	-719.52	-49.57	-	6086.04
	2007	76352	-7545	-885	-	70952	9812.16	-1016.63	-71.65	-	9043.07
	2017	119934	-	-	-	111505	13985.41	-	-	-	12897.13
12	1990	25121	-	-167	-	25121	3639.31	-	-18.16	-	3639.31
	1993	28498	-	-208	-	29332	4152.34	-	-21.82	-	4134.18
	1997	36545	-	-348	-	36337	4950.88	-	-33.15	-	4929.06
	2007	60100	-	-555	-	59751	7396.85	-	-47.98	-	7353.70
	2017	94730	-	-	-	94175	10587.90	-	-	-	10589.92
13	1990	16526	-	-2	-	16526	2255.03	-	-	-	2255.03
	1993	19331	-	-3	-	19329	2562.14	-	-0.1	-	2562.14
	1997	23827	-	-4	-	23824	3037.64	-	-0.1	-	3037.63
	2007	38752	-	-6	-	38748	4483.40	-	-0.1	-	4483.40
	2017	60635	-	-	-	60629	6366.11	-	-0.1	-	6366.10
14	1990	6632	-110	-170	-	6632	1034.08	-15.20	-22.45	-	1034.08
	1993	7701	-134	-206	-	7421	1165.81	-17.76	-26.07	-	1128.17
	1997	9399	-211	-321	-	9099	1367.88	-25.39	-36.71	-	1324.05
	2007	14951	-	-	-	14419	1972.25	-35.14	-50.13	-	1910.15
	2017	22968	-	-	-	22162	2746.96	-	-	-	2661.69
15	1990	4335	110	143	-	4335	655.33	15.20	20.69	-	655.33
	1993	5020	134	174	-	5274	748.43	17.76	24.23	-	784.31
	1997	6106	211	275	-	6415	875.58	25.89	34.78	-	917.57
	2007	9643	321	420	-	10129	1254.52	35.14	48.30	-	1314.70
	2017	14731	-	-	-	15472	1738.74	-	-	-	1822.17
16	1990	2041	18	-130	-	2041	304.38	2.66	-18.76	-	304.38
	1993	2371	21	-158	-	2259	343.56	3.04	-21.94	-	327.46
	1997	2896	31	-249	-	2759	403.78	4.18	-31.43	-	364.88
	2007	4614	46	-380	-	4336	584.38	5.60	-43.56	-	557.12
	2017	7102	-	-	-	6768	816.73	-	-	-	778.77

TRAFFIC PROJECTION NUEVA ECUIJA

TABLE 3.2 - 4 (3)

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
17	1990	12543	-	-	-	12543	1776.43	-	-	1776.43
	1993	14697	-1161	-218	-	13318	2021.44	-109.23	-36.65	1875.57
	1997	18157	-1437	-270	-	16449	2401.52	-129.92	-43.67	2227.92
	2007	29670	-2358	-444	-	26868	3558.93	-193.10	-65.14	3300.69
2017	46568	-3713	-699	-	42156	5065.36	-275.62	-93.20	4696.54	
18	1990	10312	-	-	-	10312	1346.43	-	-	1346.43
	1993	12088	-1285	8	-	10811	1532.85	-120.80	-4.65	1407.40
	1997	14941	-1591	9	-	13359	1822.20	-143.73	-5.68	1672.79
	2007	24439	-2612	11	-	21838	2703.85	-213.75	-8.92	2481.17
2017	38407	-4115	13	-	34305	3852.63	-305.24	-13.28	3534.11	
19	1990	6260	-	-	-	6260	950.96	-	-	950.96
	1993	7345	717	-557	-	7505	1083.98	114.13	-82.87	1115.24
	1997	9090	879	-689	-	9280	1290.83	134.66	-98.59	1326.91
	2007	14902	1411	-1129	-	15184	1922.18	196.61	-146.56	1972.20
2017	23470	2187	-1775	-	23883	2748.26	276.84	-209.23	2815.88	
20	1990	5178	-	-	-	5178	769.36	-	-	769.36
	1993	6066	925	-318	-	6672	875.39	153.49	-48.17	980.71
	1997	7491	1133	-393	-	8231	1039.86	181.13	-57.16	1163.82
	2007	12225	1816	-640	-	13400	1539.91	264.47	-84.51	1719.88
2017	19178	2809	-1003	-	20985	2191.56	372.28	-120.00	2443.84	
21	1990	6656	-	-	-	6656	1087.97	-	-	1087.97
	1993	7737	-397	-467	-	6943	1231.61	-44.77	-70.88	1115.97
	1997	9467	-443	-555	-	8469	1454.23	-52.12	-82.83	1319.28
	2007	15224	-693	-875	-	13836	2133.29	-74.24	-118.61	1940.44
2017	23631	-1055	-1336	-	21240	3016.54	-102.69	-164.46	2749.39	
22	1990	5793	-	-	-	5793	895.88	-	-	895.88
	1993	6685	-302	-560	-	5823	1007.05	-37.59	-87.29	882.16
	1997	8099	-362	-581	-	7056	1177.91	-43.48	-102.18	1032.25
	2007	12718	-556	-1075	-	11087	1690.57	-61.02	-146.62	1482.92
2017	19417	-834	-1643	-	16940	2352.42	-83.44	-203.48	2065.50	
23	1990	3713	-	-	-	3713	562.22	-	-	562.22
	1993	4308	488	7	90	4893	633.58	73.39	.81	720.89
	1997	5255	589	9	346	6200	743.29	85.41	1.10	879.70
	2007	8362	916	19	648	9945	1072.96	121.22	2.04	1283.82
2017	12872	1384	34	1161	15461	1498.53	167.00	3.32	1808.98	
24	1990	2250	-	-	-	2250	343.24	-	-	343.24
	1993	2628	-	18	90	2736	389.58	-	2.45	405.14
	1997	3234	-	23	346	3603	461.56	-	2.95	514.40
	2007	5253	-	38	648	5940	681.17	-	4.47	773.24
2017	8226	-	61	1161	9448	968.80	-	6.46	1115.38	

TRAFFIC PROJECTION NUEVA ECUIJA

TABLE 3.2 - 4 (4)

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	
25	1990	898	-	-	241	898	135.36	-	-	0.01	35.06	135.36
	1993	1085	-	-	925	1327	158.95	-	-	0.01	30.67	194.02
	1997	1998	-	-	1647	2324	196.93	-	-	0.01	212.35	327.61
	2007	2491	-	-	2764	4139	318.50	-	-	0.02	320.86	530.87
26	1990	12416	-602	-418	5	12416	1911.99	-97.47	-62.82	0.76	2033.84	1911.99
	1993	14653	-739	-513	18	13637	2193.36	-115.07	-74.15	2.99	2449.64	2033.84
	1997	18288	-1194	-823	40	17054	2635.87	-168.48	-108.21	5.62	3742.55	2449.64
	2007	30619	-1860	-1273	79	28642	4013.61	-238.01	-152.07	9.23	5471.07	3742.55
27	1990	11010	-509	-347	5	11010	1703.12	-83.27	-52.68	0.76	1823.34	1703.12
	1993	13025	-629	-426	18	12373	1958.54	-98.79	-62.29	2.99	2203.32	1823.34
	1997	16310	-1027	-687	40	15273	2361.41	-146.07	-91.25	5.62	3339.97	2203.32
	2007	27505	-1614	-1065	79	25830	3621.66	-207.87	-128.60	9.23	4983.31	3339.97
28	1990	8583	-509	-307	5	8583	1351.19	-83.27	-46.09	0.76	1412.64	1351.19
	1993	10183	-629	-376	18	9372	1541.24	-98.79	-54.31	2.99	1687.65	1412.64
	1997	12600	-1027	-603	40	11614	1837.76	-146.07	-78.86	5.62	2528.47	1687.65
	2007	20676	-1614	-928	79	19086	2747.78	-207.87	-110.20	9.23	3635.65	2528.47
29	1990	4970	571	-461	85	4970	788.97	105.31	-70.15	12.35	955.17	788.97
	1993	5875	679	-564	328	6071	907.67	121.35	-82.66	46.90	1180.06	955.17
	1997	7345	1019	-904	608	7787	1094.46	168.43	-120.11	81.98	1805.11	1180.06
	2007	12314	1495	-1393	1082	13038	1674.82	227.82	-168.10	130.89	2635.56	1805.11
30	1990	1611	-	-	65	1611	360.79	-	-	14.14	437.85	360.79
	1993	1948	-	-	251	2012	423.71	-	-	52.55	577.54	437.85
	1997	2509	-	-	447	2759	524.99	-	-	84.95	933.91	577.54
	2007	4470	-	-	750	4917	848.96	-	-	129.56	1421.44	933.91
31	1990	19585	-578	-423	-	19585	3028.47	-141.74	-63.94	-	3028.47	19585
	1993	22879	-697	-516	-	21878	3436.82	-166.53	-75.08	-	3827.01	3028.47
	1997	28155	-1079	-819	-	25942	4068.62	-240.79	-108.39	-	5635.00	3827.01
	2007	45627	-1625	-1257	-	43729	5984.18	-336.36	-151.26	-	7984.17	5635.00
32	1990	7001	2377	-201	-	7001	1160.46	149.42	-33.63	-	1160.46	7001
	1993	8174	2953	-247	-	10350	1316.52	179.22	-39.80	-	1432.32	1160.46
	1997	10049	4882	-400	-	12755	1557.77	271.13	-58.47	-	1697.19	1432.32
	2007	16244	7733	-622	-	20227	2287.78	392.41	-82.73	-	2500.44	1697.19

TRAFFIC PROJECTION NUEVA ECIJA

TABLE 3.2 - 4 (5)

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
33	1990	3710	-	-	-	3710	453.71	-	-	453.71
	1993	4332	3034	-41	-	7384	513.78	282.91	-5.56	791.13
	1997	5326	3829	-50	-	9104	606.42	336.53	-6.48	936.48
	2007	8614	6282	-80	-	14816	886.57	500.22	-9.23	1377.56
	2017	13394	9892	-124	-	23162	1247.44	714.09	-12.77	1948.76
34	1990	1648	-	-	-	1648	203.24	-	-	203.24
	1993	1759	-	-	-	1759	210.66	-	-	210.66
	1997	1918	-	-	-	1918	220.97	-	-	220.97
	2007	2388	-	-	-	2388	249.70	-	-	249.70
	2017	3026	-	-	-	3026	287.10	-	-	287.09
35	1990	7923	-	-	-	7923	1214.98	-	-	1214.98
	1993	9213	-1247	212	-	8179	1372.47	-208.42	19.49	1183.55
	1997	11266	-1531	262	-	9997	1614.73	-246.08	23.33	1391.98
	2007	18013	-2473	428	-	15968	2343.93	-359.84	35.16	2019.25
	2017	27797	-3836	672	-	24633	3284.01	-506.45	50.80	2828.36
36	1990	4782	-	-	-	4782	709.39	-	-	709.39
	1993	5556	707	559	-	6822	800.36	72.25	63.57	936.19
	1997	5786	871	686	-	8343	940.07	85.83	75.11	1101.00
	2007	10831	1417	1106	-	13353	1360.98	127.21	109.97	1598.16
	2017	16698	2221	1717	-	20637	1903.63	181.47	155.17	2240.27
37	1990	3046	-	-	-	3046	388.39	-	-	388.39
	1993	3548	707	686	-	4941	439.49	72.25	80.97	592.71
	1997	4350	871	841	-	6062	518.20	85.83	95.44	699.47
	2007	6996	1417	1350	-	9762	756.22	127.21	139.16	1022.60
	2017	10847	2221	2092	-	15160	1064.24	181.47	195.76	1441.47
38	1990	7397	-	-	-	7397	832.00	-	-	832.00
	1993	8510	3706	603	-	12818	941.75	340.53	74.55	1356.83
	1997	10445	4583	739	-	15767	1110.91	405.05	87.80	1603.76
	2007	16838	7510	1186	-	25535	1622.59	602.06	127.81	2352.45
	2017	26138	11820	1838	-	39797	2283.52	859.77	179.57	3322.86
39	1990	1325	-	-	-	1325	170.41	-	-	170.41
	1993	1550	1037	292	-	2879	193.53	163.01	38.13	394.67
	1997	1909	1272	360	-	3542	229.30	192.54	45.22	467.07
	2007	3100	2047	585	-	5732	337.64	281.70	66.69	686.02
	2017	4841	3176	914	-	8931	478.09	397.14	94.51	969.74
40	1990	9282	-	-	-	9282	1428.56	-	-	1428.56
	1993	10847	-1037	-294	-	9517	1621.52	-163.01	-38.10	1420.41
	1997	13351	-1272	-362	-	11717	1919.97	-192.54	-45.18	1682.24
	2007	21635	-2047	-588	-	19000	2823.88	-281.70	-66.63	2475.35
	2017	33727	-3176	-917	-	29534	3995.19	-397.14	-94.43	3503.62

TRAFFIC PROJECTION NUEVA ECILJA

TABLE 3.2 - 4 (6)  
Movement of Passengers and Commodity

Link	Year	Number of Passengers				Total	Commodity Tonnage				Total
		Normal	Diver- ted-1	Diver- ted-2	Gene- rated		Normal	Diver- ted-1	Diver- ted-2	Gene- rated	
41	1990	9844				9844	1500.60				1500.60
	1993	11608	-4445	-80	-	6983	1704.07	-680.68	-12.14	-	1011.25
	1997	14174	-5471	-99	-	8604	2018.96	-806.96	-14.43	-	1198.56
	2007	22999	-8866	-162	-	13971	2979.40	-1285.41	-21.39	-	1766.61
	2017	35887	-13824	-264	-	21809	4211.02	-1677.43	-30.41	-	2603.18
42	1990	6807				6807	1034.82				1034.82
	1993	7993	-93	29	-	7929	1180.15	-12.54	4.34	-	1171.96
	1997	9903	-113	35	-	9824	1406.17	-14.72	5.06	-	1396.51
	2007	16275	-180	54	-	16149	2096.51	-21.22	7.16	-	2082.46
	2017	25657	-275	81	-	25463	2998.46	-29.54	9.83	-	2978.75
43	1990	12901				12901	1959.28				1959.28
	1993	15120	-523	-411	-	14186	2241.79	-72.73	-59.60	-	2109.46
	1997	18686	-641	-506	-	17539	2664.81	-85.75	-70.56	-	2508.49
	2007	30550	-1030	-819	-	28701	3953.50	-124.91	-103.78	-	3724.81
	2017	47975	-1594	-1278	-	45103	5633.55	-176.31	-146.88	-	5311.36
44	1990	5927				5927	912.76				912.76
	1993	6923	96	-305	-	6713	1035.56	11.28	-45.55	-	1001.29
	1997	8516	116	-376	-	8256	1225.46	13.14	-54.00	-	1184.60
	2007	13786	183	-612	-	13357	1800.45	18.62	-79.69	-	1739.38
	2017	21481	279	-957	-	20803	2546.05	25.52	-113.09	-	2458.49
45	1990	4528				4528	680.86				680.86
	1993	5257	280	-89	-	5448	767.66	36.97	-12.15	-	792.48
	1997	6413	347	-108	-	6653	900.83	44.15	-14.17	-	930.81
	2007	10194	573	-170	-	10598	1299.20	66.10	-20.15	-	1345.16
	2017	15652	907	-258	-	16300	1809.99	94.79	-27.75	-	1877.03
46	1990	578				578	81.56				81.56
	1993	674	-	142	-	816	92.39	-	19.92	-	112.31
	1997	827	-	174	-	1001	109.09	-	23.49	-	132.58
	2007	1393	-	279	-	1512	159.48	-	34.23	-	193.70
	2017	2069	-	432	-	2501	224.37	-	48.01	-	272.39
47	1990	5110				5110	770.27				770.27
	1993	6008	-117	12	-	5902	879.62	-13.73	.66	-	866.54
	1997	7455	-147	15	-	7323	1049.93	-16.55	.73	-	1034.11
	2007	12295	-247	23	-	12072	1671.44	-25.26	.94	-	1547.12
	2017	19437	-395	36	-	19077	2254.35	-36.76	1.18	-	2218.76
48	1990	3335				3335	285.04				285.04
	1993	3900	-76	13	-	3837	323.66	-4.11	1.03	-	320.57
	1997	4804	-94	16	-	4726	383.38	-4.86	1.14	-	379.65
	2007	7699	-150	22	-	7570	557.09	-7.05	1.39	-	551.43
	2017	12102	-237	31	-	11896	794.21	-10.04	1.68	-	785.86

TRAFFIC PROJECTION NUEVA ECIJA

TABLE 3.2 - 4 (7)

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
49	1990	2023				2023	199.66				199.66
	1993	2359	76	-14	-	2422	226.36	4.11	-1.02	-	229.45
	1997	2897	94	-16	-	2975	267.62	4.86	-1.13	-	271.36
	2017	4618	180	-22	-	4746	387.64	7.05	-1.38	-	393.31
50	1990	7424	237	-31	-	7430	551.11	10.04	-1.67	-	559.48
	1993	4543				4543	709.31				709.31
	1997	5358	11	-6	-	5363	813.21	-3.06	-2.31	-	807.83
	2017	6676	13	-8	-	6680	975.83	-3.78	-2.79	-	969.26
51	1990	11092	13	-16	-	11089	1475.88	-6.16	-4.31	-	1465.41
	1993	17683	16	-26	-	17673	2138.55	-9.21	-6.24	-	2123.09
	1997	2687				2687	526.80				526.80
	2017	3095	811	163	113	4182	592.17	120.86	20.48	17.22	750.73
52	1990	3740	991	196	421	5348	692.75	142.27	23.70	61.91	920.63
	1993	5847	3583	301	702	8434	995.67	207.10	33.22	93.31	1329.29
	1997	8383	2447	452	1119	12902	1386.82	291.31	45.39	134.70	1858.21
	2017	2237	620	548	113	2237	404.16	100.13	83.71	17.22	404.16
53	1990	3199	760	674	421	5054	545.60	118.12	99.18	61.91	824.80
	1993	5156	1225	1091	702	8174	808.32	172.66	146.02	93.31	1220.30
	1997	8020	1906	1698	1119	12743	1152.28	243.62	206.72	134.70	1737.31
	2017	1844				1844	298.26				298.26
54	1990	2155	618	-165	-	2608	338.65	118.55	-27.95	-	429.25
	1993	2654	754	-204	-	3204	401.17	139.60	-33.20	-	507.58
	1997	4303	1201	-333	-	5171	590.73	202.97	-49.15	-	744.55
	2017	6713	1849	-521	-	8041	836.85	284.70	-69.95	-	1051.60
55	1990	535				535	66.14				66.14
	1993	626	634	218	-	1478	75.11	120.90	34.81	-	230.82
	1997	772	774	268	-	1814	88.99	142.40	41.18	-	272.57
	2017	1256	1234	433	-	2922	131.05	207.14	60.43	-	398.62
56	1990	1961	1901	673	-	4534	185.55	290.66	85.20	-	561.41
	1993	3486				3486	548.51				548.51
	1997	4069		35	-	4104	622.02	-	3.90	-	625.92
	2017	5001		43	-	5044	735.57	-	4.59	-	740.16
2017	1990	8077		70	-	8147	1078.60	-	6.68	-	1085.28
	1993	12676		112	-	12788	1536.78	-	9.72	-	1546.49
	1997	2802				2802	403.87				403.87
	2017	3273		-72	-	3202	458.36	-	-8.95	-	449.44
2017	1990	4028		-88	-	3940	542.68	-	-10.57	-	532.11
	1993	6523		-142	-	6381	797.70	-	-15.46	-	782.25
	1997	10223		-224	-	9998	1132.60	-	-22.22	-	1110.39
	2017										



TRAFFIC PROJECTION NUEVA ECUIJA

TABLE 3.2 - 4 (8)

Movement of Passengers and Commodity

Link	Year	Number of Passengers				Total	Commodity Tonnage				Total
		Normal	Diver- ted-1	Diver- ted-2	Gene- rated		Normal	Diver- ted-1	Diver- ted-2	Gene- rated	
57	1990	1236	-	-	-	1236	180.57	-	-	-	180.57
	1993	1443	16	66	-	1525	204.64	2.35	11.75	-	218.74
	1997	1772	20	81	-	1873	241.78	2.80	13.89	-	258.47
	2017	2859	33	131	-	3023	353.77	4.17	20.37	-	378.30
58	1990	4440	52	205	-	4696	498.31	5.96	28.82	-	533.09
	1993	9509	-2433	100	-	9509	1240.53	-221.78	20.76	-	1240.53
	1997	11118	-3007	125	-	10817	1669.41	-263.71	24.78	-	1307.80
	2017	13699	-4921	208	-	17554	2461.08	-391.74	37.13	-	2106.47
59	1990	34829	-7740	332	-	27421	3489.69	-559.29	53.30	-	2983.70
	1993	1225	-	-	-	1225	138.45	-	-	-	138.45
	1997	1432	-	-	143	1575	157.11	-	-	20.97	178.08
	2017	1761	-	-	530	2292	185.95	-	-	74.49	260.44
60	1990	2852	-	-	-	2852	3712	273.24	-	-	3985.58
	1993	4444	-	-	1339	5784	386.34	-	-	109.34	5973.92
	1997	1263	1705	-247	39	1853	194.51	246.02	-36.06	5.73	352.20
	2017	1800	2097	-303	143	3736	259.03	290.84	-42.50	20.23	627.61
61	1990	2883	3392	-488	229	6015	376.65	426.59	-61.98	29.43	770.68
	1993	4444	5282	-758	354	9312	528.16	602.35	-87.14	41.23	1084.60
	1997	346	1705	-206	-	346	48.01	246.02	-30.99	-	269.30
	2017	402	2097	-253	-	1901	54.27	290.84	-35.53	-	318.19
62	1990	493	3392	-408	-	3774	63.88	426.59	-53.30	-	466.04
	1993	790	5282	-633	-	5869	129.85	602.35	-74.95	-	657.24
	1997	1220	-	83	-	32179	3982.26	-	-	-	3982.26
	2017	37642	-	102	-	37725	4524.57	-	-	-	4524.57
63	1990	46395	-	166	-	46497	5364.25	-	-	-	5364.17
	1993	75458	-	260	-	75624	7917.17	-	-	-	7917.06
	1997	118065	-	260	-	118326	11241.03	-	-	-	11240.88
	2017	17285	-1285	-194	-	17285	2114.20	-120.80	-8.28	-	2114.20
64	1990	20220	-1591	-238	-	18392	2843.91	-143.73	-9.66	-	2690.52
	1993	24921	-2612	-383	-	21926	4188.97	-213.75	-13.69	-	3861.53
	1997	40528	-4115	-595	-	35818	5934.66	-305.24	-18.91	-	5610.50
	2017	63399	-	-	-	58689	5934.66	-305.24	-18.91	-	5610.50
65	1990	15797	-3552	-294	-	15797	1613.98	-320.52	-29.05	-	1613.98
	1993	18502	-4394	-363	-	14656	1834.83	-381.30	-34.44	-	1485.25
	1997	22843	-7202	-591	-	18086	2177.06	-566.96	-50.81	-	1761.32
	2017	37282	-11338	-927	-	29489	3217.77	-809.99	-72.22	-	2500.00
66	1990	58495	-	-	-	46231	4573.03	-	-	-	3590.83
	1993	15797	-	-	-	15797	1613.98	-	-	-	1613.98
	1997	18502	-	-	-	14656	1834.83	-	-	-	1485.25
	2017	22843	-	-	-	18086	2177.06	-	-	-	1761.32

TRAFFIC PROJECTION NUEVA ECIJA

TABLE 3.2 - 4 (9)

Movement of Passengers and Commodity

Link	Year	Number of Passengers				Total	Commodity Tonnage				Total
		Normal	Diver- ted-1	Diver- ted-2	Gene- rated		Normal	Diver- ted-1	Diver- ted-2	Gene- rated	
65	1990	13827				13827	1291.89				1291.89
	1993	16200	-3552	-294	-	12354	1469.04	-320.52	-26.88	-	1121.65
	1997	20008	-4394	-362	-	15252	1743.68	-381.30	-31.88	-	1330.50
	2007	32685	-7202	-591	-	24892	2579.77	-566.96	-47.10	-	1965.72
	2017	51348	-11338	-928	-	39082	3671.53	-809.99	-67.01	-	2794.53
66	1990	22041				22041	2072.69				2072.69
	1993	25783	-	21	-	25804	2354.97	-	.68	-	2355.65
	1997	31779	-	25	-	31804	2792.04	-	.80	-	2792.84
	2007	51688	-	40	-	51729	4120.95	-	1.16	-	4122.11
	2017	80880	-	62	-	80942	5851.52	-	1.63	-	5853.15
67	1990	799				799	111.81				111.81
	1993	929	93	-29	-	993	126.28	12.54	-4.32	-	134.50
	1997	1135	113	-35	-	1213	148.53	14.72	-5.03	-	158.21
	2007	1810	180	-54	-	1935	215.13	21.22	-7.12	-	229.22
	2017	2784	275	-81	-	2978	300.56	29.54	-9.77	-	320.33
68	1990	-				-	-				-
	1993	-	443	121	-	564	-	60.46	18.61	-	79.07
	1997	-	546	147	-	694	-	71.69	21.87	-	93.56
	2007	-	889	234	-	1123	-	105.74	31.64	-	137.38
	2017	-	1391	359	-	1750	-	145.92	44.18	-	194.10
69	1990	6791				6791	1061.49				1061.49
	1993	7944	3408	416	-	11769	1205.82	517.67	59.20	-	1782.69
	1997	9793	4199	513	-	14504	1429.25	613.42	70.10	-	2112.77
	2007	15920	6819	831	-	23570	2106.97	903.71	103.08	-	3113.76
	2017	24890	10648	1295	-	36832	2937.55	1280.29	145.78	-	4413.62
70	1990	2872				2872	395.35				395.35
	1993	3355	1400	-213	-	4542	448.85	251.97	-25.96	-	674.87
	1997	4128	1724	-263	-	5589	531.60	298.13	-30.75	-	798.98
	2007	6681	2796	-425	-	9052	782.04	437.83	-45.25	-	1174.62
	2017	10398	4368	-663	-	14104	1105.78	619.49	-64.02	-	1661.24
71	1990	1041				1041	145.07				145.07
	1993	1213	539	678	-	2430	164.06	71.73	98.33	-	334.12
	1997	1486	663	830	-	2979	193.29	84.83	115.72	-	393.84
	2007	2385	1073	1327	-	4785	281.14	124.36	167.90	-	573.39
	2017	3689	1670	2047	-	7405	394.24	175.44	234.98	-	804.66
72	1990	846				846	131.04				131.04
	1993	976	488	-	-	1464	146.77	-73.39	-	-	73.39
	1997	1178	589	-	-	1767	170.83	-85.41	-	-	85.41
	2007	1832	916	-	-	2748	242.43	-121.22	-	-	121.22
	2017	2768	1384	-	-	4152	333.99	-167.00	-	-	167.00

TRAFFIC PROJECTION NUEVA ECIJA

TABLE 3.2 - 4 (10)

Movement of Passengers and Commodity

Link Year	Number of Passengers			Commodity Tonnage			Total		
	Normal	Diver- ted-1	Diver- ted-2	Gene- rated	Normal	Diver- ted-1		Diver- ted-2	Gene- rated
1990	1388				220.32				220.32
1993	1621	141	26		250.81	11.29	4.06		265.85
73   1997	1992	175	33		297.39	13.51	4.84		315.64
2007	3205	288	55		438.42	20.26	7.22		465.90
2017	4997	488	87		623.77	29.29	10.31		663.36

TRAFFIC PROJECTION

NUEVA EC11A

TABLE 3.2 - 5 (1)  
Traffic Volume

Link	Year	w/o					with						
		Car /Van	Jeep-ney	Bus	Tru-ck	Tri-Mot. cycl	Total	Car /Van	Jeep-ney	Bus	Tru-ck	Tri-Mot. cycl	Total
1	1990	2157	704	793	1270	4874	4874	2507	820	858	1443	5627	5627
	1993	2506	820	858	1443	5627	5627	3044	1004	1057	1711	6816	6816
	2007	4779	1608	1720	2525	10632	10632	4779	1608	1720	2525	10633	10633
	2017	7234	2482	2691	3585	15991	15991	7235	2482	2691	3585	15993	15993
	1990	2528	860	928	1287	5604	5604	2809	961	1040	1404	6214	6214
2	1993	2931	1003	1086	1464	6485	6485	3423	1180	1284	1667	7554	7554
	2007	5550	1984	2186	2571	12390	12390	5415	1901	2094	2467	11878	11878
	2017	8608	3074	3427	3656	18766	18766	8253	2946	3284	3510	17993	17993
	1990	2508	853	919	1281	5560	5560	2857	979	1060	1422	6319	6319
	1993	2908	995	1076	1457	6435	6435	3483	1202	1309	1689	7683	7683
3	2007	5606	1967	2166	2560	12299	12299	5513	1937	2136	2502	12088	12088
	2017	8542	3048	3396	3643	18629	18629	8404	3003	3350	3561	18313	18313
	1990	2959	1012	1095	1482	6549	6549	3326	1146	1246	1624	7341	7341
	1993	3439	1183	1285	1689	7596	7596	4068	1412	1543	1935	8958	8958
	2007	6598	2362	2611	2996	14666	14666	6487	2391	2535	2885	14199	14199
4	2017	10267	3682	4116	4286	22351	22351	9954	3575	4000	4129	21658	21658
	1990	3014	1028	1111	1522	6675	6675	3420	1175	1275	1687	7557	7557
	1993	3502	1202	1303	1735	7742	7742	4182	1447	1579	2009	9217	9217
	2007	6816	2399	2647	3076	14938	14938	6566	2348	2594	2994	14603	14603
	2017	10444	3738	4173	4398	22752	22752	10221	3662	4091	4284	22258	22258
5	1990	2222	755	813	1136	4926	4926	2487	851	921	1243	5502	5502
	1993	2572	879	951	1291	5693	5693	3027	1044	1135	1474	6681	6681
	2007	4929	1728	1902	2256	10816	10816	4775	1676	1846	2176	10473	10473
	2017	7486	2669	2973	3201	16329	16329	7258	2591	2887	3089	15825	15825
	1990	1795	601	640	965	4000	4000	1954	657	702	1034	4347	4347
6	1993	2074	698	746	1095	4613	4613	2370	803	863	1224	5260	5260
	2007	3934	1359	1481	1901	8675	8675	3709	1280	1395	1797	8182	8182
	2017	5938	2088	2304	2687	13017	13017	5600	1968	2170	2541	12279	12279
	1990	1714	571	607	933	3825	3825	1835	614	653	989	4091	4091
	1993	1973	661	705	1055	4394	4394	2218	748	800	1167	4932	4932
7	2007	3682	1266	1376	1807	8131	8131	3429	1177	1276	1696	7578	7578
	2017	5507	1928	2120	2535	12091	12091	5125	1790	1965	2379	11260	11260
	1990	1714	571	607	933	3825	3825	1835	614	653	989	4091	4091

TRAFFIC PROJECTION NUEVA ECIIJA

TABLE 3.2 - 5 (2)

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	
9	1990	478	345	317	681	1822	-	-	-	1822	-	-	-	-	-	-	-	-	-	2117
	1993	554	402	371	774	2101	-	-	-	2101	-	-	-	-	-	-	-	-	-	2602
	1997	675	492	457	918	2542	-	-	-	2542	-	-	-	-	-	-	-	-	-	4048
	2007	1068	788	743	1354	3954	-	-	-	3954	-	-	-	-	-	-	-	-	-	6072
	2017	1629	1216	1162	1923	5930	-	-	-	5930	-	-	-	-	-	-	-	-	-	6072
10	1990	465	335	305	678	1783	-	-	-	1783	-	-	-	-	-	-	-	-	-	2056
	1993	539	389	357	770	2056	-	-	-	2056	-	-	-	-	-	-	-	-	-	2487
	1997	637	477	440	913	2487	-	-	-	2487	-	-	-	-	-	-	-	-	-	3866
	2007	1039	764	716	1347	3866	-	-	-	3866	-	-	-	-	-	-	-	-	-	5796
	2017	1584	1178	1121	1913	5796	-	-	-	5796	-	-	-	-	-	-	-	-	-	5796
11	1990	2631	1303	560	940	5434	-	-	-	5434	-	-	-	-	-	-	-	-	-	5830
	1993	3055	1518	657	1070	6300	-	-	-	6300	-	-	-	-	-	-	-	-	-	7106
	1997	3732	1860	812	1272	7676	-	-	-	7676	-	-	-	-	-	-	-	-	-	11244
	2007	5935	2983	1328	1889	12134	-	-	-	12134	-	-	-	-	-	-	-	-	-	17116
	2017	9080	4500	2086	2592	18457	-	-	-	18457	-	-	-	-	-	-	-	-	-	17116
12	1990	2023	1006	437	701	4166	-	-	-	4166	-	-	-	-	-	-	-	-	-	4816
	1993	2354	1174	513	799	4841	-	-	-	4841	-	-	-	-	-	-	-	-	-	5884
	1997	2884	1443	636	953	5915	-	-	-	5915	-	-	-	-	-	-	-	-	-	9363
	2007	4616	2328	1045	1424	9413	-	-	-	9413	-	-	-	-	-	-	-	-	-	14307
	2017	7094	3606	1647	2038	14385	-	-	-	14385	-	-	-	-	-	-	-	-	-	14307
13	1990	1907	653	287	434	2682	-	-	-	2682	-	-	-	-	-	-	-	-	-	3105
	1993	1516	760	336	493	3105	-	-	-	3105	-	-	-	-	-	-	-	-	-	3776
	1997	1848	929	414	585	3776	-	-	-	3776	-	-	-	-	-	-	-	-	-	5948
	2007	2928	1484	674	863	5949	-	-	-	5949	-	-	-	-	-	-	-	-	-	9033
	2017	4471	2283	1055	1225	9034	-	-	-	9034	-	-	-	-	-	-	-	-	-	9033
14	1990	583	788	-	103	1475	-	-	-	1516	-	-	-	-	-	-	-	-	-	1557
	1993	637	905	-	117	1688	-	-	-	1736	-	-	-	-	-	-	-	-	-	1585
	1997	797	1037	-	137	2022	-	-	-	2080	-	-	-	-	-	-	-	-	-	2429
	2007	1207	1869	-	197	3073	-	-	-	3167	-	-	-	-	-	-	-	-	-	3604
	2017	1770	2479	-	275	4523	-	-	-	4667	-	-	-	-	-	-	-	-	-	3604
15	1990	378	512	-	67	956	-	-	-	984	-	-	-	-	-	-	-	-	-	1096
	1993	431	586	-	75	1092	-	-	-	1124	-	-	-	-	-	-	-	-	-	1113
	1997	514	703	-	88	1304	-	-	-	1342	-	-	-	-	-	-	-	-	-	1694
	2007	773	1071	-	125	1970	-	-	-	2030	-	-	-	-	-	-	-	-	-	2499
	2017	1128	1583	-	174	2885	-	-	-	2977	-	-	-	-	-	-	-	-	-	2499
16	1990	175	238	-	30	444	-	-	-	457	-	-	-	-	-	-	-	-	-	464
	1993	201	274	-	34	509	-	-	-	524	-	-	-	-	-	-	-	-	-	474
	1997	240	330	-	40	610	-	-	-	629	-	-	-	-	-	-	-	-	-	729
	2007	365	508	-	58	931	-	-	-	960	-	-	-	-	-	-	-	-	-	1084
	2017	537	757	-	82	1376	-	-	-	1420	-	-	-	-	-	-	-	-	-	1084

TRAFFIC PROJECTION NUEVA ECILJA

TABLE 3.2 - 5 (3)

Traffic Volume

Link	Year	w/o						with									
		Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-Mot. cycl	Ani-mal	Total	Car /Van	Jeep-ney	Bus	Iru-ck	Sub-Total	Tri-Mot. cycl	Ani-mal	Total
17	1990	840	957	35	351	2183	-	78	2261	891	1015	37	370	2314	-	83	2397
	1993	977	1116	41	399	2531	-	92	2625	1090	1246	46	440	2824	-	103	2924
	1997	1196	1370	50	474	3091	-	113	3204	1739	2005	74	552	4470	-	158	4638
	2017	1911	2206	82	703	4902	-	185	5087	2671	3102	117	928	6818	-	263	7081
18	1990	677	777	29	266	1748	-	64	1813	709	814	30	278	1831	-	68	1899
	1993	788	906	33	303	2031	-	76	2106	869	1000	37	330	2236	-	83	2319
	1997	966	1114	41	360	2481	-	93	2574	1390	1611	60	490	3551	-	135	3688
	2017	1646	1797	68	534	3945	-	153	4097	2139	2498	95	698	5431	-	214	5645
19	1990	206	41	215	212	674	-	39	713	244	49	258	248	799	-	47	845
	1993	238	48	253	241	780	-	46	826	296	60	319	295	971	-	58	1029
	1997	289	59	313	287	948	-	57	1005	465	97	522	439	1523	-	95	1618
	2017	689	147	807	611	2264	-	147	2401	703	150	821	627	2300	-	149	2450
20	1990	168	34	178	171	552	-	32	584	216	44	229	218	707	-	42	749
	1993	195	40	209	195	638	-	38	676	262	53	283	259	857	-	51	909
	1997	236	48	258	231	774	-	47	820	408	85	461	383	1337	-	84	1421
	2017	558	119	669	483	1824	-	120	1944	615	131	722	544	2011	-	131	2142
21	1990	420	610	5	193	1228	-	42	1270	434	632	5	198	1269	-	43	1312
	1993	482	705	6	219	1412	-	48	1461	523	768	7	234	1532	-	53	1585
	1997	581	856	7	258	1703	-	59	1763	812	1217	11	344	2384	-	85	2469
	2017	1347	2064	19	539	3955	-	148	4103	1217	1860	17	488	3882	-	133	3715
22	1990	357	525	5	159	1045	-	36	1081	355	525	5	157	1042	-	36	1078
	1993	407	602	5	179	1194	-	42	1235	425	632	6	183	1245	-	44	1290
	1997	486	725	6	209	1426	-	51	1477	643	977	9	263	1892	-	69	1961
	2017	1085	1681	15	418	3199	-	121	3320	949	1468	13	367	2797	-	106	2903
23	1990	177	301	19	108	605	-	23	628	240	349	45	139	773	-	31	803
	1993	203	347	22	122	694	-	27	721	324	323	108	169	924	-	39	963
	1997	244	420	27	143	834	-	33	867	505	504	173	247	1429	-	62	1491
	2017	558	994	65	288	1907	-	80	1987	762	762	269	348	2141	-	97	2238
24	1990	107	183	12	66	368	-	14	382	134	195	25	78	438	-	17	450
	1993	124	212	14	75	425	-	16	441	189	188	63	99	538	-	23	561
	1997	151	259	17	89	515	-	20	535	302	302	103	149	856	-	27	893
	2017	358	635	42	186	1223	-	51	1275	467	467	164	215	1313	-	59	1372

TRAFFIC PROJECTION NUEVA ECUIJA

TABLE 3.2 - 5 (4)

Traffic Volume

Link	Year	w/o						with								
		Car /Van	Jeep-ney	Bus	Tru-ck	Sub-ck	Total	Tri-cycl	Mot. cycl	Ani-mal	Total	Tri-cycl	Mot. cycl	Ani-mal	Total	
25	1990	43	73	5	26	146	152	-	6	-	-	152	-	8	-	217
	1993	51	87	6	31	175	181	-	7	-	-	181	-	15	-	360
	1997	65	112	7	38	222	230	-	9	-	-	230	-	26	-	619
	2017	181	322	21	93	618	644	-	26	-	-	644	-	43	-	1003
26	1990	741	881	74	387	2082	2082	-	-	-	-	2082	-	-	-	2261
	1993	867	1035	87	441	2433	2433	-	-	-	-	2433	-	-	-	2791
	1997	1069	1285	108	534	2996	2996	-	-	-	-	2996	-	-	-	4542
	2017	1742	2123	182	813	4860	4860	-	-	-	-	4860	-	-	-	7088
27	1990	658	782	65	345	1850	1850	-	-	-	-	1850	-	-	-	2022
	1993	771	921	77	397	2166	2166	-	-	-	-	2166	-	-	-	2503
	1997	955	1147	97	478	2676	2676	-	-	-	-	2676	-	-	-	4102
	2017	2464	3041	263	1075	6844	6844	-	-	-	-	6844	-	-	-	6437
28	1990	443	510	65	274	1392	1392	-	-	-	-	1392	-	-	-	1484
	1993	514	712	76	312	1615	1615	-	-	-	-	1615	-	-	-	1814
	1997	628	876	95	372	1971	1971	-	-	-	-	1971	-	-	-	2885
	2017	1528	2010	245	799	4781	4781	-	-	-	-	4781	-	-	-	4416
29	1990	255	350	37	160	803	803	-	-	-	-	803	-	-	-	977
	1993	299	412	44	184	939	939	-	-	-	-	939	-	-	-	1236
	1997	369	512	55	222	1158	1158	-	-	-	-	1158	-	-	-	2002
	2017	932	1341	148	495	2916	2916	-	-	-	-	2916	-	-	-	3109
30	1990	95	121	12	73	301	301	-	-	-	-	301	-	-	-	371
	1993	114	145	15	86	359	359	-	-	-	-	359	-	-	-	500
	1997	144	186	19	106	455	455	-	-	-	-	455	-	-	-	854
	2017	247	325	34	172	777	777	-	-	-	-	777	-	-	-	1376
31	1990	1285	1426	70	621	3402	3402	-	-	-	-	3402	-	-	-	3742
	1993	1489	1660	81	705	3935	3935	-	-	-	-	3935	-	-	-	4549
	1997	1813	2034	100	834	4781	4781	-	-	-	-	4781	-	-	-	7162
	2017	2865	3259	162	1227	7513	7513	-	-	-	-	7513	-	-	-	10873
32	1990	4367	5033	253	1737	11390	11390	-	-	-	-	11390	-	-	-	10873
	1993	527	544	17	220	1308	1308	-	-	-	-	1308	-	-	-	1785
	1997	608	632	19	250	1510	1510	-	-	-	-	1510	-	-	-	2110
	2017	1153	1234	39	435	2860	2860	-	-	-	-	2860	-	-	-	3329

TRAFFIC PROJECTION NUEVA ECIJA

TABLE 3.2 - 5 (5)

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
33	1990	252	277	9	86	624	-	-	-	624	469	535	20	154	1178	-	-	-	1178
	1993	291	322	10	98	721	-	-	-	721	541	635	32	192	1400	-	-	-	1400
	1997	354	394	13	115	876	-	-	-	876	863	1024	53	282	2222	-	-	-	2222
	2017	842	973	32	237	2084	-	-	-	2084	1324	1589	82	399	3395	-	-	-	3395
34	1990	100	135	5	33	273	-	21	-	294	105	143	6	34	288	-	22	-	310
	1993	105	143	6	34	288	-	22	-	310	113	155	6	36	310	-	24	-	334
	1997	113	155	6	36	310	-	24	-	334	135	190	8	41	373	-	30	-	403
	2017	164	237	10	47	457	-	38	-	495	164	237	10	47	457	-	38	-	495
35	1990	297	407	141	249	1094	-	-	-	1094	299	416	145	243	1102	-	-	-	1102
	1993	341	471	154	281	1257	-	-	-	1257	359	504	178	285	1326	-	-	-	1326
	1997	410	571	200	331	1512	-	-	-	1512	551	791	284	414	2040	-	-	-	2040
	2017	934	1361	494	673	3462	-	-	-	3462	818	1200	438	590	3036	-	-	-	3036
36	1990	176	244	85	145	651	-	-	-	651	243	343	121	192	900	-	-	-	900
	1993	202	282	99	164	747	-	-	-	747	293	416	148	226	1083	-	-	-	1083
	1997	243	342	121	193	898	-	-	-	898	451	655	238	328	1671	-	-	-	1671
	2017	553	813	297	390	2053	-	-	-	2053	671	996	367	459	2494	-	-	-	2494
37	1990	105	151	54	80	390	-	-	-	390	167	242	88	122	619	-	-	-	619
	1993	121	175	63	90	450	-	-	-	450	202	296	108	143	749	-	-	-	749
	1997	147	213	77	106	543	-	-	-	543	313	469	174	210	1165	-	-	-	1165
	2017	340	516	193	218	1267	-	-	-	1267	471	718	270	296	1753	-	-	-	1753
38	1990	242	355	130	171	897	-	-	-	897	413	616	228	278	1536	-	-	-	1536
	1993	279	412	151	193	1035	-	-	-	1035	501	754	280	329	1864	-	-	-	1864
	1997	337	503	186	228	1253	-	-	-	1253	784	1203	454	482	2924	-	-	-	2924
	2017	789	1223	465	468	2945	-	-	-	2945	1135	1851	708	681	4425	-	-	-	4425
39	1990	39	125	-	33	197	-	17	32	245	119	359	-	78	456	-	24	48	528
	1993	45	145	-	37	228	-	19	36	284	223	280	-	96	599	-	-	-	599
	1997	55	178	-	44	277	-	24	43	344	352	449	-	141	942	-	-	-	942
	2017	133	456	-	92	661	-	61	96	818	537	694	-	199	1429	-	-	-	1429
40	1990	594	739	-	296	1629	-	58	-	1687	604	755	-	295	1653	-	59	-	1713
	1993	689	860	-	366	1886	-	68	-	1953	736	925	-	349	2011	-	73	-	2084
	1997	839	1054	-	398	2292	-	83	-	2376	1155	1485	-	514	3165	-	119	-	3284
	2017	2027	2612	-	829	5468	-	211	-	5679	1780	2295	-	727	4802	-	185	-	4987



TRAFFIC PROJECTION NUEVA ECIJA

TABLE 3.2 - 5 (6)

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	
41	1990	628	782	-	311	1722	-	62	-	1784	-	-	-	210	1202	-	44	-	1245	
	1993	729	912	-	354	1994	-	72	-	2066	-	-	-	249	1463	-	54	-	1516	
	1997	889	1118	-	419	2426	-	89	-	2515	-	-	-	367	2307	-	87	-	2394	
	2007	1409	1796	-	617	3823	-	144	-	3966	-	-	-	519	3505	-	136	-	3642	
	2017	2152	2777	-	874	5803	-	224	-	6027	-	-	-	-	-	-	-	-	-	
42	1990	434	541	-	215	1190	-	43	-	1232	-	-	-	243	1373	-	50	-	1423	
	1993	506	633	-	245	1384	-	50	-	1434	-	-	-	290	1681	-	61	-	1742	
	1997	621	781	-	292	1693	-	62	-	1755	-	-	-	432	2682	-	101	-	2783	
	2007	997	1271	-	435	2702	-	102	-	2804	-	-	-	618	4114	-	159	-	4273	
	2017	1537	1985	-	622	4144	-	160	-	4304	-	-	-	-	-	-	-	-	-	
43	1990	863	1069	25	374	2332	-	81	-	2413	-	-	-	28	401	2540	-	89	-	2629
	1993	1003	1246	30	426	2705	-	95	-	2799	-	-	-	35	477	3098	-	110	-	3208
	1997	1226	1528	37	506	3297	-	117	-	3414	-	-	-	57	708	4906	-	179	-	5086
	2007	1952	2454	60	751	5217	-	191	-	5408	-	-	-	89	1009	7477	-	282	-	7759
	2017	2990	3791	95	1070	7946	-	300	-	8246	-	-	-	-	-	-	-	-	-	
44	1990	398	492	12	173	1075	-	37	-	1112	-	-	-	13	190	1203	-	42	-	1245
	1993	460	572	14	197	1242	-	43	-	1286	-	-	-	16	225	1460	-	52	-	1512
	1997	560	698	17	233	1507	-	53	-	1561	-	-	-	26	330	2286	-	83	-	2369
	2007	883	1109	27	342	2361	-	86	-	2448	-	-	-	41	467	3452	-	130	-	3582
	2017	1342	1700	42	484	3568	-	134	-	3702	-	-	-	-	-	-	-	-	-	
45	1990	302	374	9	129	814	-	28	-	842	-	-	-	11	151	968	-	34	-	1002
	1993	347	432	10	146	935	-	33	-	968	-	-	-	13	177	1166	-	42	-	1208
	1997	419	523	13	171	1126	-	40	-	1166	-	-	-	21	256	1799	-	66	-	1865
	2007	649	817	20	247	1732	-	64	-	1796	-	-	-	32	357	2684	-	102	-	2786
	2017	972	1234	31	344	2580	-	98	-	2678	-	-	-	-	-	-	-	-	-	
46	1990	80	26	-	18	124	-	36	-	160	-	-	-	2	29	162	-	6	-	169
	1993	93	30	-	20	143	-	42	-	186	-	-	-	3	42	254	-	10	-	264
	1997	114	37	-	23	175	-	52	-	226	-	-	-	5	59	385	-	16	-	400
	2007	182	59	-	34	275	-	83	-	359	-	-	-	148	173	656	-	119	-	2096
	2017	280	91	-	48	419	-	129	-	549	-	-	-	-	-	-	-	-	-	
47	1990	167	103	176	154	600	-	32	-	632	-	-	-	203	173	684	-	37	-	721
	1993	194	119	207	176	695	-	47	-	733	-	-	-	232	207	832	-	46	-	878
	1997	237	143	256	210	846	-	38	-	884	-	-	-	415	309	1308	-	75	-	1384
	2007	374	220	423	314	1331	-	77	-	1408	-	-	-	656	444	1977	-	119	-	2096
	2017	568	324	658	451	2012	-	121	-	2133	-	-	-	-	-	-	-	-	-	
48	1990	118	249	26	48	442	-	42	-	484	-	-	-	30	57	499	-	48	-	547
	1993	137	290	31	55	513	-	49	-	561	-	-	-	37	72	592	-	59	-	651
	1997	167	354	38	65	624	-	60	-	684	-	-	-	60	105	924	-	95	-	1019
	2007	259	557	61	95	972	-	96	-	1068	-	-	-	94	149	1418	-	149	-	1566
	2017	395	861	96	135	1488	-	151	-	1639	-	-	-	-	-	-	-	-	-	

TRAFFIC PROJECTION NUEVA ECIIJA

TABLE 3.2 - 5 (7)

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
49	1990	93	144	-	34	271	174	13	-	458	110	171	-	41	322	181	15	-	518
	1993	108	167	-	38	313	203	15	-	531	134	211	-	52	397	154	19	-	569
	1997	131	203	-	45	380	250	18	-	647	209	333	-	75	616	245	30	-	891
	2017	311	485	-	94	889	623	45	-	1557	319	516	-	106	941	384	46	-	1371
50	1990	246	409	-	121	776	235	28	-	1039	287	456	-	143	885	277	34	-	1196
	1993	287	478	-	138	903	277	33	-	1214	352	510	-	184	1046	346	42	-	1433
	1997	353	589	-	166	1107	345	42	-	1494	564	833	-	278	1675	574	69	-	2318
	2017	872	1479	-	364	2714	915	111	-	3739	869	1306	-	403	2578	914	110	-	3603
51	1990	100	267	3	105	475	-	34	-	509	167	366	22	150	705	-	44	-	749
	1993	114	305	4	118	542	-	39	-	580	253	360	72	184	869	-	33	-	903
	1997	137	366	4	139	645	-	47	-	692	391	552	113	268	1322	-	53	-	1374
	2017	306	835	11	277	1429	-	111	-	1540	585	821	173	372	1352	-	81	-	2032
52	1990	81	217	3	81	382	-	28	-	410	153	335	20	132	641	-	40	-	681
	1993	94	252	3	92	440	-	33	-	473	236	334	68	165	803	-	32	-	835
	1997	113	307	4	109	533	-	40	-	573	374	526	110	244	1254	-	51	-	1305
	2017	269	741	10	230	1280	-	100	-	1381	571	798	171	347	1888	-	80	-	1968
53	1990	92	126	14	61	293	-	35	-	328	139	177	20	88	424	-	38	-	462
	1993	107	146	16	69	339	-	40	-	379	188	215	24	104	531	-	20	-	551
	1997	130	179	20	82	411	-	50	-	461	295	341	39	153	828	-	32	-	860
	2017	309	440	50	172	971	-	126	-	1097	447	523	60	216	1246	-	50	-	1396
54	1990	17	55	-	11	83	-	10	9	102	65	144	4	40	253	-	22	21	295
	1993	20	64	-	12	96	-	12	10	118	107	129	14	53	303	-	11	-	314
	1997	24	78	-	14	117	-	14	12	143	168	203	22	78	471	-	18	-	489
	2017	57	190	-	30	277	-	37	25	339	254	310	34	109	707	-	28	-	736
55	1990	179	168	65	107	519	-	22	-	541	208	195	76	122	603	-	26	-	628
	1993	207	195	75	121	598	-	25	-	624	262	239	94	144	729	-	32	-	760
	1997	250	237	93	143	723	-	31	-	755	392	377	151	212	1131	-	51	-	1182
	2017	588	574	235	300	1697	-	79	-	1776	593	579	238	302	1711	-	80	-	1791
56	1990	139	132	52	79	402	-	18	-	419	157	150	59	88	454	-	20	-	474
	1993	160	153	61	89	464	-	20	-	484	190	183	73	104	550	-	25	-	575
	1997	194	187	75	106	562	-	25	-	587	297	290	119	153	858	-	40	-	898
	2017	459	454	190	221	1324	-	64	-	1388	450	445	186	217	1296	-	62	-	1359

TRAFFIC PROJECTION NUEVA ECIJA

TABLE 3.2 - 5 (8)

Traffic Volume

Link	Year	w/o						with							
		Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-Mot. Anl-cycl mal	Total	Car /Van	Jeep-ney	Bus	Tru-ck	Sub-Total	Tri-Mot. Anl-cycl mal	Total
57	1990	64	88	5	39	196	15	212	78	101	10	48	237	16	252
	1993	74	103	6	45	227	18	245	95	104	21	55	277	12	289
	1997	90	126	7	53	275	22	297	151	166	35	82	434	19	453
	2017	142	201	11	77	431	36	467	231	255	54	116	655	29	685
58	1990	596	679	34	254	1563	-	1563	558	631	31	248	1458	-	1458
	1993	692	791	40	289	1812	-	1812	581	773	38	293	1785	-	1785
	1997	845	971	49	342	2207	-	2207	1079	1242	62	432	2815	-	2815
	2017	1343	1563	79	505	3490	-	3490	1648	1922	98	612	4279	-	4279
59	1990	74	73	16	23	185	8	193	92	88	23	30	233	10	242
	1993	85	84	19	26	214	9	223	126	111	39	48	323	14	337
	1997	103	103	23	31	260	11	271	196	177	63	70	506	23	529
	2017	161	163	37	45	406	18	424	296	270	98	99	763	36	799
60	1990	87	108	-	36	231	24	255	199	228	12	81	520	43	563
	1993	100	129	-	41	266	28	294	244	227	44	96	611	23	634
	1997	121	152	-	49	322	34	355	379	357	71	141	948	38	986
	2017	188	239	-	71	498	54	552	569	543	111	198	1421	58	1479
61	1990	23	29	-	9	61	6	67	126	145	8	50	329	28	357
	1993	27	34	-	10	70	8	78	150	141	28	58	377	15	391
	1997	32	41	-	12	85	9	94	235	223	45	85	587	24	611
	2017	50	64	-	17	132	15	147	353	339	70	120	882	37	919
62	1990	1977	707	789	836	4309	-	4309	2298	826	924	950	4998	-	4998
	1993	2294	824	922	950	4891	-	4891	2802	1014	1139	1125	6082	-	6082
	1997	2788	1012	1137	1126	6073	-	6073	4445	1632	1853	1663	9593	-	9593
	2017	6783	2526	2893	2361	14563	-	14563	6794	2531	2900	2361	14585	-	14585
63	1990	1059	379	424	444	2305	-	2305	1145	411	459	477	2492	-	2492
	1993	1228	442	495	504	2670	-	2670	1395	504	566	565	3030	-	3030
	1997	1458	543	611	597	3248	-	3248	2210	811	920	832	4773	-	4773
	2017	3274	874	993	880	5121	-	5121	3375	1256	1438	1178	7247	-	7247
64	1990	923	340	387	389	1989	-	1989	855	315	359	312	1841	-	1841
	1993	1073	397	453	385	2309	-	2309	1045	388	443	370	2245	-	2245
	1997	1313	489	560	457	2818	-	2818	1665	627	723	546	3560	-	3560
	2017	2095	791	914	676	4476	-	4476	2556	975	1133	775	5439	-	5439

TRAFFIC PROJECTION NUEVA ECUIJA

TABLE 3.2 - 5 (9)

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
65	1990	791	295	339	271	1696	-	-	-	1696	702	263	303	236	1504	-	-	-	1504
	1993	920	345	397	308	1971	-	-	-	1971	859	324	374	279	1836	-	-	-	1836
	1997	1127	425	490	366	2408	-	-	-	2408	1373	525	610	413	2921	-	-	-	2921
	2007	1803	689	801	542	3835	-	-	-	3835	2116	818	968	587	4478	-	-	-	4478
	2017	2779	1074	1258	771	5883	-	-	-	5883	-	-	-	-	-	-	-	-	-
66	1990	1263	471	540	435	2709	-	-	-	2709	1468	550	632	495	3145	-	-	-	3145
	1993	1467	550	632	495	3143	-	-	-	3833	1794	676	779	586	3836	-	-	-	3836
	1997	1793	675	779	586	3833	-	-	-	6079	2859	1091	1268	868	6083	-	-	-	6083
	2007	2857	1090	1267	865	6079	-	-	-	9292	4390	1695	1984	1229	9298	-	-	-	9298
	2017	4387	1694	1982	1229	9292	-	-	-	-	-	-	-	-	-	-	-	-	-
67	1990	47	70	-	21	139	-	5	-	144	60	75	5	26	166	-	6	-	172
	1993	55	81	-	24	159	-	6	-	165	78	62	19	30	189	-	8	-	196
	1997	66	98	-	28	192	-	7	-	199	121	95	31	44	291	-	12	-	303
	2007	102	154	-	41	297	-	11	-	309	182	144	47	61	433	-	19	-	452
	2017	154	234	-	57	444	-	17	-	462	-	-	-	-	-	-	-	-	-
68	1990	-	-	-	-	-	-	-	-	-	39	53	.4	13	105	-	-	-	105
	1993	-	-	-	-	-	-	-	-	-	42	55	2	19	118	-	-	-	118
	1997	-	-	-	-	-	-	-	-	-	67	88	3	27	185	-	-	-	185
	2007	-	-	-	-	-	-	-	-	-	102	135	4	39	280	-	-	-	280
	2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
69	1990	436	432	-	220	1089	468	-	-	1557	750	762	-	370	1882	744	-	-	2625
	1993	506	503	-	250	1260	548	-	-	1808	915	975	-	438	2328	750	-	-	3078
	1997	618	617	-	297	1531	675	-	-	2207	1452	1565	-	646	3663	1219	-	-	4832
	2007	981	990	-	437	2408	1098	-	-	3506	2219	2419	-	916	5553	1905	-	-	7458
	2017	1500	1529	-	620	3649	1717	-	-	5366	-	-	-	-	-	-	-	-	-
70	1990	179	226	-	82	486	-	18	-	504	288	360	-	140	788	-	28	-	816
	1993	207	263	-	93	563	-	21	-	584	351	441	-	166	958	-	35	-	993
	1997	253	322	-	110	685	-	26	-	711	555	707	-	244	1506	-	57	-	1563
	2007	400	517	-	162	1080	-	42	-	1121	845	1092	-	345	2283	-	88	-	2371
	2017	611	798	-	229	1638	-	65	-	1703	-	-	-	-	-	-	-	-	-
71	1990	78	90	-	22	190	54	-	-	243	170	205	-	55	430	98	-	-	528
	1993	90	104	-	25	218	63	-	-	281	180	239	-	79	497	51	-	-	549
	1997	109	126	-	29	263	77	-	-	340	283	378	-	115	775	82	-	-	857
	2007	168	196	-	42	406	123	-	-	530	429	576	-	161	1166	128	-	-	1294
	2017	252	295	-	59	606	191	-	-	797	-	-	-	-	-	-	-	-	-
72	1990	64	87	-	20	171	-	-	-	171	34	47	-	12	93	-	-	-	93
	1993	72	100	-	23	194	-	-	-	194	35	51	-	17	103	-	-	-	103
	1997	86	119	-	26	231	-	-	-	231	53	78	-	24	155	-	-	-	155
	2007	129	180	-	36	346	-	-	-	346	78	116	-	33	228	-	-	-	228
	2017	189	266	-	50	505	-	-	-	505	-	-	-	-	-	-	-	-	-

TRAFFIC PROJECTION NUEVA ECIIJA

TABLE 3.2 - 5 (10)

Traffic Volume

Link	Year	w/o					with				
		Car Jeep- /Van ney	Bus	Tru-Sub- ck	Tri- Mot, Ani- cycl cycl mal	Total	Car Jeep- /Van ney	Bus	Tru-Sub- ck	Tri- Mot, Ani- cycl cycl mal	Total
	1990	105	144	33	282	282					
	1993	122	167	38	326	326	123	173	44	341	341
73	1997	147	203	45	395	395	129	190	63	382	382
	2007	229	319	66	613	613	203	302	93	599	599
	2017	345	485	94	924	924	311	466	133	909	909

### 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 inapplicable, specific values were used.

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

Existing Road Condition	Passenger Movement (trip/person/day)		Non-Agricultural Commodity (kg/person/day)	
	w/o	with	w/o	with
Paved/Gravel				
Good/Fair	0.12	0.12	2.0	2.0
Bad	0.10	0.11	1.6	1.8
Very Bad	0.08	0.11	0.6	1.0
Earth Road	0.03	0.06	0.5	1.0
Impassable to motoried vehicle	0.01	0.03	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

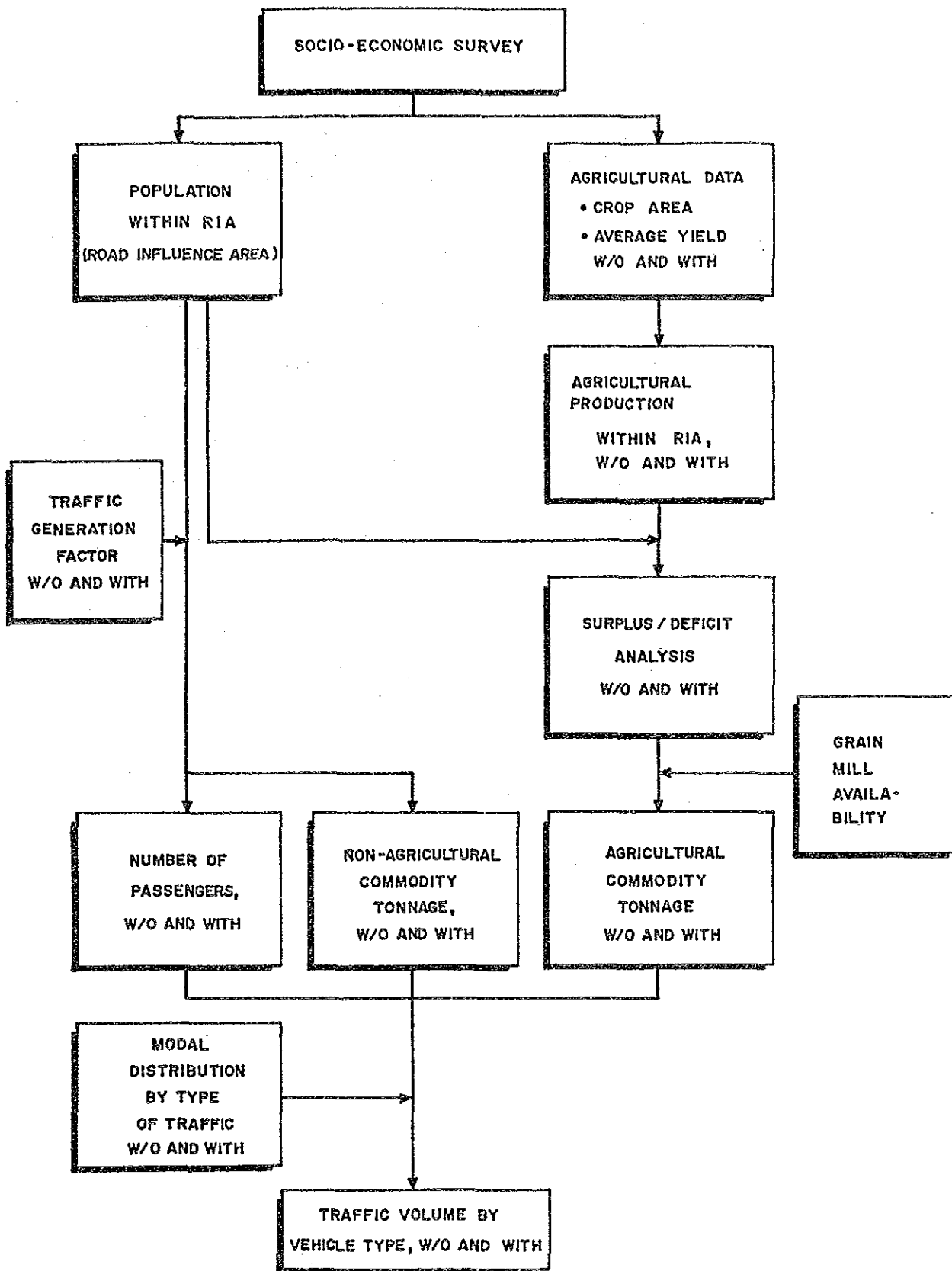


FIGURE 3.3-1  
 PROCEDURE OF TRAFFIC FORECAST  
 FOR DEVELOPMENT PROJECTS

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 consumption 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 consumption 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 converted 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

NUEVA ECIJA

Class of Road	Type of Impr't	Road Number	w/o					with										
			Car	Jeep	Bus	Truck	Total	Car	Jeep	Bus	Truck	Total						
Primary Major	Rehab/Imp-1	N2-3	1516	760	336	493	3105	1516	760	336	493	3105	0	0	0	0	0	
		N10-3	291	322	10	98	721	469	535	20	154	1178	0	0	0	0	0	
		N10-1	1489	1660	81	705	3935	1417	1584	78	662	3742	0	0	0	0	0	
		N12-2	202	282	99	164	747	243	343	121	192	900	0	0	0	0	0	
		N12-3	121	175	63	90	450	167	242	88	122	519	0	0	0	0	0	
		N10-4	291	322	10	98	721	469	535	20	154	1178	0	0	0	0	0	
		N9-5	114	145	15	86	359	118	150	15	89	371	0	0	0	0	0	
		Imp-2/Widen	N10-2	608	632	19	250	1510	707	771	29	279	1785	0	0	0	0	0
	Secondary Major	Rehab/Imp-1	P67-2	689	860	-	336	1886	604	755	-	295	1653	0	59	0	0	0
			P29-1	692	791	40	289	1812	558	631	31	248	1468	0	0	0	0	0
		N3-4	431	586	-	75	1092	450	487	28	98	1063	0	33	0	0	0	
		P81-1	729	912	-	354	1994	440	552	-	210	1202	0	44	0	0	0	
		P76-1	506	633	-	245	1384	502	628	-	243	1373	0	50	0	0	0	
		P44-1	287	478	-	138	903	287	456	-	143	885	277	34	0	0	0	
		P4-1	194	119	207	176	695	191	117	203	173	684	0	37	0	0	0	
		P15-2	207	195	76	121	598	208	196	76	122	603	-	26	-	-	-	
		P15-1	207	195	76	121	598	208	196	76	122	603	-	26	-	-	-	
		N6-2	195	40	209	195	638	216	44	229	218	707	0	42	0	0	0	
		N6-1	238	48	253	241	780	244	49	258	248	799	0	47	0	0	0	
		P65-2	94	252	3	92	440	153	335	20	132	641	-	40	-	-	-	
		P15-3	160	153	61	89	464	157	150	59	88	454	0	20	0	0	0	
		P18-1	107	146	16	69	339	139	177	20	88	424	-	38	-	-	-	
		P71-1	45	145	-	37	228	119	259	-	78	456	0	24	48	0	0	
		P50-1	100	125	-	41	266	199	228	12	81	520	0	43	0	0	0	
		N8-2	124	212	14	75	425	134	195	25	78	433	0	17	0	0	0	
		P46-4	93	30	-	20	143	92	43	1	24	160	0	36	0	0	0	
	P13-1	85	84	19	26	214	92	88	23	30	233	0	10	0	0	0		
	N8-3	51	87	6	31	175	65	94	12	37	209	0	8	0	0	0		
	P31-1	108	167	-	38	313	110	171	-	41	322	181	15	-	-	-		
	P18-2	20	64	-	12	96	65	144	4	40	253	-	22	21	0	0		
	Imp-2/Widen	P25-1	74	103	6	45	227	78	101	10	48	237	0	16	-	-		

TABLE 3.4 - 1 (2)

Traffic Volume by Vehicle Type

NUEVA ECIJA

Class of Road	Type of Impr't	Road Number	w/o						with															
			Car	Jeep	Bus	Truck	Total	Tri-cycle	Motor cycle	Ani-mal	Walk	Boat	Car	Jeep	Bus	Truck	Total	Tri-cycle	Motor cycle	Ani-mal	Walk	Boat		
Minor (Nat'l/Prov'l)	Rehab/Imp-1	P36-1	506	503	-	250	1260	548	-	49	-	-	750	762	-	370	1882	744	-	-	-	-	-	-
		P32-1	137	290	31	55	513	0	6	17	-	135	277	30	57	499	0	48	-	-	-	-	-	
		P56-1	19	37	-	14	70	31	-	-	-	18	34	-	16	58	28	6	17	-	-	-	-	
		P2-1	90	104	-	25	218	63	-	-	-	170	205	-	55	430	98	-	-	-	-	-	-	
		P1-1	82	60	-	15	157	356	22	19	53	47	92	-	22	161	232	12	19	38	-	-	-	
		P73-1	53	122	-	3	178	292	13	1	43	50	109	-	9	168	274	14	1	45	-	-	-	
		N16-1	71	71	-	4	146	409	25	3	60	70	69	-	3	142	407	26	3	62	-	-	-	
		P16-1	42	65	-	10	117	58	11	13	-	27	61	-	14	103	50	12	13	-	-	-	-	
		P62-1	49	30	-	20	99	72	3	27	11	21	29	-	25	76	74	4	27	12	-	-	-	
		P10-1	72	100	-	22	194	0	-	-	-	34	47	-	12	93	0	-	-	-	-	-	-	
		P80-1	48	103	-	27	177	91	18	25	-	46	102	-	26	174	83	19	26	-	-	-	-	
		N13-1	28	27	-	8	63	156	9	7	23	19	38	-	9	67	97	5	7	16	-	-	-	
		P4-2	-	-	-	-	-	-	-	-	-	39	53	0	13	105	0	-	-	-	-	-	-	
		N15-1	45	40	-	17	102	237	15	19	36	44	34	-	21	100	237	15	20	37	-	-	-	
		P67-1	100	163	-	23	285	143	29	30	-	74	172	-	32	277	141	33	30	-	-	-	-	
		P26-1	38	27	-	15	79	65	3	20	10	19	35	-	18	73	29	7	20	-	-	-	-	
	Imp-2/ Widen		P85-1	32	31	-	6	69	183	12	6	28	22	45	-	8	76	114	6	6	18	-	-	-
			P103-1	54	53	-	18	126	126	6	29	19	33	64	-	29	127	53	12	30	-	-	-	-
			P21-1	143	354	-	34	530	295	62	35	-	135	325	-	49	509	268	62	35	-	-	-	-
			P9-1	46	40	-	5	91	235	15	7	36	28	58	-	10	97	147	7	7	24	-	-	-

TABLE 3.4 - 1 (3)

Traffic Volume by Vehicle Type

NUEVA ECIJA

Class of Road	Type of Impr't	Road Number	w/o				with														
			Car	Jeep	Bus	Truck	Total	Tri- cycle	Motor cycle	Ani- mal	Walk - ing										
Minor (Barangay)	Rehab/Imp-1	B31-1	53	63	-	17	133	56	11	23	-	29	58	-	23	110	48	11	23	-	
		B1-1	10	8	-	7	25	45	3	8	7	8	12	-	8	27	29	1	8	5	-
		B25-3	19	25	-	6	50	21	4	9	-	12	24	-	9	45	20	5	9	-	-
		B29-1	80	80	-	26	186	193	9	34	29	48	98	-	35	180	80	19	35	-	-
		B0-1	27	55	-	0	83	129	6	25	20	26	67	-	5	98	55	13	1	-	-
		B18-1	38	4	-	1	43	143	18	38	114	16	30	-	10	56	76	4	9	12	-
		B10-1	28	26	-	2	56	153	10	3	23	18	38	-	5	62	96	5	3	16	-
		B5-2	25	29	-	0	54	70	4	18	11	17	43	-	4	64	35	8	4	-	-
		B17-1	35	28	-	5	69	167	11	7	25	21	42	-	10	72	104	5	7	17	-
		H11-3	53	27	-	23	103	66	3	31	10	23	37	-	28	88	30	7	31	-	-
		B3-1	17	-	-	0	18	152	16	9	106	21	18	-	1	40	109	7	4	22	-
		B28-1	27	14	-	7	48	83	5	13	17	14	24	-	11	48	55	3	12	9	-
		B21-2	35	25	-	7	67	147	9	10	22	20	36	-	12	68	92	5	11	15	-
		B4-1	7	-	-	0	7	77	8	3	55	11	9	-	0	20	59	4	1	11	-
Imp-2/ Widen		B16-1	17	24	-	4	45	57	3	6	9	13	29	-	7	49	24	6	6	-	-

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 Nueva Ecija

	Road Class	National Roads	Prov'l/City Roads	Barangay Roads	Total
Surveyed Road	Major Rd.	473.2	227.2	-	700.4
	Minor Rd.	18.3	206.1	30.0	254.4
	Total	491.5	433.3	30.0	954.8
Rd. Proj. Proposed by Local Officials	Major Rd.	129.7	136.6	-	266.3
	Minor Rd.	28.1	136.9	318.0	483.0
	Total	157.8	273.5	318.0	749.3
Studied Road	Major Rd.	492.5	242.2	-	735.1
	Minor Rd.	28.1	246.9	318.0	593.0
	Total	521.0	489.1	318.0	1,328.1

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 bad 2/
(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 Nueva Ecija

Road Class		National Road	Prov'l/City Road	Barangay Road	Total
Major Road	: Length (kms.)	180.3	187.2	-	367.5
	: (% to Studied Roads)	(37%)	(77%)	-	(50%)
Minor Road	: Length (kms.)	28.1	246.9	318.0	593.0
	: (% to Studied Roads)	(100%)	(100%)	(100%)	(100%)
Total	: Length (kms.)	208.4	434.1	318.0	960.5
	: (% to Studied Roads)	(40%)	(89%)	(100%)	(72%)

## 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

- \* Primary major roads
- \* Secondary major roads

##### Minor Roads

- \* National/provincial/city 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:

Improvement 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 Superior
Good/Fair	No improvement or widening (widening)	Upgrading of pavement type (improvement- 2)
Bad/Very bad	Improvement of surface condi- tion (Rehabilita- tion)	Upgrading of pavement type (improvement- 1) : (Rehabilita- tion) : (Improve- ment-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 narrower 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	$7.5 \leq IRR$	MA-1	↑ To be selected for F/S ↓
2	Secondary	A	$7.5 \leq IRR$		
3	Primary	B	$15.0 \leq IRR$	MA-2	
4	Secondary	B	$15.0 \leq IRR$		
5	Primary	A	$IRR < 7.5$	MA-3	
6	Secondary	A	$IRR < 7.5$		
7	Primary	B	$IRR < 15.0$	MA-3	
8	Secondary	B	$IRR < 15.0$		

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	$7.5 \leq MPI$	MI-1	↑ To be selected for F/S ↓
2	Barangay	A	$7.5 \leq MPI$		
3	National/Provincial/ City	A	$MPI < 7.5$	MI-2	
4	Barangay	A	$MPI < 7.5$		

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 Nueva Ecija

Category	Road Class	Type of Improvement	IRR	Priority Group	Road Length	No. of Road Links
1	Primary	A	$7.5 \leq$ IRR	MA-1	123.3	9
2	Secondary	A	$7.5 \leq$ IRR	MA-1	242.3	22
3	Primary	B	$15.0 \leq$ IRR	MA-2	-	-
4	Secondary	B	$15.0 \leq$ IRR	MA-2	-	-
5	Primary	A	IRR < 7.5	MA-2	-	-
6	Secondary	A	IRR < 7.5	MA-2	1.9	1
7	Primary	B	IRR < 15.0	MA-3	-	-
8	Secondary	B	IRR < 15.0	MA-3	-	-
Total					367.5	32

Table 4.2-7 PRIORITY OF IDENTIFIED MINOR ROADS  
Province of Nueva Ecija

Category	Road Class	Type of Improvement	MPI	Priority Group	Road Length	No. of Rd. Links
1	Nat'l/Provi/ City	A	$7.5 \leq$ MPI	MI-1	202.2	24
2	Barangay	A	$7.5 \leq$ MPI	MI-1	157.2	23
3	Nat'l/Provi/	A	MPI < 7.5	MI-2	72.8	8
4	Barangay	A	MPI < 7.5	MI-2	160.8	28
Total					593.0	83

#### 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 .....	362.4 kms. ( 31 projects)
Minor Road .....	329.6 kms. ( 35 projects)
-----	
Total	692.0 kms. ( 66 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	Existing Pavement			Proposed			Pavement Structure (cm)	
	Road Section Type	Condition	Pavement Type	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

NUEVA ECIJA

Primary Major

Type of Impr't	Road Number	Length (km)	1993 AADT		Existing Condition		Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso)		IRR (%)	
			w/o	with	L	Width			Type	Condition		Road
Rehab/Imp-1	N2-3	17.9	3105	3105	1.0	6.1	BT Good	-	4.42	.00	4.42	100.0 (T)
					15.0	6.1	PCC Good/Fair	Rehab(6.1-Ovl)				
					.9	6.1	PCC Bad	Rehab(6.1-PCC)				
					1.0	6.1	PCC V.Bad					
	N10-3	1.6	721	1178	1.6	6.0	BT Good	2-lane Br (n= 1,L= 12m)	.00	1.30	1.30	100.0 (T)
	N10-1	15.3	3935	3742	4.7	6.0	PCC Bad	Rehab(6.7-PCC)	20.41	.00	20.41	67.1 (T)
					9.1	6.0	PCC Good/Fair					
					.6	6.0	PCC Bad	Rehab(6.0-Ovl)				
					.9	6.0	BT Good					
	N12-2	10.0	747	900	4.3	6.0	BT Good/Fair		9.55	.00	9.55	50.0 (T)
					2.3	6.0	PCC Fair					
					3.4	6.0	BT Bad/V.Bad	Rehab(6.7-AC)				
	N12-3	23.1	450	619	4.8	6.0	BT Good/Fair		38.46	.00	38.46	32.1 (T)
					4.7	6.0	PCC Good					
					13.6	6.0	BT Bad/V.Bad	Rehab(6.7-AC)				
	N10-4	14.4	721	1178	4.8	6.0	BT Good/Fair		35.86	.00	35.86	31.4 (T)
					8.7	6.0	GRV Bad	Imp-1(6.7-PCC)				
					.9	6.0	GRV Fair	Imp-2(6.7-PCC)				
	N9-5	29.1	359	371	29.1	3.2-5.5	GRV Bad/V.Bad	Imp-1(6.0-BMP)	84.17	7.76	91.94	19.4 (T)
					6.0	6.0	PCC Good	2-lane Br (n= 4,L= 95m)				
Imp-2/Widen	N10-2	18.3	1510	1785	10.8	6.0	GRV Fair	2-lane Br (n= 1,L= 30m)	43.06	2.47	45.53	84.1 (T)
					1.5	6.0	PCC Bad/V.Bad	Rehab(6.7-PCC)				

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

TABLE 5.1 - 2 (2)  
Summary of Proposed Improvement  
NUEVA ECIIJA

Type of Improvement	Road Number	Length (km)	1993 AADT	Existing Condition		Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso)		IRR (%)
				L	Width			Road	Bridge Total	
Rehab/Imp-1	P67-2	8.7	1886	7.2	6.1 PCC Bad/V.Bad	Rehab(6.1-Ov1)		9.89	100.0 (T)	
			1553	1.5	6.1 PCC Fair			.00		
	P29-1	12.2	1812	6.4	5.0 PCC Good/Fair			16.78	67.4 (T)	
			1468	1.4	5.0 PCC Bad	Rehab(5.0-Ov1)				
				4.4	6.0 PCC V.Bad	Rehab(6.0-PCC)				
	N3-4	.7	1092	3.2	GRV Bad	Imp-1(6.0-PCC)	2-lane Br (n= 1,L=300m)	2.03	51.5 (T)	
			1063					3.21	44.8 (T)	
	P81-1	1.7	1994	6.1	PCC Fair	Imp-1(6.0-PCC)				
			1202	1.1	5.6 GRV Bad			7.47	42.0 (T)	
	P76-1	2.4	1384	1.5	5.5 GRV Bad	Imp-1(6.0-PCC)				
			1373	.9	6.1 PCC Bad	Rehab(6.1-Ov1)		7.74	41.7 (T)	
	P44-1	3.0	903	2.6	6.0 GRV Bad	Imp-1(6.0-AC)				
			885	.4	6.0 GRV Fair	Imp-2(6.0-AC)				
	P4-1	3.5	695	3.1	4.0-6.0 GRV Bad/V.Bad	Imp-1(6.0-AC)	1-lane Br (n= 1,L= 19m)	13.12	37.0 (T)	
			684	.4	5.0 GRV Fair	Imp-2(6.0-AC)		1.17	14.29	
	P15-2	6.4	598	4.4	6.2 PCC V.Bad	Rehab(6.2-PCC)		13.81	36.9 (T)	
			603	1.5	6.2 PCC Fair					
				.5	6.2 PCC Bad	Rehab(6.2-Ov1)				
	P15-1	2.3	598	4	5.5 GRV Fair	Imp-2(6.0-AC)		3.58	36.4 (T)	
			603	1.9	6.1 PCC Bad	Rehab(6.1-Ov1)				
	N6-2	8.1	638	3.8	6.1 PCC Good/Fair	Imp-1(6.0-AC)		16.63	32.5 (T)	
			707	4.3	5.5-6.0 GRV Bad/V.Bad					
	N6-1	11.9	780	5.3	6.1 PCC Good/Fair	Imp-2(6.0-AC)	2-lane Br (n= 2,L= 35m)	27.50	32.2 (T)	
			799	.3	6.0 GRV Fair			3.13	30.62	
				4.6	5.5-6.0 GRV Bad	Imp-1(6.0-AC)				
				.4	5.8 BT Bad	Rehab(6.0-AC)				
				1.3	6.1 PCC Bad	Rehab(6.1-Ov1)				
	P65-2	11.2	440	9.2	4.0-6.0 GRV Bad/V.Bad	Imp-1(6.0-AC)	2-lane Br (n= 2,L=205m)	41.02	25.8 (T)	
			641	.5	6.0 EAR V.Bad	Imp-1(6.0-AC)				
				1.3	5.5 GRV Fair	Imp-2(6.0-AC)				
				.2	6.1 PCC Fair					
	P15-3	7.2	454	5.7	6.1 PCC Good/Fair	Imp-1(6.1-PCC)		4.33	24.7 (T)	
			454	1.5	5.5 BT Bad/V.Bad			.00	4.83	
	P18-1	15.9	339	4.0	5.5 GRV Fair	Imp-2(6.0-AC)	2-lane Br (n= 1,L=150m)	58.76	23.6 (T)	
			424	4.2	5.5 GRV Bad	Imp-1(6.0-AC)	1-lane Br (n= 3,L= 44m)	12.53	71.29	
				7.7	4.0-5.5 EAR V.Bad	Imp-1(6.0-AC)				
	P71-1	16.8	228	3	6.0 GRV Fair	Imp-2(6.0-AC)		51.56	22.7 (T)	
			456	17.9	5.5-6.0 GRV Bad/V.Bad	Imp-1(6.0-AC)		.00	51.56	
				.6	6.1 PCC Good					

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

TABLE 5.1 - 2 (3)

Summary of Proposed Improvement

NUEVA ECIJA

Secondary Major (Continued)

Type of Impr't	Road Number	Length (km)	1993 AADT	Existing Condition	Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso)	IRR (%)
			w/o with	L Width Type Condition			Road Bridge Total	
Rehab/Imp-1	P50-1	21.3	266 520	3.0 6.0 PCC Good/Fair 18.1 4.5-6.0 GRV Bad/V.Bad .2 6.0 PCC Bad	Imp-1(6.0-AC) Rehab(6.0-OvI)		56.02 .00 56.02	18.3 (T)
	N8-2	19.8	425 433	19.8 4.5 GRV Bad/V.Bad	Imp-1(6.0-AC)	2-lane Br (n= 5,L= 85m)	88.39 8.01 96.40	17.4 (T)
	P46-4	14.0	143 160	5.3 6.1 PCC Fair 2.8 6.1 PCC V.Bad 1.1 6.0 GRV V.Bad 1.6 6.1 PCC V.Bad 3.2 5.5-6.0 GRV V.Bad	Rehab(6.1-OvI) Imp-1(6.1-PCC) Rehab(6.1-PCC) Rehab(6.0-GRV)	2-lane Br (n= 1,L= 20m)	15.61 1.68 17.29	17.3 (T)
	P13-1	12.8	214 233	9.0 6.4 PCC Fair .3 6.4 PCC Bad 2.9 4.0 GRV V.Bad .6 4.0 Bt V.Bad	Rehab(6.4-OvI) Imp-1(6.0-BMP) Rehab(6.0-BMP)	2-lane Br (n= 5,L=172m)	7.28 11.35 18.62	17.0 (T)
	N8-3	11.6	175 209	.4 6.0 Bt V.Bad 1.0 6.0 PCC Good 2.2 4.5 GRV V.Bad 8.0 4.5 GRV V.Bad	Rehab(6.0-BMP) Imp-1(6.0-BMP) Rehab(6.0-GRV)	2-lane Br (n= 4,L=100m)	20.44 8.32 28.76	14.3 (T)
	P31-1	6.1	313 322	3.7 4.0-5.5 GRV Bad .2 5.1 PCC Good 2.2 5.5-6.0 GRV Fair	Imp-1(6.0-BMP)		12.31 .00 12.31	11.8 (T)
	P18-2	17.7	96 253	1.4 5.5 GRV Fair 8.4 2.4-6.0 GRV V.Bad 7.9 2.0-4.5 EAR V.Bad	Imp-2(6.0-BMP) Imp-1(6.0-BMP) Imp-1(6.0-BMP)	2-lane Br (n= 2,L= 50m) 1-lane Br (n= 1,L= 7m)	39.08 4.90 43.98	11.0 (T)
Imp-2/ Widen	P25-1	15.4	227 237	.3 6.1 PCC Bad 7.2 4.5-6.0 GRV Bad/V.Bad .2 6.1 PCC Good 7.7 5.5-6.0 GRV Fair	Rehab(6.1-OvI) Imp-1(6.0-BMP)		37.40 .00 37.40	8.1 (T)

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

TABLE 5.1 - 2 (4)

Summary of Proposed Improvement

NUEVA ECIIJA

Minor(National/Provincial)

Type of Impr't	Road Number	Length (km)	1993 AADT w/c with	Existing Condition		Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso)		IRR (%)
				L	Width Type Condition			Road	Bridge Total	
Rehab/ Imp-1	P36-1	3.1	1260 1882	2.6 5.5-6.0	GRV Bad PCC Fair	Imp-1(6.0-AC)	2-lane Br (n= 2,L=200m)	6.43 13.22 19.64	75.9 (T)	
	P32-1	17.7	513 499	.7 4.9-5.0 6.8 4.0-6.0 10.2 4.0-5.0	BT Fair/Bad GRV Fair GRV Bad/V.Bad	Rehab(6.0-AC) Imp-2(6.0-AC) Imp-1(6.0-AC)		45.91 .00 45.31	25.4 (T)	
	P56-1	5.6	70 68	.3 6.1 3.2 3.2-5.5 2.1 4.0-5.5	PCC Good GRV Bad GRV Fair	Rehab(6.0-GRV) Widen(6.0-GRV)		3.40 .00 3.40	25.4 (D)	
	P2-1	12.4	218 430	1.9 6.0 10.5 5.5-6.0	GRV Fair GRV V.Bad	Imp-2(6.0-AC) Imp-1(6.0-AC)		40.49 .00 40.49	19.6 (T)	
	P1-1	11.7	157 161	.5 5.1 11.2 3.2-5.5	PCC Fair GRV Bad/V.Bad	Rehab(6.0-GRV)		13.80 .00 13.80	17.0 (D)	
	P73-1	5.6	178 168	.7 6.0 4.6 6.0 .5 6.0	GRV Fair GRV Bad BT V.Bad	Rehab(6.0-GRV) Rehab(6.0-BMP) Rehab(6.0-BMP)		3.98 .00 3.98	12.8 (D)	
	N15-1	7.5	146 142	4.2 6.1 2.7 4.5-6.0 .3 4.2 .3 6.1	PCC Fair GRV Bad BT V.Bad PCC Bad	Rehab(6.0-GRV) Rehab(6.0-BMP) Rehab(6.1-Ovl)		2.88 .00 2.88	10.0 (D)	
	P16-1	7.8	117 103	.7 6.0 5.6 3.2-5.5 1.5 5.0	PCC V.Bad GRV Bad/V.Bad BT Fair	Rehab(6.0-PCC) Rehab(6.0-GRV)	2-lane Br (n= 5,L= 40m)	6.54 6.27 12.91	7.8 (D)	
	P82-1	8.9	99 76	4.3 5.5-6.0 4.6 3.2	GRV Bad/V.Bad EAR V.Bad	Rehab(6.0-GRV) Imp-1(6.0-GRV)		22.49 .00 22.49	6.9 (D)	
	P10-1	13.6	194 93	12.7 4.5 .9 4.0	GRV Bad EAR V.Bad	Rehab(6.0-GRV) Imp-1(6.0-GRV)	2-lane Sp (n= 5,L= 90m)	13.05 1.63 14.69	6.6 (T)	
	P80-1	12.5	177 174	.5 6.1 10.6 4.0-6.0 1.4 5.5	PCC Bad GRV Bad/V.Bad BT V.Bad	Rehab(6.1-Ovl) Rehab(6.0-GRV) Rehab(6.0-BMP)		14.59 .00 14.59	5.1 (D)	
	N13-1	6.8	63 67	5.3 4.0-6.0 1.5 5.5	GRV Bad/V.Bad GRV Fair	Rehab(6.0-GRV) Widen(6.0-GRV)		7.26 .00 7.26	3.6 (D)	
	PA-2	12.2	0 105	2.4 4.5 7.7 3.2-6.0 .4 3.2 .7 .3 6.0 .7 6.0	GRV Fair GRV Bad EAR Bad None BT Bad PCC Good	Widen(6.0-GRV) Rehab(6.0-GRV) Imp-1(6.0-GRV) New-C(6.0-GRV) Rehab(6.0-BMP)	2-lane Br (n= 1,L=200m)	11.21 12.49 28.70	2.6 (T)	

(T):Traffic Project

TABLE 5.1 - 2 (5)

## Summary of Proposed Improvement

NUEVA ECIJA

## Minor (National/Provincial) (Continued)

Type of Impr't	Road Number	Length (km)	1993 AADT w/o with	L	Width	Existing Condition Type Condition	Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso)	IRR (%)		
Rehab/ Imp-1	NI5-1	4.7	102	100	2.3	6.1	PCC Good/Fair	2-lane Br (n= 1, L= 10m)	8.19	1.20	9.39	2.1 (D)
					.2	6.1	BT Fair					
					2.2	3.2-4.5	GRV Bad					
							Rehab(6.0-GRV)					
	P67-1	17.7	286	277	16.5	4.0-6.0	GRV Bad/v.Bad		40.25	.00	40.25	1.5 (D)
					1.0	6.1	PCC Good/Fair					
					.2	6.0	BT Fair					
							Imp-1(6.0-BMP)					
	P26-1	8.2	79	73	.9	5.5	GRV Fair		13.03	.00	13.03	.3 (D)
					7.3	3.2-5.5	GRV Bad/v. Bad					
							Widen(6.0-GRV)					
							Rehab(6.0-GRV)					
Imp-2/ Widen	P85-1	2.0	69	76	1.6	5.5	GRV Fair		.91	.00	.91	33.5 (D)
					.4	6.0	PCC Good					
							Widen(6.0-GRV)					
	P103-1	16.6	126	127	5.0	6.0	PCC Good		7.48	.00	7.48	11.9 (D)
					11.6	4.5	GRV Fair					
							Widen(6.0-GRV)					
	P21-1	9.4	530	509	.8	6.1	PCC Fair		28.11	1.20	29.31	10.4 (D)
					8.6	4.5-6.0	GRV Fair					
							Imp-2(6.0-AC)					
	P9-1	5.7	91	97	5.7	4.5	GRV Fair		3.87	1.30	5.17	7.7 (D)
							Widen(6.0-GRV)					

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

TABLE 5.1 - 2 (6)

Summary of Proposed Improvement

NUEVA ECIJA

Minor(Barangay)

Type of Impr't	Road Number	Length (km)	1993 AADT		Existing Condition		Proposed Improvement	Proposed Bridge (Number/Total Length)	Cost (Million Peso)		IRR (%)	
			w/o	with	L	Width			Type	Condition		Road
Rehab/Imp-1	B31-1	8.9	133	110	3.3	6.1	PCC Good	-	1.65	.00	1.65	25.6 (D)
					3.6	5.5	GRV Fair	Rehab(4.0-GRV)				
					2.0	5.5	GRV Bad/V.Bad					
	B1-1	2.7	25	27	2.7	3.2-4.0	GRV Bad	Rehab(4.0-GRV)	1.34	.00	1.34	20.2 (D)
	B25-3	8.0	50	45	8.0	2.4-6.0	GRV Bad	Rehab(4.0-GRV)	5.06	5.81	10.87	19.8 (D)
	B29-1	24.7	186	180	18.5	3.2-5.5	GRV Fair/V.Bad	2-lane Br (n= 1,L= 80m)	12.24	.00	12.24	19.3 (D)
					6.2	5.5	GRV Fair	Rehab(4.0-GRV)				
	B0-1	10.7	83	98	9.2	2.4-4.0	GRV Fair/Bad	1-lane Br (n= 2,L=130m)	4.82	6.47	11.29	19.2 (D)
					.5		None	Rehab(4.0-GRV)				
					1.0	3.2	GRV Fair	New-C(4.0-GRV)				
								Widen(4.0-GRV)				
	B18-1	11.2	43	56	6.4	3.2-4.0	GRV Bad/V.Bad	1-lane Br (n= 1,L= 50m)	6.91	2.49	9.40	19.1 (D)
					3.1	3.2	EAR V.Bad/Impa	Rehab(4.0-GRV)				
					1.7	4.5	GRV Fair	Imp-1(4.0-GRV)				
	B10-1	2.4	56	52	1.6	3.2	GRV Bad	1-lane Br (n= 1,L=200m)	.80	9.09	9.89	17.7 (D)
					.8	6.1	PCC Good	Rehab(4.0-GRV)				
	B5-2	21.2	54	64	20.0	2.4-4.0	GRV V.Bad	1-lane Br (n= 2,L=110m)	17.13	6.60	23.73	15.4 (D)
					1.2	2.4	EAR V.Bad	1-lane Sp (n= 3,L= 80m)				
	B17-1	6.4	69	72	5.9	3.2-4.0	GRV Fair/Bad	Rehab(4.0-GRV)	5.32	.00	5.32	15.0 (D)
					.5	3.2	GRV Fair	Widen(4.0-GRV)				
	B11-3	15.1	103	88	.8	4.5	GRV Fair	1-lane Br (n= 1,L= 40m)	16.01	2.13	18.14	8.1 (D)
					10.1	2.4-3.2	GRV Bad/V.Bad	Rehab(4.0-GRV)				
					4.2	2.4	EAR V.Bad	Imp-1(4.0-GRV)				
	B3-1	3.8	18	40	3.4	2.0-6.0	GRV Bad/V.Bad	1-lane Br (n= 1,L=230m)	2.18	10.58	12.76	7.5 (D)
					.4	1.6	EAR Impas	Imp-1(4.0-GRV)				
	B28-1	9.5	48	48	8.2	3.2-4.0	GRV Fair/Bad	Rehab(4.0-GRV)	6.01	.00	6.01	2.2 (D)
					.8	3.2	GRV Fair	Widen(4.0-GRV)				
					.5	4.5	GRV Fair					
	B21-2	6.3	67	68	1.9	4.0-4.5	GRV Fair/Bad	Rehab(4.0-GRV)	5.91	.00	5.91	1.6 (D)
					.7	5.0	PCC Good					
					1.9	4.5	GRV Fair	Widen(4.0-GRV)				
					1.8	3.2	GRV Fair					
	B4-1	1.1	7	20	.8	3.2	GRV V.Bad/Impa	Rehab(4.0-GRV)	1.78	.00	1.78	1.6 (D)
					.3	4.5	GRV Fair					
Imp-2/Widen	B16-1	7.7	45	49	.7	5.5	GRV Fair	Widen(4.0-GRV)	4.84	.00	4.84	10.9 (D)
					6.6	3.2	GRV Fair	Rehab(4.0-GRV)				
					.4	2.4	GRV Bad					

### 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 construction 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
<b>Bridge Cost</b>			
	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
<b>Reinforced Concrete Box Culvert</b>			
	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
<b>Spillway</b>			
	2-lane Spillway	m	16,500.00
	1-lane Spillway	m	12,000.00
<b>Slope Protection Cost</b>			
	Cut Slope Protection	m	23,000.00
	Embankment Slope Protection	m	25,000.00



TABLE 5.1 - 4 (1)

Quantity and Construction Cost

NUEVA ECIIJA

	Unit	N2-3	N10-3	N10-1	N12-2	N12-3	N10-4	N9-5	N10-2	F67-2	P29-1	N3-4
Total Road Length	km	17.9	1.6	15.3	10.0	23.1	14.4	29.1	18.3	8.7	12.2	.7
Improvement Length	km	1.9	.0	5.3	3.4	13.6	9.6	29.1	12.3	7.2	5.8	.7
Proposed Pavement Type		6.1-OVI	6.7-PCC	6.7-PCC	6.7-PCC	6.7-PCC	6.7-PCC	6.0-EMP	6.7-PCC	6.1-OVI	6.0-OVI	6.0-PCC
		6.1-PCC	6.0-OVI	6.0-OVI	6.7-PCC	6.7-PCC	6.7-PCC	6.0-EMP	6.7-PCC	6.1-OVI	6.0-OVI	6.0-PCC
Quantity												
100 Clearing & Grubbing	m2	-	-	-	-	-	-	-	-	-	-	-
102 Stripping	m3	310	-	1034	1428	11054	1923	151120	2705	-	958	525
104 Roadway & Drainage Excavation	m3	3630	-	17682	8001	35982	54849	33708	56938	-	16632	-
200 Borrow	m3	3110	-	14502	9503	35402	32756	54163	37638	1440	13128	2454
Aggregate Subbase	m2	3500	-	2400	-	-	82590	196420	64800	28300	5600	8320
Preparation of Prev. Road (Grvl)	m2	6100	-	23200	20400	81600	-	-	9000	-	26400	-
Preparation of Prev. Road (Asph)	m2	5490	-	3600	-	-	-	-	43920	-	6400	-
Preparation of Pave. Surf. (PCC)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave. Surf. (AC)	m2	-	-	-	-	-	-	-	-	-	-	-
Crushed Aggregate Base Course	m3	-	-	-	5066	20264	-	29769	-	-	-	-
Crushed Agr. Surface Course	m3	-	-	-	-	-	-	-	-	-	-	-
Bituminous Prime Coat	M.T.	7	-	4	27	109	-	210	-	53	10	-
Bituminous Jack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
Bituminous Macadam Pavement	m2	604	-	396	2506	10023	-	174500	-	4831	924	-
Bitum. Concrete Surface Course	M.T.	-	-	-	-	-	-	-	-	-	-	-
Double Bitum. Surface Treatment	m2	-	-	-	-	-	-	-	-	-	-	-
1-1 PCC Pavement (t=23 cm)	m2	6100	-	31490	-	-	64320	-	82410	-	26400	4200
1-2 PCC Pavement (t=20 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
1-3 PCC Pavement (t=18 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
500 RCPC (dia. 910mm)	m	60	-	375	105	405	285	1515	375	210	180	15
Headwall for RCPC (dia. 910mm)	Set	4	-	25	7	27	19	101	25	14	12	1
Grouted Riprap	m3	-	-	4650	-	-	-	10979	-	-	-	-
Slide Ditch (Grouted Riprap)	m	-	-	-	-	-	-	31500	-	-	-	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	50	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	20	-	-	-	-
2-lane Bridge, Superstructure	m	-	12	-	-	-	-	95	30	-	-	300
1-lane Bridge, Superstructure	m	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge, Abutment	Each	-	2	-	-	-	-	8	2	-	-	2
1-lane Bridge, Abutment	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge, Pier	Each	-	-	-	-	-	-	-	1	-	-	11
1-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
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.	4.42	.00	20.41	9.55	38.46	35.86	84.17	43.06	9.89	15.78	2.03
Bridge Construction Cost	M.P.	.00	1.30	.00	.00	.00	.00	7.76	2.47	.00	.00	18.53
Total Construction Cost	M.P.	4.42	1.30	20.41	9.55	38.46	35.86	91.93	45.53	9.89	15.78	20.56
Road Construction Cost/Impr't km	M.P.	2.32	.00	3.85	2.81	2.83	3.74	2.89	3.50	1.37	2.72	2.91
Total Construction Cost/Total km	M.P.	.25	.81	1.33	.95	1.66	2.49	3.16	2.49	1.14	1.29	29.38

TABLE 5.1 - 4 (2)

Quantity and Construction Cost

NUEVA ECIJA

	Unit	P81-1	P75-1	P44-1	P4-1	P15-2	P15-1	N6-2	N6-1	P65-2	P15-3	P18-1
Total Road Length	km	1.7	2.4	3.0	3.5	6.4	2.3	8.1	11.9	11.2	7.2	15.9
Improvement Length	km	1.1	2.4	3.0	3.5	4.9	2.3	4.3	6.6	11.0	1.5	15.9
Proposed Pavement Type		6.0-PCC	6.0-PCC	6.0-AC	6.0-AC	6.2-PCC	6.0-AC	6.0-AC	6.0-AC	6.0-AC	6.1-PCC	6.0-AC
		6.1-Ovi	6.1-Ovi			6.2-Ovi	6.1-Ovi	6.1-Ovi				
Quantity												
100 Clearing & Grubbing	m2	-	-	-	-	-	-	-	-	-	-	-
102 Striping & Drainage	m3	-	-	-	-	-	-	-	-	-	-	-
Excavation	m3	825	-	851	1631	1574	676	3225	2018	9360	1865	10535
104 Borrow	m3	-	5100	3220	15581	7488	-	15437	58219	43871	1060	68576
200 Aggregate Subbase	m3	3872	5460	9525	11153	13036	1462	13997	17100	34483	4485	48024
Preparation of Prev. Road (Grvl)	m2	13860	14100	26640	28340	2000	9800	50740	61440	115010	-	120140
Preparation of Prev. Road (Asph)	m2	-	-	-	-	27280	-	-	2320	-	8250	-
Preparation of Pave. Surf. (PCC)	m2	-	5490	-	-	3100	11590	-	7930	-	-	-
Preparation of Pave. Surf. (AC)	m2	-	-	-	-	-	-	-	-	-	-	-
202 Crushed Aggregate Base Course	m3	-	-	4050	4725	-	540	5805	7155	14850	-	21465
300 Crushed Agr. Surface Course	m3	-	-	-	-	-	-	-	-	-	-	-
301 Bituminous Prime Coat	M.T.	-	7	22	25	4	17	31	48	79	-	114
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
305 Bituminous Macadam Pavement	m2	-	-	-	-	-	-	-	-	-	-	-
304 Bitum-Concrete Surface Course	M.T.	-	604	1890	2310	341	1539	2838	4370	7260	-	10484
Double Bitum. Surface Treatment	m2	-	-	-	-	-	-	-	-	-	-	-
311-1 PCC Pavement (t=23 cm)	m2	6500	9000	-	-	27280	-	-	-	-	9150	-
311-2 PCC Pavement (t=20 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-3 PCC Pavement (t=18 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
500 RCPC (dia. 910mm)	m	30	165	90	225	150	75	405	390	750	45	1155
Headwall for RCPC (dia. 910mm)	Set	2	11	6	15	10	5	27	26	50	3	77
Grouted Riprap	m3	-	1738	-	3482	-	-	4919	7649	9215	-	15387
Side Ditch (Grouted Riprap)	m	-	-	-	-	-	-	-	-	3000	-	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge, Superstructure	m	-	-	-	-	-	-	-	35	205	-	150
2-lane Bridge, Superstructure	m	-	-	-	19	-	-	-	-	-	-	44
1-lane Bridge, Abutment	Each	-	-	-	-	-	-	-	4	4	-	2
1-lane Bridge, Abutment	Each	-	-	-	2	-	-	-	-	-	-	6
1-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	7	-	5
2-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
2-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 1-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 2-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	i.s.	1	1	1	1	1	1	1	1	1	1	1
Road Construction Cost	M.P.	3.21	7.47	7.74	13.12	13.81	3.58	15.63	27.50	41.02	4.33	58.76
Bridge Construction Cost	M.P.	.00	.00	.00	1.17	.00	.00	.00	3.13	13.46	.00	12.53
Total Construction Cost	M.P.	3.21	7.47	7.74	14.29	13.81	3.58	15.63	30.62	54.47	4.33	71.29
Road Construction Cost/Impr't km	M.P.	2.92	3.11	2.58	3.75	2.82	1.56	3.87	4.17	3.73	2.89	3.70
Total Construction Cost/Total km	M.P.	1.89	3.11	2.58	4.08	2.16	1.56	2.05	2.57	4.86	.60	4.48

TABLE 5.1 - 4 (3)

Quantity and Construction Cost

NUEVA ECIJA

	Unit	P71-1	P50-1	N8-2	F46-4	P13-1	N8-3	F31-1	P18-2	P35-1	P36-1	P32-1
Total Road Length	km	18.8	21.3	19.8	14.0	12.8	11.6	6.1	17.7	15.4	3.1	17.7
Improvement Length	km	18.2	18.3	19.8	8.7	3.8	10.6	5.9	17.7	15.2	2.6	17.7
Proposed Pavement Type		6.0-AC	6.0-AC	6.0-AC	6.1-OVI	6.4-OVI	6.0-BMP	6.0-BMP	6.0-BMP	6.1-OVI	6.0-AC	6.0-AC
		6.0-OVI	6.0-OVI		6.1-PCC	6.0-BMP	6.0-GRV		6.0-BMP	6.0-BMP		
					6.0-GRV							
Quantity												
100 Clearing & Grubbing	m2	-	-	-	-	-	-	-	-	-	-	-
Striping	m3	6042	-	64198	1621	6686	80684	3428	71778	16870	1050	15459
102 Roadway & Drainage Excavation	m3	24780	96580	34801	12140	-	8794	11650	5420	20607	2280	20435
104 Borrow	m3	59061	58956	58097	11254	6124	10485	11100	27932	26124	7293	43203
200 Aggregate Subbase	m2	176020	117800	141420	41120	20786	55600	37070	85850	121870	23520	129730
Preparation of Prev. Road (Grvl.)	m2	-	-	-	9760	2400	2400	-	-	-	-	3460
Preparation of Pave. Surf. (PCC)	m2	-	1200	-	17080	1920	-	-	-	1830	-	-
Preparation of Pave. Surf. (AC)	m2	24570	24435	26730	-	3881	2660	6036	18107	15243	3510	23895
Crushed Aggregate Base Course	m3	-	-	-	2880	-	7200	-	-	-	-	-
300 Crushed Agr. Surface Course	m3	131	132	143	20	28	19	42	127	109	19	127
301 Bituminous Prime Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-
305 Bituminous Macadam Pavement	m2	-	-	-	-	21000	15600	35400	106200	89400	-	-
310 Bitum. Concrete Surface Course	M.T.	12012	12078	13068	1879	211	-	-	-	201	1716	11682
304 Double Bitum. Surface Treatment	m2	-	-	-	-	-	-	-	-	-	-	-
311-1 PCC Pavement (t=23 cm)	m2	-	-	-	16470	-	-	-	-	-	-	-
311-2 PCC Pavement (t=20 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
311-3 PCC Pavement (t=18 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
500 RCPC (dia. 910mm)	m	780	555	735	330	120	315	255	525	1230	75	660
Headwall for RCPC (dia. 910mm)	Set	52	37	49	22	8	21	17	35	82	5	44
Grouted Riprap	m3	4396	-	2924	1034	-	-	1331	-	11541	-	2829
Side Ditch (Grouted Riprap)	m	-	-	10700	-	2100	4000	-	16500	-	-	-
Slope Protection (Cut Slope)	m	-	-	800	-	-	70	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	240	-	-	75	-	-	-	-	-
2-lane Bridge, Superstructure	m	-	-	85	20	172	100	-	50	-	200	-
1-lane Bridge, Superstructure	m	-	-	-	-	-	-	-	7	-	-	-
2-lane Bridge, Abutment	Each	-	-	10	2	8	8	-	4	-	4	-
1-lane Bridge, Abutment	Each	-	-	-	-	-	-	-	2	-	-	-
2-lane Bridge, Pier	Each	-	-	1	-	-	2	-	1	-	-	-
1-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
1-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
2-cell RCBC	m	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 1-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Wingwall for 2-cell RCBC	Set	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	i.s.	1	1	1	1	1	1	1	1	1	1	1
Road Construction Cost	M.P.	51.56	56.02	88.39	15.61	7.28	20.44	12.31	39.08	37.40	6.43	45.31
Bridge Construction Cost	M.P.	.00	.00	8.01	1.68	11.35	8.32	.00	4.90	.00	13.22	.00
Total Construction Cost	M.P.	51.56	56.02	96.40	17.29	18.63	28.76	12.31	43.98	37.40	19.64	45.31
Road Construction Cost/Impr't km	M.P./km	2.83	3.06	4.46	1.79	1.52	1.93	2.09	2.21	2.46	2.47	2.56
Total Construction Cost/Total km	M.P./km	2.74	2.63	4.87	1.23	1.46	2.48	2.02	2.48	2.43	6.34	2.56

TABLE 5.1 - 4 (4)  
Quantity and Construction Cost

NUEVA ECIJA

	Unit	P56-1	P2-1	P1-1	P73-1	N16-1	P16-1	F62-1	P10-1	P80-1	N13-1	P4-2
Total Road Length	km	5.6	12.4	11.7	5.8	7.5	7.8	8.9	13.6	12.5	6.8	12.2
Improvement Length	km	5.3	12.4	11.2	5.1	3.3	6.3	8.9	13.6	12.5	6.8	11.5
Proposed Pavement Type		6.0-GRV	6.0-AC	6.0-GRV	6.0-GRV	6.0-GRV	6.0-PCC	6.0-GRV	6.0-GRV	6.1-OVI	6.0-GRV	6.0-GRV
					6.0-BMP	6.0-BMP	6.0-GRV	6.0-GRV	6.0-GRV	6.0-GRV	6.0-GRV	6.0-BMP
					5.1-OV1	5.1-OV1						
Quantity												
100 Clearing & Grubbing	m2	-	-	-	-	-	-	-	-	-	-	12600
102 Stripping	m3	-	-	-	-	-	-	-	-	-	-	1260
104 Roadway & Drainage Excavation	m3	5019	8626	6750	4201	2305	2189	1650	7526	4798	1890	3780
200 Borrow	m3	2533	37584	27124	2599	2426	13414	55680	28668	23912	8037	35460
Aggregate Subbase	m3	2463	33642	7392	3783	2329	5180	5874	8978	9233	3663	6760
Preparation of Prev. Road(Grv1)	m2	31470	117580	68500	30380	18720	26300	46780	83820	67960	43230	57580
Preparation of Prev. Road(Asph)	m2	-	-	-	3000	1260	4200	-	-	7700	-	1800
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	1830	-	-	-	3050	-	-
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	-	-	-	-	-	-
Crushed Aggregate Base Course	m3	-	16740	-	512	307	-	-	-	1432	-	307
Crushed Aggr. Surface Course	m3	4770	-	10080	4140	2430	5040	8010	12240	9540	6120	10080
Bituminous Prime Coat	M.T.	-	89	-	4	4	-	-	-	14	-	2
Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	1800
Bituminous Macadam Pavement	m2	-	-	-	3000	1800	-	-	-	8400	-	-
Double Bitum.Surface Treatment	m2	-	8184	-	-	201	-	-	-	335	-	-
1-1 PCC Pavement (t=23 cm)	m2	-	-	-	-	-	4200	-	-	-	-	-
1-2 PCC Pavement (t=20 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
1-3 PCC Pavement (t=18 cm)	m2	-	-	-	-	-	-	-	-	-	-	-
RCPC (dia.910mm)	m	165	765	570	150	105	195	780	420	525	210	360
Headwall for RCPC	Set	11	51	38	10	7	13	52	28	35	14	24
Grouted Riprap	m3	-	8488	4737	-	-	-	14034	717	3215	-	-
Side Ditch (Grouted Riprap)	m	-	-	-	-	-	-	-	2100	-	-	140
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	90	-
2-lane Bridge, Superstructure	m	-	-	-	-	-	40	-	-	-	-	200
1-lane Bridge, Superstructure	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge, Abutment	Each	-	-	-	-	-	12	-	-	-	-	2
1-lane Bridge, Abutment	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	7
1-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Spillway	m	-	-	-	-	-	-	-	90	-	-	-
1-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
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.	3.40	40.49	13.80	3.98	2.88	6.64	22.49	13.05	14.59	7.26	11.21
Bridge Construction Cost	M.P.	.00	.00	.00	.00	.00	6.27	.00	1.63	.00	.00	12.49
Total Construction Cost	M.P.	3.40	40.49	13.80	3.98	2.88	12.91	22.49	14.69	14.59	7.26	23.70
Road Construction Cost/Impr't km	M.P.	.64	3.27	1.23	.78	.87	1.05	2.53	.96	1.17	1.07	.97
Total Construction Cost/Total km	M.P.	.61	3.27	1.18	.69	.38	1.66	2.53	1.08	1.17	1.07	1.94

TABLE 5.1 - 4 (5)

Quantity and Construction Cost

NUEVA ECUIJA

	Unit	N15-1	P67-1	P26-1	P85-1	P103-1	P21-1	P9-1	B31-1	B1-1	B25-3	B29-1	
Total Road Length	km	4.7	17.7	8.2	2.0	16.6	9.4	5.7	8.9	2.7	8.0	24.7	
Improvement Length	km	2.2	16.5	8.2	1.6	11.6	8.6	5.7	2.0	2.7	8.0	18.5	
Proposed Pavement Type		6.0-GRV 6.0-BMP 6.0-GRV 6.0-GRV 6.0-GRV 6.0-GRV 6.0-GRV 6.0-GRV 6.0-GRV 4.0-GRV 4.0-GRV 4.0-GRV 4.0-GRV											
Quantity													
100 Clearing & Grubbing	m2	-	-	-	-	-	-	-	-	-	-	-	
102 Stripping	m3	-	-	-	-	-	-	-	-	-	-	-	
104 Roadway & Drainage Excavation	m3	1125	5700	5796	176	12480	13894	1197	1500	2025	2213	4800	
200 Borrow	m3	31860	27178	27970	1832	12507	20736	10417	2154	1526	15432	20449	
200 Aggregate Subbase	m3	1452	34552	4917	176	2436	19613	1197	920	1242	3680	8050	
Preparation of Prev.Road(Grvl)	m2	14100	142690	53130	8800	52200	45100	25650	9200	12420	33530	81850	
Preparation of Prev.Road(Asph)	m2	-	-	-	-	-	-	-	-	-	-	-	
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	-	-	-	-	-	-	-	
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	11610	-	-	-	-	-	
202 Crushed Aggregate Base Course	m3	-	-	-	-	-	-	-	-	-	-	-	
300 Crushed Agr. Surface Course	m3	1980	-	7380	1440	10440	-	5130	1200	1620	4800	11100	
301 Bituminous Prime Coat	M.T.	-	119	-	-	-	62	-	-	-	-	-	
302 Bituminous Tack Coat	M.T.	-	-	-	-	-	-	-	-	-	-	-	
305 Bituminous Macadam Pavement	m2	-	99000	-	-	-	5676	-	-	-	-	-	
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	180	1110	555	45	345	690	165	56	40	128	400	
Headwall for RCPC	Set	12	74	37	3	23	45	11	7	5	16	50	
504 Grouted Riprap	m3	4049	10701	5975	-	-	7427	-	689	-	-	3301	
Side Ditch (Grouted Riprap)	m	-	-	-	-	-	-	-	-	-	-	-	
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-	
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	-	-	
2-lane Bridge, Superstructure	m	10	-	-	-	-	10	12	-	-	80	-	
1-lane Bridge, Superstructure	m	-	-	-	-	-	-	-	-	-	-	-	
2-lane Bridge, Abutment	Each	2	-	-	-	-	2	2	-	-	2	-	
1-lane Bridge, Abutment	Each	-	-	-	-	-	-	-	-	-	-	-	
1-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	-	
2-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	-	
1-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-	
1-lane 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													
Bridge Construction Cost	M.P.	8.19	40.25	13.03	.91	7.48	28.11	3.87	1.65	1.34	5.06	12.24	
Total Construction Cost	M.P.	1.20	.00	.00	.00	.00	1.20	1.30	.00	.00	5.81	.00	
Road Construction Cost/Impr't km	M.P.	9.39	40.25	13.03	.91	7.48	29.31	5.17	1.55	1.34	10.86	12.24	
Total Construction Cost/Total km	M.P.	3.72	2.44	1.59	.57	.64	3.27	.68	.82	.50	.63	.66	
Total Construction Cost/Total km	M.P.	2.00	2.27	1.59	.46	.45	3.12	.91	.19	.50	1.36	.50	

TABLE 5.1 - 4 (6)

Quantity and Construction Cost

NUEVA EC1JA

	Unit	B0-1	B18-1	B10-1	B6-2	B17-1	B11-3	B3-1	B28-1	B21-2	B4-1	B16-1
Total Road Length	km	10.7	11.2	2.4	21.2	6.4	15.1	3.8	9.5	6.3	1.1	7.7
Improvement Length	km	10.7	9.5	1.6	21.2	6.4	14.3	3.8	9.0	3.7	.8	7.0
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	6000	-	-	-	-	-	-	-	-	-	-
Strippling	m3	600	-	-	-	-	-	-	-	-	-	-
102 Roadway & Drainage Excavation	m3	9478	1350	1200	25218	3655	10200	3750	112	1551	600	8449
104 Borrow	m3	3829	25458	904	13157	7860	24752	2341	22919	15465	452	6855
200 Aggregate Subbase	m3	3406	4370	736	9752	1634	6578	1748	3424	850	368	1108
Preparation of Prev.Road(Grvl)	m2	43960	40160	7350	76850	26340	64660	16840	35360	14140	3680	22040
Preparation of Prev.Road(Asph)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(PCC)	m2	-	-	-	-	-	-	-	-	-	-	-
Preparation of Pave.Surf.(AC)	m2	-	-	-	-	-	-	-	-	-	-	-
Crushed Aggregate Base Course	m3	-	-	-	-	-	-	-	-	-	-	-
300 Crushed Aggr. Surface Course	m3	6420	5700	960	12720	3840	8580	2280	5400	2220	480	4200
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	176	152	24	648	192	568	72	144	152	16	176
Headwall for RCPC (dia. 910mm)	Set	22	19	3	81	24	71	9	18	19	2	22
Grouted Riprap	m3	-	-	-	7692	2668	8963	259	-	3715	-	1810
Side Ditch (Grouted Riprap)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Cut Slope)	m	-	-	-	-	-	-	-	-	-	-	-
Slope Protection (Embank't Sl)	m	-	-	-	-	-	-	-	-	-	50	-
2-lane Bridge, Superstructure	m	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge, Superstructure	m	130	50	200	110	-	40	230	-	-	-	-
2-lane Bridge, Abutment	Each	-	4	2	4	-	2	2	-	-	-	-
1-lane Bridge, Abutment	Each	-	4	1	3	-	1	9	-	-	-	-
2-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	-
1-lane Bridge, Pier	Each	-	-	-	-	-	-	-	-	-	-	-
2-lane Spillway	m	-	-	-	80	-	-	-	-	-	-	-
1-lane Spillway	m	-	-	-	-	-	-	-	-	-	-	-
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.	4.82	6.91	.80	17.13	5.32	16.01	2.18	6.01	5.91	1.78	4.84
Bridge Construction Cost	M.P.	6.47	2.49	9.09	6.60	.00	2.13	10.68	.00	.00	.00	.00
Total Construction Cost	M.P.	11.29	9.40	9.88	23.73	5.32	18.14	12.76	6.01	5.91	1.78	4.84
Road Construction Cost/Impr't km	M.P.	.45	.73	.50	.81	.83	1.12	.57	.67	1.60	2.23	.69
Total Construction Cost/Total km	M.P.	1.06	.84	4.12	1.12	.83	1.20	3.36	.63	.94	1.62	.63

### 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 Nueva Ecija  
- Major Roads -

	Type of Improvement			Total
	Rehabilitation/ Improvement - 1	Improvement-2/ Widening	New Construction	
<b>Primary Major Roads</b>				
1. No. of Links	7	1	-	8
2. Total Length (km)	111.4	18.3	-	129.7
3. Improvement Length (km)	62.9	12.3	-	75.2
4. Construction Cost (million P)	201.9	45.5	-	247.4
5. Const. Cost/Imp. Length (MP/km)	3.21	3.70	-	3.29
<b>Secondary Major Roads</b>				
1. No. of Links	22	1	-	23
2. Total Length (km)	217.3	15.4	-	232.7
3. Improvement Length (km)	173.2	15.2	-	188.4
4. Construction Cost (million P)	598.6	37.4	-	636.0
5. Const. Cost/Imp. Length (MP/km)	3.46	2.46	-	3.38
<b>Major Roads Total</b>				
1. No. of Links	29	2	-	31
2. Total Length (km)	328.7	33.7	-	362.4
3. Improvement Length (km)	236.1	27.5	-	263.6
4. Construction Cost (million P)	800.5	82.9	-	883.4
5. Const. Cost/Imp. Length (MP/km)	3.39	3.01	-	3.35

TABLE 5.1-6 SUMMARY OF PRELIMINARY DESIGN  
Province of Nueva Ecija  
- Minor Roads -

	Type of Improvement		
	Rehabilitation/ Improvement-1&2/ Widening	New Construction	Total
-----			
Minor Roads (National/ Provincial/City)			
1. No. of Links	20	-	20
2. Total Length (km)	189.9	-	189.9
3. Improvement Length (km)	171.6	-	171.6
4. Construction Cost (million P)	330.7	-	330.7
5. Const. Cost/Imp. Length (MP/km)	1.93	-	1.93
Minor Roads (Barangay)			
1. No. of Links	15	-	15
2. Total Length (km)	139.7	-	139.7
3. Improvement Length (km)	119.2	-	119.2
4. Construction Cost (million P)	135.1	-	135.1
5. Const. Cost/Imp. Length (MP/km)	1.13	-	1.13
Minor Roads Total			
1. No. of Links	35	-	35
2. Total Length (km)	329.6	-	329.6
3. Improvement Length (km)	290.8	-	290.8
4. Construction Cost (million P)	465.8	-	465.8
5. Const. Cost/Imp. Length (MP/km)	1.60	-	1.60
-----			



## 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%
<u>+Construction Supervision Cost</u>	<u>6%</u>
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	1)	
			Financial Cost (millionP/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: P 0.210 M	85% of Cost
			6.0 m Gravel: P 0.320 M	
BMP	5.5cm BMP Overlay	When pavement serviceability decreases to 2.0, assuming 85,000 ESAL or 350,000 vehicle repetitions (4-10 years)	P 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)	P 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)	P 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 (P/km)	Fixed Cost (P/hour)	Time Cost (P/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 Condition	Surface Type			
	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			BMP/DBST			Gravel			Earth		
	OV	TR	MC	OV	TR	MC	OV	TR	MC	OV	TR	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 P/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 was 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 distance 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:

$$\text{Benefit} = \text{PRODw}(\text{FGPw}-\text{CPw}) - (\text{FGPw}-\text{CPw}/\text{o})$$

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

NUEVA ECIJA

Class of Road	Type of Road	Road Number	Road Length (km)	1990 Population		Total	1990 Crop Area (ha)		1993 AADT	IRR (%)		
				Total	/km		Major Crop	w/o with				
Minor (Natl./Prov'l)	Rehab/Imp-1	P56-1	5.6	4100	732	2185	2122 (Palay)	63 (Vege.)	70	68	25.4	
	Imp-1	P1-1	11.7	16554	1415	2442	2087 (Palay)	375 (Vege.)	157	161	17.0	
		P73-1	5.8	18561	3200	328	328 (Palay)		178	168	12.8	
		P16-1	7.5	15616	2082	238	138 (Corn)	100 (Vege.)	146	142	10.0	
		P62-1	7.8	7846	1006	1881	825 (Palay)	464 (Root)	117	103	7.8	
		P80-1	8.9	7849	882	3454	3454 (Palay)	392 (Vege.)	99	76	6.9	
		N13-1	12.5	13902	1112	3623	3623 (Palay)		177	174	5.1	
		N15-1	6.8	6523	959	1100	975 (Palay)	125 (Vege.)	63	67	3.6	
		P67-1	4.7	9354	1990	2563	2563 (Palay)		102	100	2.1	
		P26-1	17.7	25341	1432	4499	4499 (Palay)		286	277	1.5	
			8.2	4843	591	2651	2563 (Palay)	44 (Corn)	44 (Vege.)	79	73	1.3
	Minor (Barangay)	Imp-2/Widen	P85-1	2.0	6642	3321	899	899 (Palay)		69	76	33.5
			P103-1	16.6	6292	379	4963	4963 (Palay)		126	127	11.9
			P21-1	9.4	32510	3459	5016	5016 (Palay)		530	509	10.4
			P9-1	5.7	8581	1505	1041	916 (Palay)	125 (Root)	91	97	7.7
		Minor (Barangay)	Rehab/Imp-1	B31-1	8.9	6321	710	2871	2771 (Palay)	100 (Vege.)	133	110
			B1-1	2.7	1976	732	925	800 (Palay)	125 (Vege.)	25	27	20.2
			B25-3	8.0	3114	389	810	559 (Palay)	188 (Vege.)	50	45	19.8
			B29-1	24.7	12576	509	4578	4490 (Palay)	50 (Vege.)	186	180	19.3
			B0-1	10.7	8142	761	476	413 (Palay)	63 (Vege.)	83	98	19.2
			B18-1	11.2	6205	554	2866	2866 (Palay)		43	56	19.1
			B10-1	2.4	6157	2565	345	175 (Vege.)	170 (Palay)	56	62	17.7
			B5-2	21.2	6087	287	1355	1355 (Palay)		54	64	15.4
			B17-1	6.4	6685	1045	787	787 (Palay)		69	72	15.0
			B11-3	15.1	6085	403	3832	3632 (Palay)	200 (Vege.)	103	88	8.1
			B3-1	3.8	5432	1429	173	173 (Vege.)		18	40	7.5
			B28-1	9.5	3572	376	1642	1642 (Palay)		48	48	2.2
	B21-2		6.3	5353	850	1490	1490 (Palay)		67	68	1.6	
	B4-1		1.1	2828	2571	54	54 (Palay)		7	20	1.6	
Imp-2/Widen	B16-1		7.7	3193	415	858	850 (Palay)	8 (Corn)	45	49	10.9	

### 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 P17,143.00/km times the EMK factor as shown in Table 5.2-7.

TABLE 5.2-7  
EMK FACTOR FOR DIFFERENT SURFACING AND AADT

Surface Type	AADT								
	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

Surface Type	AADT								
	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 (pcso/km)
Gravel	Vegetation Control	1,150
	Ditch Cleaning	4.0 m Gravel: 2,650 + 40 AADT
	Grading	6.0 m Gravel: 3,000 + 45 AADT
	Pothole Repair	
	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.



# PROVINCE OF NUEVA ECIJA

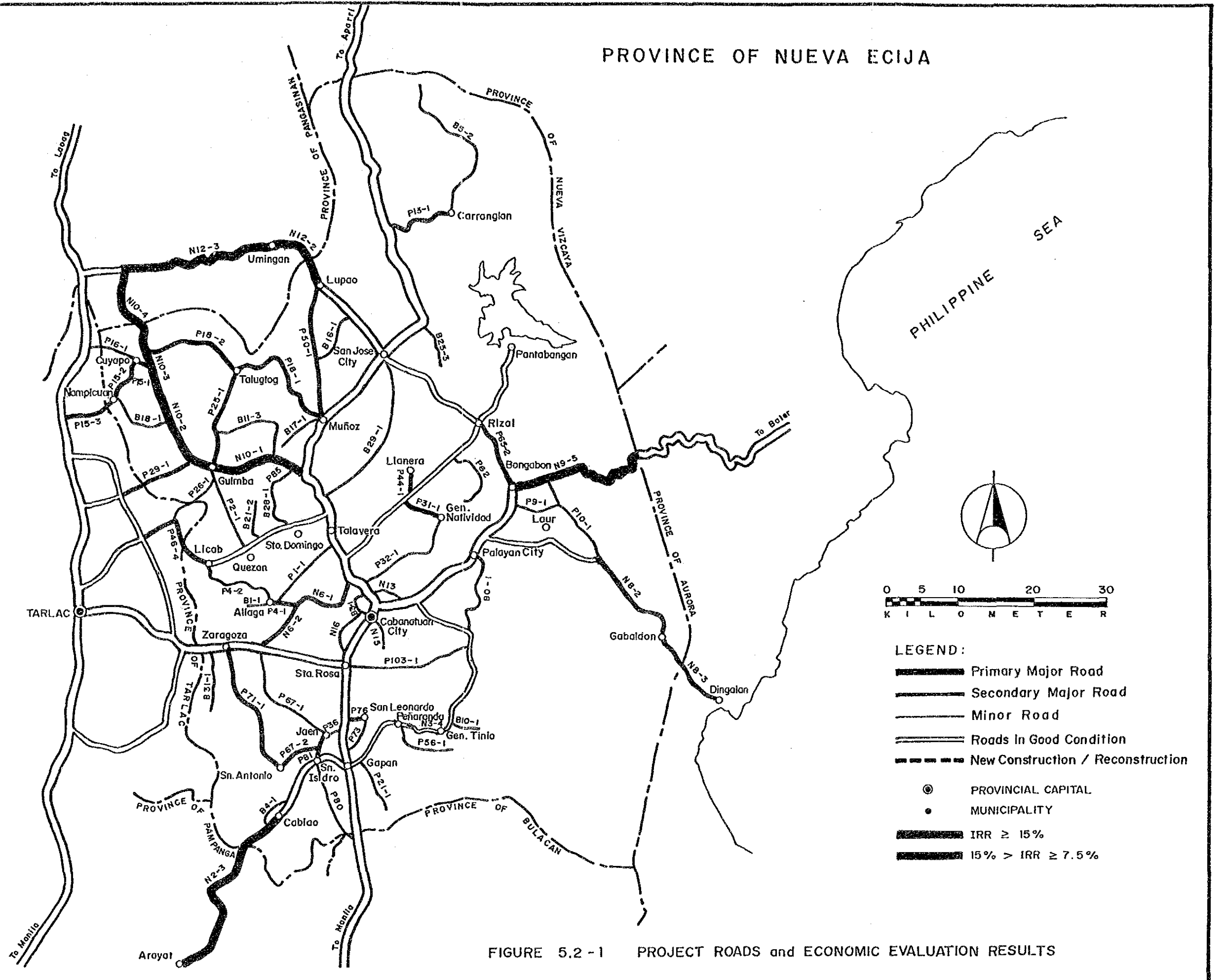


FIGURE 5.2 - 1 PROJECT ROADS and ECONOMIC EVALUATION RESULTS



TABLE 5.2 - 9 (1)  
Road Length and Construction Cost NUEVA ECIJA

Class of Road	Range of IRR	Rehabilitation/Improvement-1		Improvement-2/Widening		New Construction							
		No. Total	Length	No. Total	Length	No. Total	Length						
Primary Major	15<	7	111.4	9.1	201.9	1	18.3	12.3	43.1	2.5	45.5	-	-
	10-15	-	-	-	-	-	-	-	-	-	-	-	-
	7.5-10	-	-	-	-	-	-	-	-	-	-	-	-
	<7.5	-	-	-	-	-	-	-	-	-	-	-	-
Total		7	111.4	62.9	192.9	9.1	201.9	1	18.3	12.3	43.1	2.5	45.5
Second'y Major	15<	19	181.9	139.0	443.7	69.9	513.6	-	-	-	-	-	-
	10-15	3	35.4	34.2	71.8	13.2	85.1	-	-	-	-	-	-
	7.5-10	-	-	-	-	-	-	1	15.4	15.2	37.4	-	37.4
	<7.5	-	-	-	-	-	-	-	-	-	-	-	-
Total		22	217.3	173.2	515.5	83.1	598.6	1	15.4	15.2	37.4	-	37.4
Minor (Nat'l/Prov'l)	15<	5	50.5	49.2	109.4	13.2	122.6	1	2.0	1.6	.9	-	.9
	10-15	2	13.3	8.4	6.9	6.9	6.9	2	26.0	20.2	35.6	1.2	36.8
	7.5-10	1	7.8	6.3	6.6	6.3	12.9	1	5.7	5.7	3.9	1.3	5.2
	<7.5	8	84.6	80.2	130.1	15.3	145.4	-	-	-	-	-	-
Total		16	156.2	144.1	253.0	34.8	287.8	4	33.7	27.5	40.4	2.5	42.9
Minor (Barangay)	15<	9	96.2	80.6	55.3	30.4	85.7	-	-	-	-	-	-
	10-15	-	-	-	-	-	-	1	7.7	7.0	4.8	-	4.8
	7.5-10	1	15.1	14.3	16.0	2.1	18.1	-	-	-	-	-	-
	<7.5	4	20.7	17.3	15.9	10.6	26.5	-	-	-	-	-	-
Total		14	132.0	112.2	87.2	43.2	130.3	1	7.7	7.0	4.8	-	4.8
Total	15<	40	440.0	331.7	801.3	122.6	923.8	2	20.3	13.9	44.0	2.5	46.4
	10-15	5	48.7	42.6	78.7	13.2	91.9	3	33.7	27.2	40.4	1.2	41.6
	7.5-10	2	22.9	20.6	22.6	8.4	31.1	2	21.1	20.9	41.3	1.3	42.6
	<7.5	12	105.3	97.5	146.0	25.9	171.9	-	-	-	-	-	-
Total		59	616.9	492.4	1048.6	170.1	1121.8	7	75.1	62.0	125.7	5.0	130.6

TABLE 5.2 - 9 (2)  
Road Length and Construction Cost

NUEVA ECIJA

Class of Road	Range of IRR	Total					
		No. Total Length	Improv Road Length	Bridge Total Cost			
Primary Major	15<	8	129.7	75.2	235.9	11.5	247.5
	10-15	-	-	-	-	-	-
	7.5-10	-	-	-	-	-	-
Second'y Major	<7.5	-	-	-	-	-	-
	Total	8	129.7	75.2	235.9	11.5	247.5
	15<	19	181.9	139.0	443.7	69.9	513.6
Minor (Nat'l/Prov'l)	10-15	3	35.4	34.2	71.8	13.2	85.1
	7.5-10	1	15.4	15.2	37.4	-	37.4
	<7.5	-	-	-	-	-	-
Total	Total	23	232.7	188.4	552.9	83.1	636.0
	15<	6	52.5	50.8	110.3	13.2	123.6
	10-15	4	39.3	28.6	42.4	1.2	43.7
Minor (Barangay)	7.5-10	2	13.5	12.0	10.5	7.6	18.1
	<7.5	8	84.6	80.2	130.1	15.3	145.4
	Total	20	189.9	171.6	293.4	37.3	330.7
Total	15<	9	96.2	80.6	55.3	30.4	85.7
	10-15	1	7.7	7.0	4.8	-	4.8
	7.5-10	1	15.1	14.3	16.0	2.1	18.1
Total	<7.5	4	20.7	17.3	15.9	10.6	26.5
	Total	15	139.7	119.2	92.0	43.2	135.2
	15<	42	460.3	345.6	845.2	125.1	970.3
Total	10-15	8	82.4	69.8	119.1	14.4	133.5
	7.5-10	4	44.0	41.5	63.9	9.7	73.6
	<7.5	12	105.3	97.5	146.0	25.9	171.9
Total	Total	66	692.0	554.4	1174.2	175.1	1349.3

TABLE 5.2 - 10 (1)

Summary of Economic Analysis

NUEVA ECIJA

Class of Road	Type of Road	1993 AADT w/o with	Length (km)	Economic Cost (Mp/km)		Benefit (Mp/km)		Cost/Benefit:1991-2017 Discounted Total		Economic Indicator			
				Const- ruct. Maint.	Period- Maint.	Total	Normal Diver- ted	Gene- Deve- rated lop't sav'g	Total	NPV (Mp)	B/C (%)	IRR (%)	
Primary Major	Rehab/ Imp-1	3105 3105	17.9	1.93	.27	2.21	25.44	-	25.41	44.1	11.5	100.0	
	N10-3	721 1178	1.6	1.08	-	2.02	24.77	-	25.79	25.7	24.8	100.0	
	N10-1	3935 3742	15.3	3.20	.24	3.44	17.85	-	17.83	76.3	5.2	97.1	
	N12-2	747 900	10.0	2.33	.21	2.54	7.62	1.29	9.33	23.1	3.7	50.0	
	N12-3	450 619	23.1	2.35	.10	2.45	4.59	.64	5.70	44.2	2.3	32.1	
	N10-4	721 1178	14.4	3.11	.06	3.16	5.05	2.15	7.31	39.8	2.3	31.4	
	N9-5	359 371	29.1	2.53	.63	3.25	3.91	-	4.16	26.3	1.3	19.4	
	Imp-2/ Widen	1510 1785	18.3	3.08	.12	3.20	11.92	1.47	13.48	126.5	4.2	54.1	
	Second'y Major	Rehab/ Imp-1	1886 1653	8.7	1.14	.33	1.47	13.62	-	13.59	87.2	9.2	100.0
		P29-1	1812 1468	12.2	2.26	.16	2.42	12.71	-	12.58	59.5	5.2	67.4
N3-4		1092 1063	.7	24.42	.02	24.44	97.68	.09	99.25	52.4	4.1	51.5	
P81-1		1994 1202	1.7	2.42	.06	2.48	8.47	-	8.58	6.7	3.5	44.8	
P76-1		1384 1373	2.4	2.59	.18	2.76	8.56	-	8.61	14.0	3.1	42.0	
P44-1		903 885	3.0	2.15	.21	2.35	7.03	-	7.13	14.3	3.0	41.7	
P4-1		695 684	3.5	3.39	.12	3.51	9.61	-	9.71	21.7	2.8	37.0	
P15-2		598 603	6.4	2.34	.01	2.35	6.65	-	6.63	21.0	2.8	36.9	
P15-1		598 603	2.3	1.29	.10	1.39	3.65	-	3.64	5.2	2.6	35.4	
N6-2		638 707	8.1	3.21	.14	3.35	7.81	-	7.91	19.6	2.4	32.5	
Primary	Imp-1	780 799	11.9	3.86	.17	4.03	9.36	-	9.43	35.7	2.3	32.2	
	P65-2	440 641	11.2	4.12	.12	4.23	6.20	.47	7.71	38.3	1.8	25.8	
	P15-3	464 454	7.2	2.40	-	2.40	4.21	-	4.25	2.8	1.8	24.7	
	P18-1	339 424	15.9	3.73	.04	3.77	6.10	.15	6.26	39.6	1.7	23.6	
	P71-1	228 456	18.8	2.35	.07	2.42	2.80	.64	3.80	25.1	1.6	22.7	
	P50-1	266 520	21.3	2.54	.07	2.61	2.56	.57	3.22	11.1	1.2	18.3	
	N8-2	425 433	19.8	4.05	.05	4.10	4.47	-	4.82	14.2	1.2	17.4	
	P46-4	149 160	14.0	1.55	.11	1.76	1.83	-	2.04	2.4	1.2	17.3	
	P15-1	214 233	12.8	4.07	.33	4.40	4.30	-	5.00	2.3	1.1	17.0	
	N8-3	175 209	11.5	2.26	.43	2.68	1.90	-	2.55	-1.5	.9	14.3	
Primary	P31-1	313 322	6.1	1.73	.48	2.21	1.75	-	1.83	-2.3	.8	11.8	
	P18-2	96 253	17.7	2.07	.34	2.41	1.36	.23	1.84	-10.1	.8	11.0	
	Imp-2/ Widen	227 237	15.4	2.05	.29	2.33	1.32	.01	1.43	-13.7	.6	8.1	



TABLE 5.2 - 10 (2)

Summary of Economic Analysis

NUEVA ECIJA

Class of Road	Type of Impr't	1993 ADT w/o	Length (km)	Economic Cost (Mp/km)			Benefit (Mp/km)			Cost/Benefit:1991-2017 Discounted Total						
				Total Improvement	Const. ruct.	Period: Maint.	Normal Diver-ted	Gene-rated	Deve-lop't sav'g	Total	NPV (Mp)	B/C	IRR (%)			
Minor (Nat'l/Proy'l)	Rehab/ Imp-1	1280 1882	3.1	2.6(6.0-AC)	6.28	.33	6.61	34.99	4.07	.89	.10	40.05	87.0	6.1	75.9	
	P36-1	513 499	17.7	17.7(6.0-AC)	2.13	.07	2.19	3.83	-	-	.10	3.93	50.7	1.8	25.4	
	P32-1	70 68	5.6	5.3(6.0-GRV)	.53	.20	.73	.09	-	.00	1.40	1.58	4.3	2.1	25.4	
	P56-1	218 430	12.4	12.4(6.0-AC)	2.71	.03	2.76	2.52	.34	.73	.09	3.68	11.5	1.3	19.6	
	P2-1	157 161	11.7	11.2(6.0-GRV)	1.02	.35	1.38	.73	-	.07	.10	1.51	1.5	1.1	17.0	
	P1-1	178 168	5.8	4.6(6.0-GRV)	.65	.33	.98	.32	-	.02	.43	.86	-1.6	.9	12.8	
	P73-1	146 142	7.5	2.7(6.0-GRV)	.72	.25	.98	.32	-	.01	.33	.74	-1.8	.8	10.0	
	N16-1	117 103	7.8	7.7(6.0-PCV)	1.70	.24	1.94	.21	-	.01	.86	.09	1.17	-4.9	.6	7.8
	P16-1	99 76	8.9	8.9(6.0-GRV)	2.10	.21	2.32	.53	-	.04	.54	.05	1.15	-10.4	.5	6.9
	P62-1	194 93	13.6	13.6(6.0-GRV)	.90	.23	1.13	.54	-	-	.14	.68	-6.2	.5	6.6	
P10-1	177 174	12.5	10.5(6.0-GRV)	.97	.32	1.29	.42	-	.04	.31	.08	.86	-5.5	.7	5.1	
P80-1	63 57	6.8	1.4(6.0-BMP)	.89	.20	1.09	.14	-	.01	.39	.06	.60	-3.4	.5	3.5	
N13-1	0 105	12.2	11.2(6.0-GRV)	1.71	.25	1.96	-	.69	.10	-	-.03	.76	-13.8	.4	2.6	
P4-2	102 100	4.7	2.2(6.0-GRV)	3.55	.25	3.80	.23	-	.01	1.71	.11	2.06	-3.8	.5	2.1	
N15-1	286 277	17.7	16.5(6.0-BMP)	2.03	.45	2.48	.56	-	.09	.29	.07	1.11	-22.5	.4	1.5	
P67-1	79 73	8.2	8.2(6.0-GRV)	1.32	.21	1.54	.30	-	.02	.20	.08	.60	-7.7	.4	.3	
P26-1	69 76	2.0	1.6(6.0-GRV)	.47	.22	.69	.49	-	.00	.60	.06	1.16	.7	1.7	33.5	
Imp-2/ Widen	126 127	16.6	11.6(6.0-GRV)	.54	.27	.80	.27	-	.00	.36	.11	.73	-1.8	.9	11.9	
P103-1	530 509	9.4	8.6(6.0-AC)	2.83	.08	2.91	1.73	-	.00	.23	.10	2.07	-7.3	.7	10.4	
P21-1	91 97	5.7	5.7(6.0-GRV)	.75	.25	1.00	.43	-	.00	.20	.09	.72	-1.6	.7	7.7	
P9-1																

TABLE 5.2 - 10 (3)

Summary of Economic Analysis

NUEVA ECIJA

Class of Road	Type of Imp't	Road Number	1993 AADT w/o	Length (km)	Economic Cost (Mp/km)		Normal Diverged	Benefit (Mp/km)		Economic Indicator						
					Const-Peri-od/ fruct. Maint.	Total		Gene-Deve-lop't sav'g	Total	NPV (Mp)	B/C IRR (%)					
Minor (Barangay)	Rehab/ Imp-1	B31-1	133	8.9	2.0(4.0-GRV)	.69	.17	.86	.02	.50	.12	1.44	1.2	1.7	25.6	
		B1-1	25	2.7	2.7(4.0-GRV)	.41	.11	.53	.00	.58	.02	.71	.5	1.3	20.2	
		B25-3	50	8.0	8.0(4.0-GRV)	1.13	.12	1.25	.00	1.77	.04	1.89	5.2	1.5	18.8	
		B29-1	186	24.7	18.5(4.0-GRV)	.55	.22	.77	.01	.39	.12	.89	2.3	1.2	19.3	
		B0-1	83	98	10.7	10.7(4.0-GRV)	.88	.18	1.05	.02	.85	.09	1.46	4.4	1.4	19.2
		B18-1	43	56	11.2	9.5(4.0-GRV)	.82	.13	.95	.04	.64	.02	1.29	3.2	1.4	19.1
		B10-1	56	62	2.4	1.5(4.0-GRV)	5.14	.13	5.27	.01	5.18	.06	6.65	2.2	1.3	17.7
		B5-2	54	64	21.2	21.2(4.0-GRV)	.93	.14	1.07	.05	.64	.04	1.11	.7	1.0	15.4
		B17-1	69	72	6.4	6.4(4.0-GRV)	.69	.13	.83	.00	.59	.07	.82	.0	1.0	15.0
		B11-3	103	88	15.1	14.3(4.0-GRV)	1.05	.16	1.21	.05	.24	.08	.77	-6.3	.6	8.1
		B3-1	18	40	3.8	3.8(4.0-GRV)	2.79	.12	2.91	.10	.45	.01	1.53	-5.3	.5	7.5
		B28-1	48	48	9.5	9.0(4.0-GRV)	.56	.12	.68	.00	.20	.04	.37	-2.8	.5	2.2
		B21-2	57	68	6.3	3.7(4.0-GRV)	1.33	.13	1.46	.00	.43	.06	.71	-2.8	.5	1.6
		B4-1	7	20	1.1	.8(4.0-GRV)	1.85	.11	1.97	.07	.10	.00	.62	-1.1	.3	1.6
	Imp-2/ Widen	B16-1	45	49	7.7	7.0(4.0-GRV)	.57	.12	.70	.00	.36	.04	-1.3	.7	10.9	





