

MAIN TEXT

1

**THE GREATER
REGION AND IRM**

1.1 Physical Location of GCLA and IRM

Definition of GCLA

Regions directly contiguous to the Metro Manila Area (MMA) are vastly developed than other regions in the nation which are separated from the capital city by water. They are characterized by a far higher degree of activity as seen in their high concentrations of population and industry substantially above national averages.

In recognition of the extreme economic importance of these regions to the nation, the six (6) provinces of Region III and the five (5) provinces of Region IV located within a radius of 100 km from MMA have been designated the "Greater Central Luzon Area" - GCLA - in order to achieve enhanced integration of this entire area (Fig. 1.1.1).

Composition of GCLA and the Location of IRM

The GCLA generally consists of MMA at its center, Region III to the north, and Region IV to the South. The southern area is further divided into the western sector which includes the two (2) provinces of Cavite and Batangas, and the eastern sector which includes the three (3) provinces of Rizal, Laguna, and Quezon.

IRM is located in Quezon of this eastern sector. It has a distance of 80 km from MMA on the map, situated between the Sierra Madre to its west, and the Pacific Ocean directly to its east.

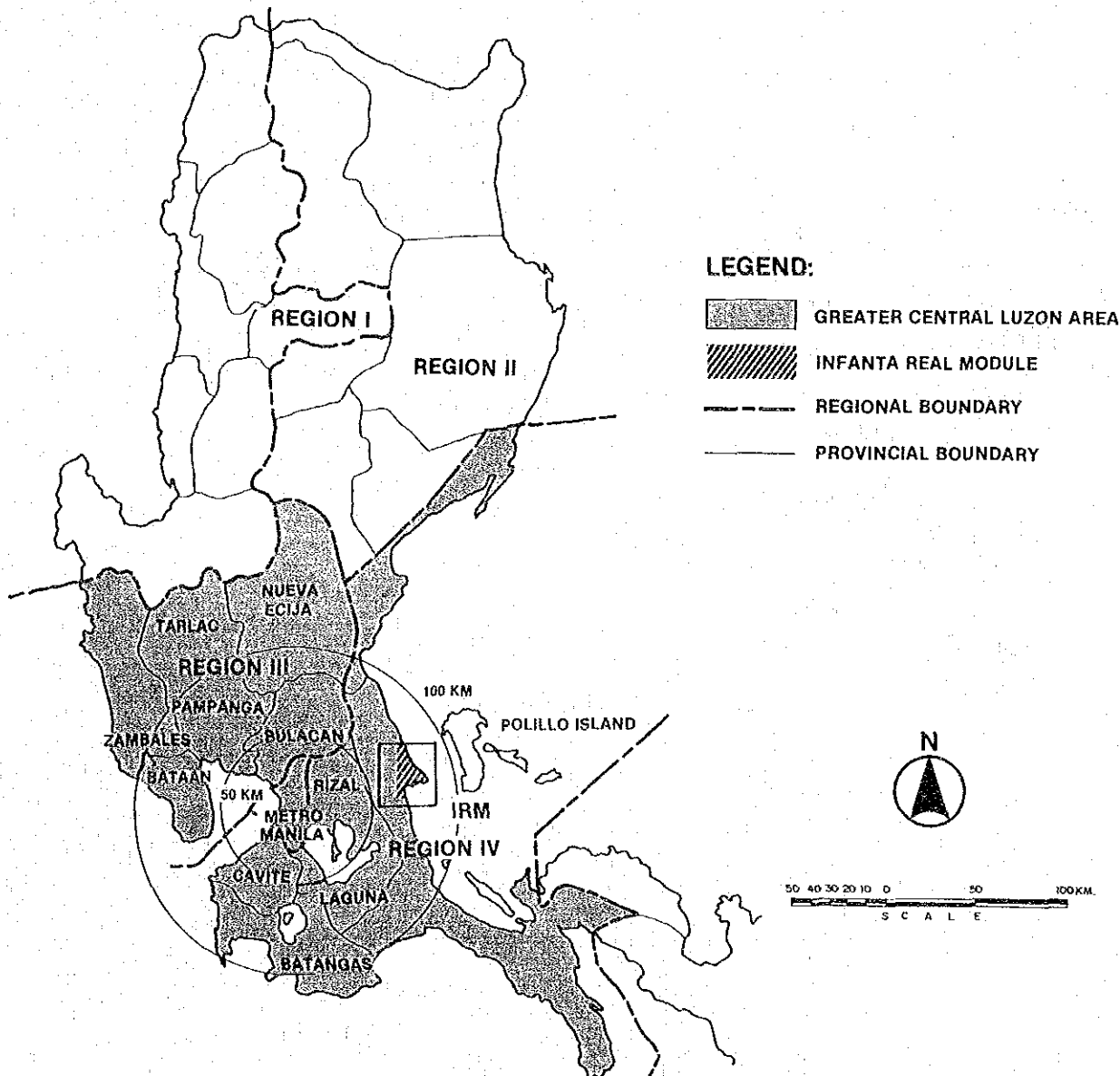


FIG. 1.1.1 THE GREATER CENTRAL LUZON AREA

1.2 Regional Structure of GCLA

1.2.1 MMA and its Contiguous Regions

Socio-Economic Development in GCLA

The population of the GCLA was 11 million in 1970 and 15.4 million in 1980. During the same decade, the share of the region's population against the national totals showed a similar increase from 30.0% to 32.1%. Current forecasts (NCSO) now predict that by the year 2000, the region's population shall grow to 23.6 million accounting for 36.1% share of the nation's inhabitants. In terms of gross industrial output, the GCLA's share of the nation's total increase from 51.0% in 1970 to 54.3% in 1980 (corresponding figures are 62.7% and 70.0% when only secondary industry is considered). Furthermore, the region's share is expected to remain at around 54% through the foreseeable future (NEDA forecast for 1987).

As just described, the GCLA serves a major function in the socio-economic activities of the Philippines. Furthermore, even as the nation proceeds with its policy aimed at a more balanced national development through regional dispersion, the region may be expected to maintain population and production in excess of its proportionate share in the national figures.

Regional Distribution Trends within GCLA

Looking at the development taking place within the GCLA, MMA continues to serve as the nucleus of the entire region. However, certain changes are beginning to appear.

Although the population continues to be concentrated in MMA, the rate of population growth has been declining for the past two (2) decades (1960s - 4.88%/1970s - 4.10%). From the 1960s through the early 1970s, the amount by which population inflow into MMA exceeded outflow, continued to drop sharply. In the same period, the contiguous regions have shifted from excess outflow to excess inflow with the rate of excess inflow now doubling in some provinces. Furthermore, the contiguous regions as a whole are now experiencing an excess influx by absorbing population drawn from the entire nation, thereby, serving as a receptacle for population dispersed from MMA itself. As a result, the rate of population growth in the regions contiguous to MMA in the 1970s was at 3.04% per annum well above the national average of 2.75%.

In addition, an examination of the contiguous regions' gross industrial output reveals that from 1970 through 1980, the rate of industrial growth was higher on these regions than MMA, both in overall totals and in the various industrial categories. The share occupied by the contiguous regions in the national industrial figures, thereby, rose from 20.7% in 1970 to 22.6% in 1980 vividly pointing to the high relative importance of these regions to the Philippine economy.

Importance of the MMA Contiguous Regions

Today, as population and industry continue to be heavily concentrated in Manila, and as the outlying regions themselves lack the growth pull sufficient to stop the outflow of their populations, promotion of the development of the GCLA as a natural receptacle for population and industry is of extreme importance not only in alleviating their concentration into Manila, but also in maintaining and further developing the national economy.

Today, the GCLA is developing in close affinity with MMA, and the GCLA as a whole is acting as a leading force in the nation's socio-economic development.

1.2.2 Present Regional Conditions

Topography and Natural Conditions

The following three (3) basic factors play a definite role in the composition of the GCLA (see Map, Fig. 1.2.1): (i) Two (2) mountain ranges running along both the eastern and western coasts enclose a plain running north-south in the center of the region; (ii) Centered on MMA, this central plain connects to the north with the Pampanga plain, Luzon's grain belt, and to the south extends to Laguna de Bay and Manila Bay; and (iii) The eastern half of the GCLA is a mountainous region formed by the Sierra Madre range which impedes access to the east coast. The region to the west of the Sierra Madre is marked by two (2) distinct seasons, rainy (May - October) and dry (November - April), while the region to the east has no clear dry season.

Population and Social Conditions

1) Population Distribution by Region/Province

The population of the GCLA (15.4 million 1980) is nearly distributed evenly throughout the following regions: 5.9 million in MMA, 4.8 million in the north (Region III), and 4.7 million in the south (part of Region IV). Population figures for the various provinces vary between 300,000 and 1.3 million (Table 1.2.1). In the 1960s, population growth was seen throughout the entire region with the growth rate exceeding the national average in all provinces except Tarlac. In the 1970s, provinces with high growth rates above the national average were concentrated around MMA which includes Bataan, Bulacan, Cavite, Laguna, and Rizal (Fig. 1.2.2).

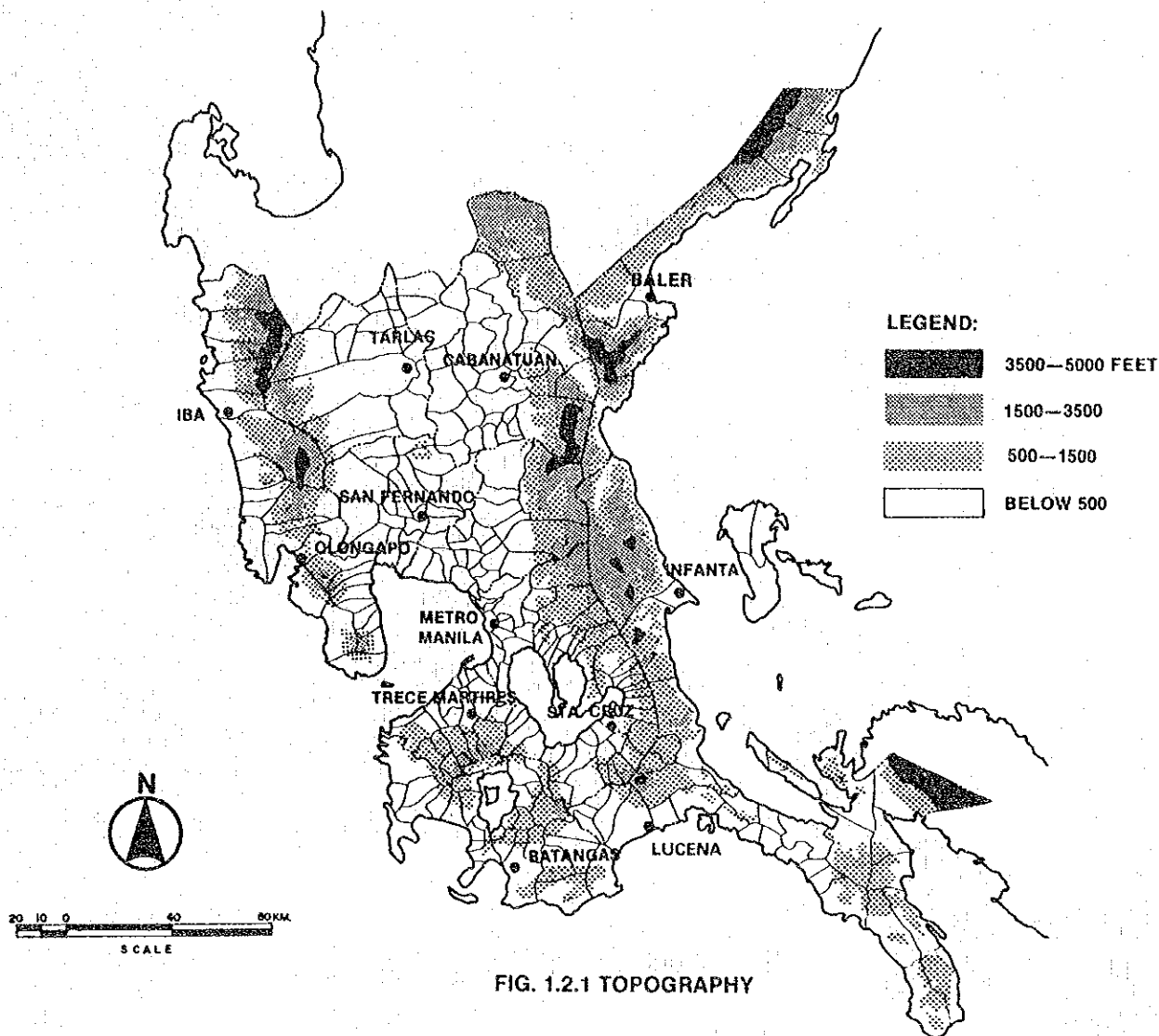


FIG. 1.2.1 TOPOGRAPHY

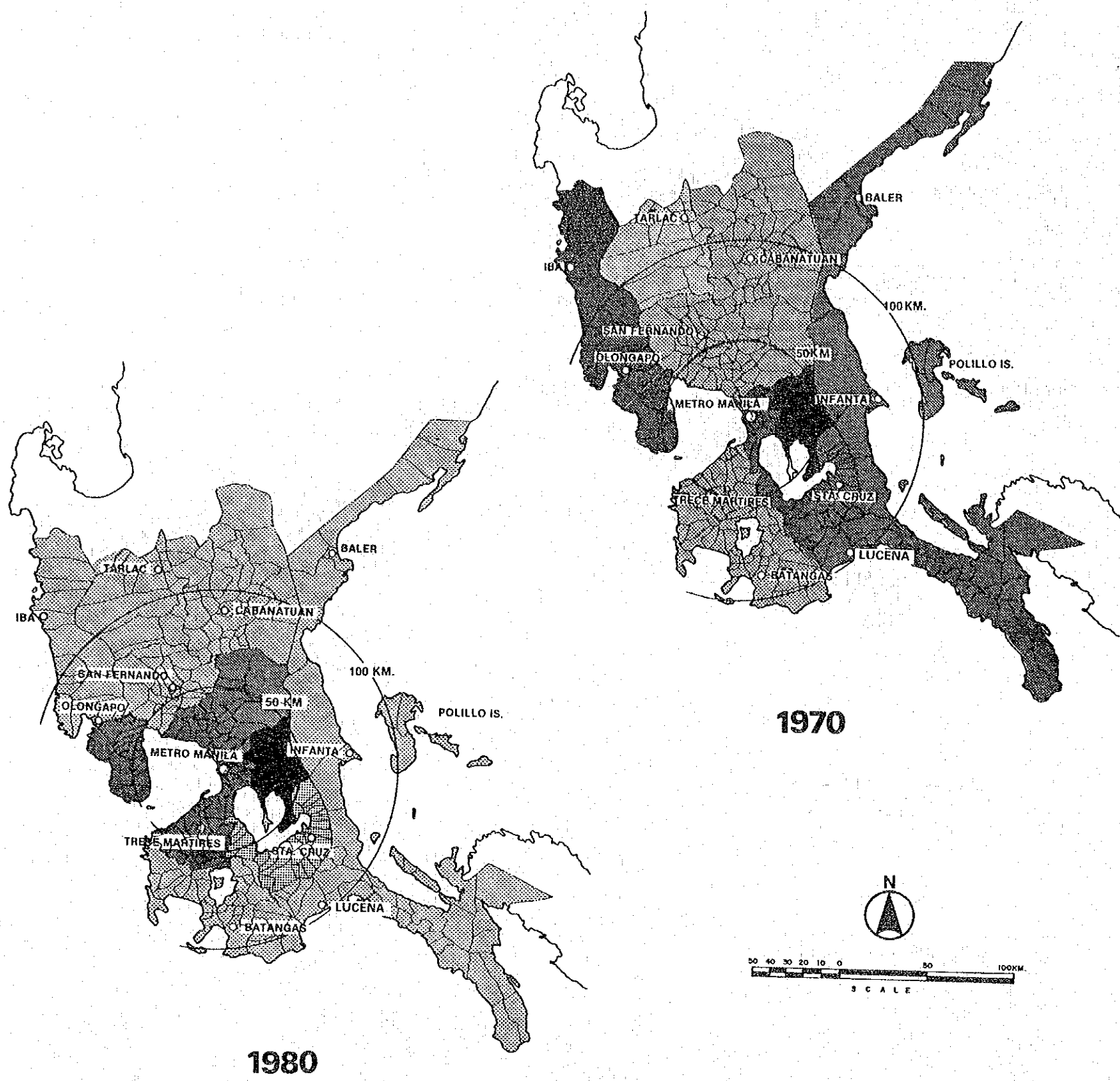
Table 1.2.1 POPULATION BY PROVINCE

	1960	1970	1980	Annual Growth Rate	
	Feb. 15			1960-70	1970-80
Philippines	27,087,685	36,684,468	48,098,460	3.06	2.75
GCLA	7,346,867	11,018,977	15,439,257	4.14	3.43
MMA	2,462,483	3,966,695	5,925,884	4.88	4.10
Region III	2,525,379	3,615,496	4,802,793	3.65	2.88
Bataan	145,323	216,210	323,254	4.05	4.10
Bulacan	514,346	737,975	1,096,046	3.68	4.03
Nueva Ecija	608,362	851,294	1,069,409	3.42	2.31
Pampanga	617,259	907,275	1,181,590	3.93	2.68
Tarlac	426,647	559,708	688,457	2.75	2.09
Zambales	213,442	343,034	444,037	4.86	2.61
Region IV	2,359,000	3,436,786	4,710,580	3.83	3.20
Batangas	618,414	926,308	1,174,201	3.12	2.40
Cavite	378,138	520,180	771,320	3.24	4.02
Laguna	472,064	699,736	973,104	4.01	3.35
Quezon	653,426	983,324	1,236,422	4.17	2.32
Rizal	173,958	307,238	555,533	5.85	6.10
Infanta		21,653	27,814		2.54
Real		10,079	14,463		3.68
Gen. Nakar		8,569	12,127		3.53
IRM Total		40,301	54,404		3.05

Source: NCSO

2) Population Distribution by Municipality

In terms of population density, the highest concentrations of population are found in the central plain with only sparse population living along the coasts (Fig. 1.2.3A, 1970, 1.2.3B, 1980). Cities having populations of more than 50,000 are concentrated most heavily in the north and south areas nearest MMA. While such cities become sparsely distributed as the distance to MMA increases, it is in these more distant areas that the regional base cities with a population over 100,000 begin to appear. In terms of population density (Fig. 1.2.4), cities with more than 1,000 persons per square kilometer are distributed in the north and south areas of Manila. Particularly the south area, such cities form a linked chain owing to the narrow geographic conditions. Cities showing a high population growth rate in excess of 5% for the period 1970 to 1980 also tend to be located in the periphery of MMA (Fig. 1.2.5), which may be due to population transferring out of the MMA.



LEGEND:





	OVER 5%
	4 - 5
	3 - 4
	0 - 3

FIG. 1.2.2 ANNUAL GROWTH RATE OF POPULATION BY PROVINCE

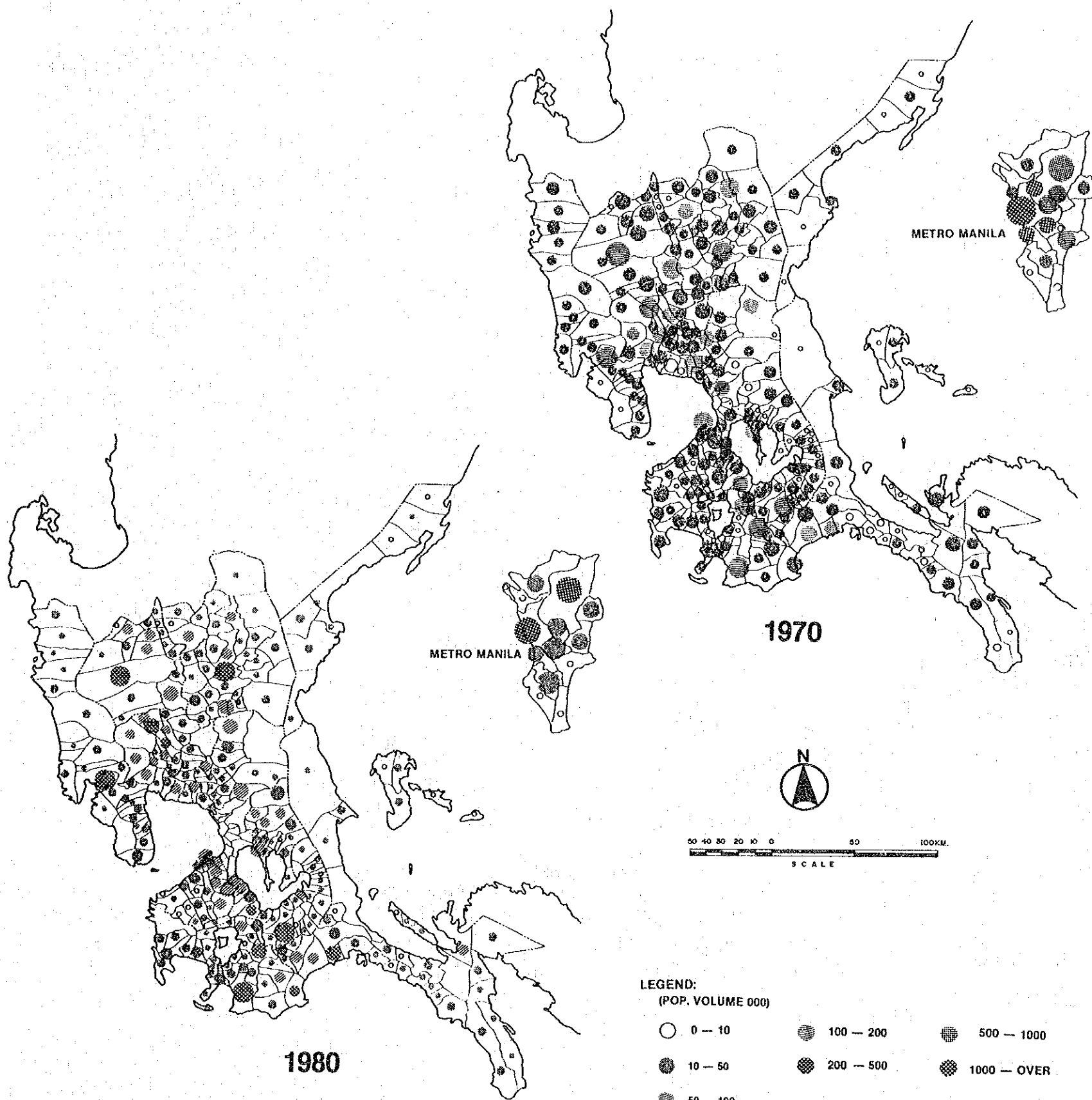


FIG. 1.2.3 DISTRIBUTION OF POPULATION

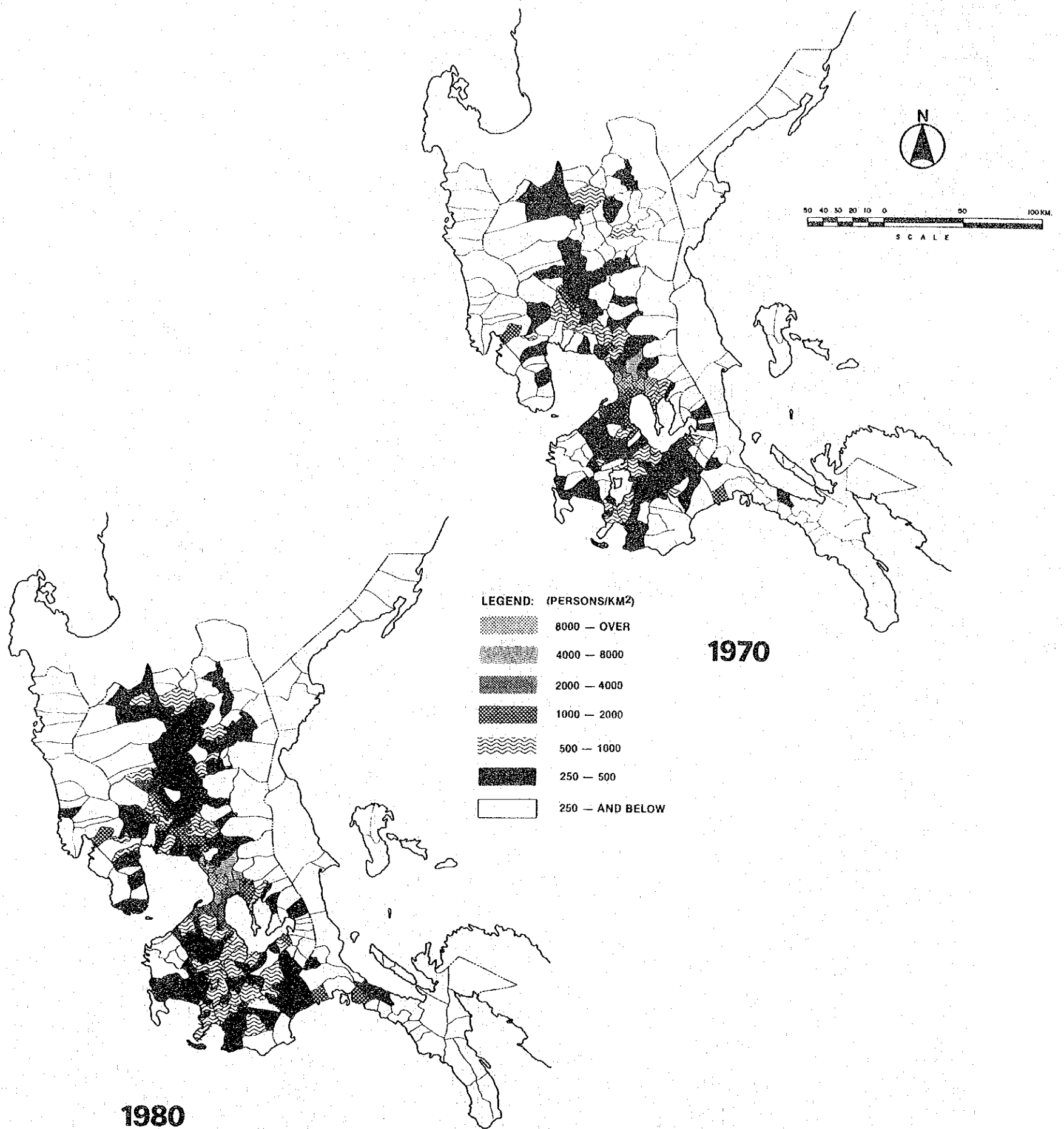


FIG. 1.2.4 POPULATION DENSITY

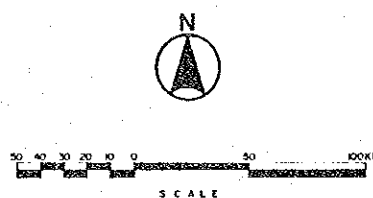
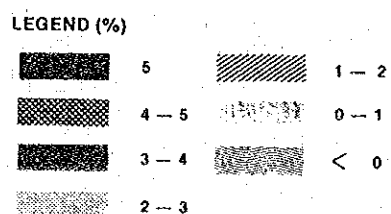
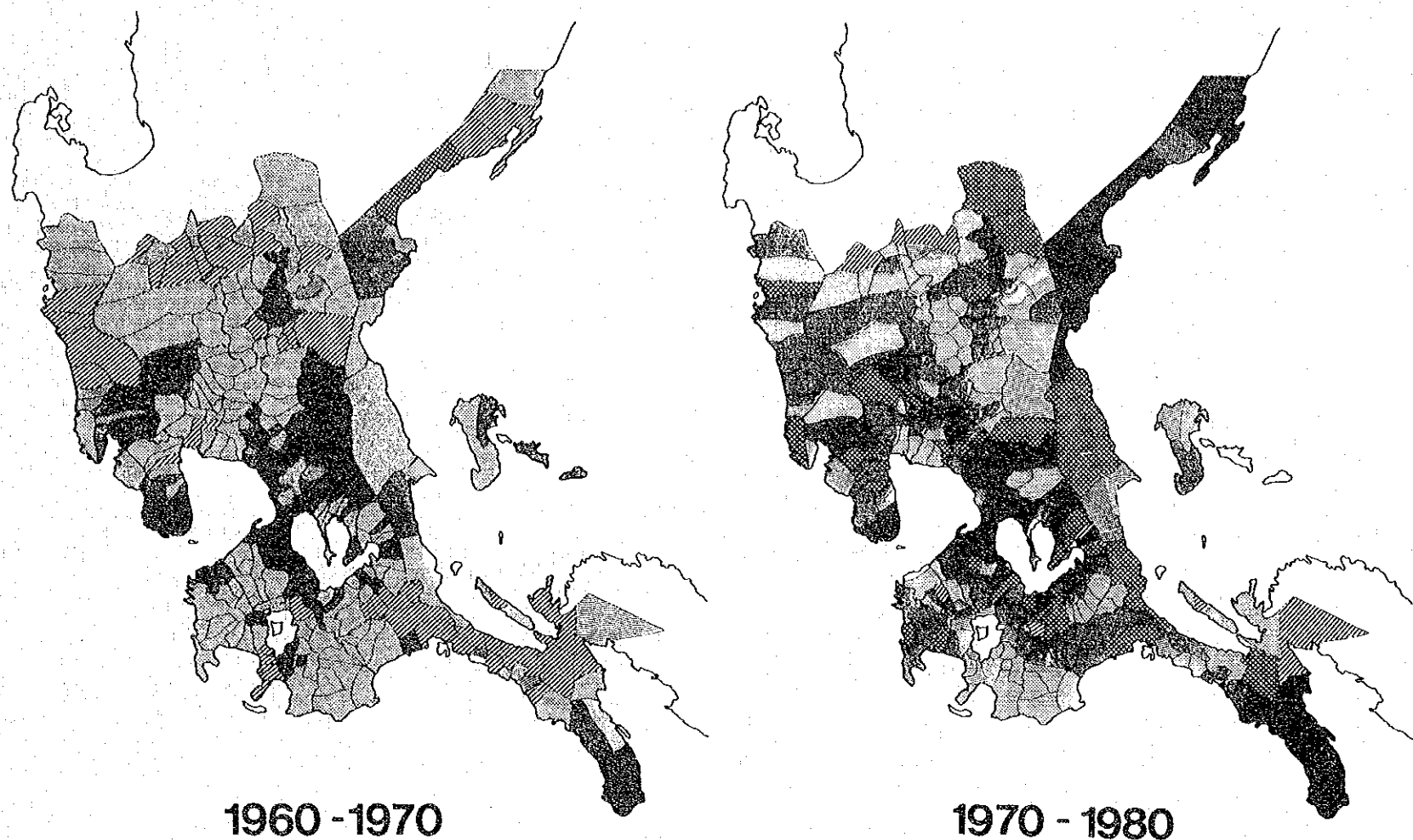


FIG. 1.2.5 ANNUAL GROWTH RATE OF POPULATION BY MUNICIPALITY

3) Social Movements

Social movements within the GCLA follow the following two (2) patterns: (i) In Regions III and IV and in MMA, the largest factor in social increase is comprised of incoming populations from regions outside the GCLA; and (ii) While population influx/outflow between MMA and the GCLA is almost equally balanced, the outflow from MMA into Region III is greater than the flow in the opposite direction. Provinces with high rates of influx during the period from 1975 to 1980 were Bataan, Zambales and the four (4) other provinces contiguous with MMA (Table 1.2.2 and 1.2.3).

Table 1.2.2 INTER-REGIONAL SOCIAL MOVEMENT OF POPULATION

D/O	MMA	Reg. III	Reg. IV	Others	Total
MMA	—	46,021	48,069	168,966	263,056
Region III	57,414	—	8,228	33,568	99,210
Region IV	47,941	7,906	—	38,266	94,113
Others	90,505	18,352	17,431	—	—
Total	195,860	72,279	73,728	—	887,910

Source: NCSO

Table 1.2.3 IN-MIGRATION BY PROVINCE

	Persons					
	1970-1975			1975-1980		
	Total	Urban	Rural	Total	Urban	Rural
MMA	151,193 (10.11)	71,316 (6.25)	52,372 —	804,566 (15.90)	804,566 (15.90)	0 0
Region III						
Bataan	13,473 (6.04)	6,503 (12.20)	5,873 (3.60)	30,422 (11.34)	17,608 (14.67)	12,814 (8.64)
Bulacan	69,586 (7.77)	49,115 (11.32)	18,044 (3.98)	66,166 (7.18)	34,511 (7.06)	31,655 (7.30)
N. Ecija	30,397 (3.79)	14,680 (8.55)	14,204 (2.29)	30,640 (3.41)	8,918 (3.76)	21,722 (3.28)
Pampanga	33,119 (3.79)	18,692 (6.90)	11,856 (1.99)	34,939 (4.53)	31,120 (5.92)	3,819 (0.82)
Tarlac	17,076 (3.14)	7,369 (7.81)	8,874 (2.00)	16,935 (2.90)	4,815 (3.90)	12,750 (2.69)
Zambales	29,516 (8.34)	18,537 (10.48)	9,925 (5.79)	25,936 (6.86)	17,351 (7.81)	8,405 (5.47)
Region IV						
Batangas	16,433 (1.88)	7,443 (5.86)	8,223 (1.11)	29,226 (3.05)	8,055 (4.73)	21,171 (2.59)
Cavite	42,493 (7.79)	30,628 (12.53)	9,591 (3.57)	66,694 (10.20)	54,395 (13.81)	12,299 (4.73)
Laguna	28,936 (4.23)	18,477 (5.37)	9,146 (2.74)	60,903 (7.44)	45,797 (9.11)	15,106 (4.78)
Quezon	49,595 (5.32)	22,234 (8.41)	26,124 (3.96)	50,391 (5.35)	16,643 (5.89)	33,748 (5.12)
Rizal	519,042 (15.96)	344,841 (12.10)	157,897 (46.90)	78,667 (17.00)	62,579 (17.96)	16,088 (14.04)

Note: () is In-migration rate (Immigration/Total Population)

Source: Present residence of Private Household Population
5 years and over by previous place of residence.

4) Household Income

Household income falls into the following two (2) patterns: higher income in the south compared with the north; and higher income in the west than in the east. In other words, income is higher in Region IV in the south (area within the GCLA only) than Region III in the north in reflection of the southward movement of economy from MMA. Disparity in income is also great within Region IV with incomes higher in the provinces adjoining MMA and lower in Quezon (home province of IRM), which is in the outer fringe of the GCLA. Thus, Quezon Province not only tends to lag in income figures overall, but is also marked by a sharp disparity in income within its own eastern and western coastal regions.

5) Urbanization Trends

The rate of urbanization in the Philippines stands at 37.3% when urbanization is evaluated on the basis of the percentages of the total population living in cities to that of the whole country. In comparison to this national figure, the rate of urbanization in the GCLA is high with the corresponding figures for Regions III and IV at 41.8% and 43.4%, respectively (MMA 9 100%).

Examination of the rate of urban population in each province (Fig. 1.2.6) shows that urbanization is centered on MMA, and exceeds 50% in all provinces within a 50 km radius of MMA. The previously described increase of population in this area may be largely attributed to this urbanization trend. In contrast, the areas lying between 50 and 100 km from MMA have urbanization rates below 30% (with the exception of Olongapo City, and the mining cities of Zambales Province).

6) Urban Population Distribution

The distribution of the urban population in the GCLA shows the following clearly definable characteristics (Fig. 1.2.7): (i) Within a 50 km radius of MMA, the urban population is concentrated along the north-south axis coinciding with the major roadway due to the direct influence of MMA; (ii) In the area beyond this radius, there are inland based cities (e.g., San Pablo and San Fernando) which serve either as central points of their respective regions or as relay cities with Manila; and (iii) In areas even more distant from MMA, there are port cities (e.g., Batangas, Lucena, San Fernando - Region I) along the coasts which serve primarily as centers of the marine products and marine transport industries.

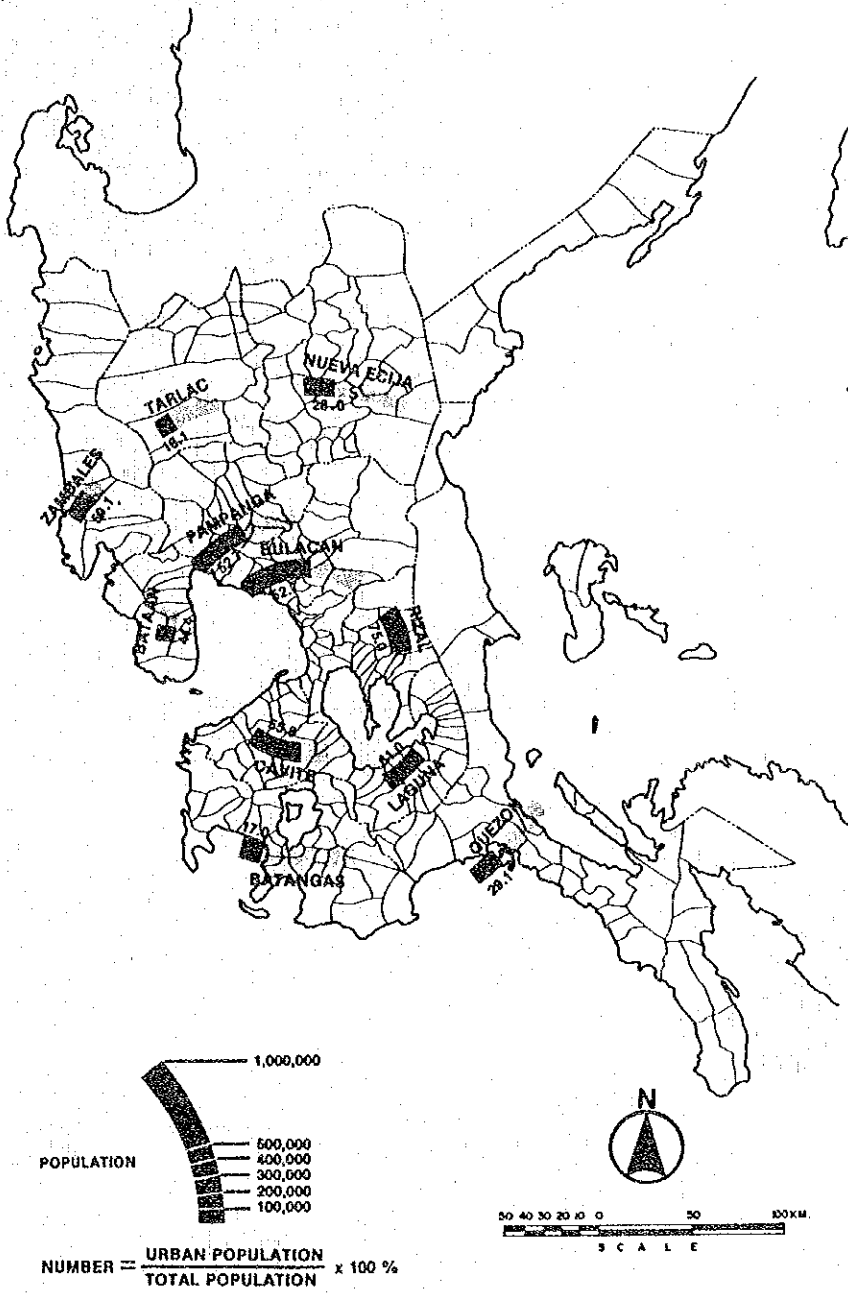


FIG. 1.2.6 URBAN/RURAL POPULATION (1980)

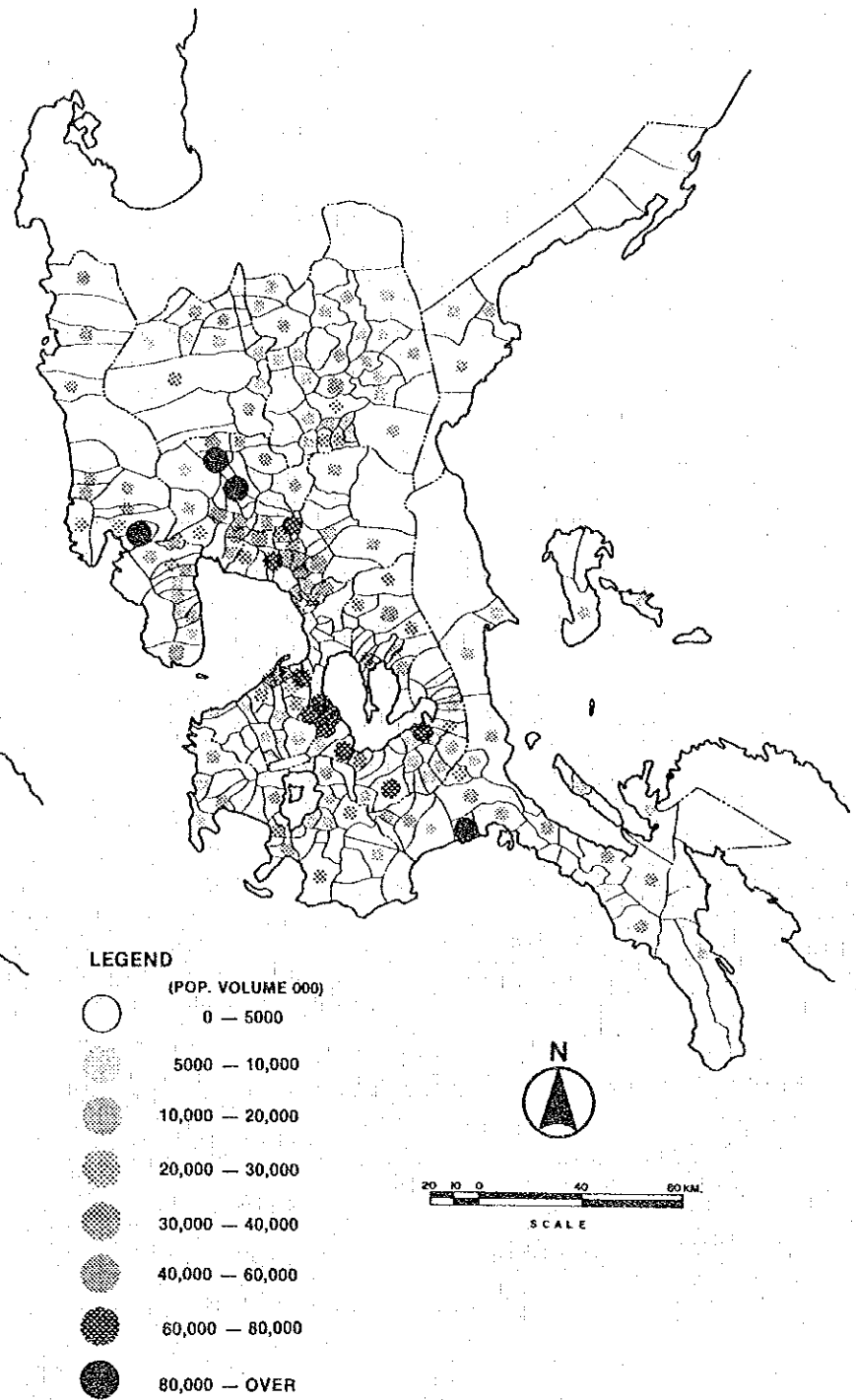


FIG. 1.2.7 DISTRIBUTION OF URBAN POPULATION — 1980

Economy and Industry

1) Gross Regional Domestic Product

From 1971 to 1981, the GRDP growth rate in the GCLA was 21.0% nominal and 6.7% actual per annum. These figures were higher than the corresponding national figures of 19.8% and 6.0%, respectively. As a result, the GCLA continued to increase its share of the GNP from 51.0% in 1971 to 53% in 1981.

While the share of the GCLA's GRDP occupied by MMA decreased from 59.3% in 1971 to 58.4% in 1981, the share of the adjacent Region IV rose from 23.6% in 1971 to 25.3% in 1981 (actual). In terms of urban industries (all industries exclusive of agro-fishery and mining), the share occupied by MMA from the above percentages dropped from 71.6% in 1971 to 67.1% in 1981, while the shares of both Regions III and IV grew during this period, thus, indicating increased distribution within these regions. The share of urban industry for Region IV vs. GCLA's total, in particular, expanded from 15.8% to 20.1% which may be interpreted as a sign of the southward movement of the economy.

In agriculture, although Regions III and IV both fell below the national average annual growth rates in terms of overall production, agriculture nevertheless continued to account for approximately 30% (Region III 28.7%, Region IV 29%) of these regions' GRDP, and comprised the number one industry in these regions.

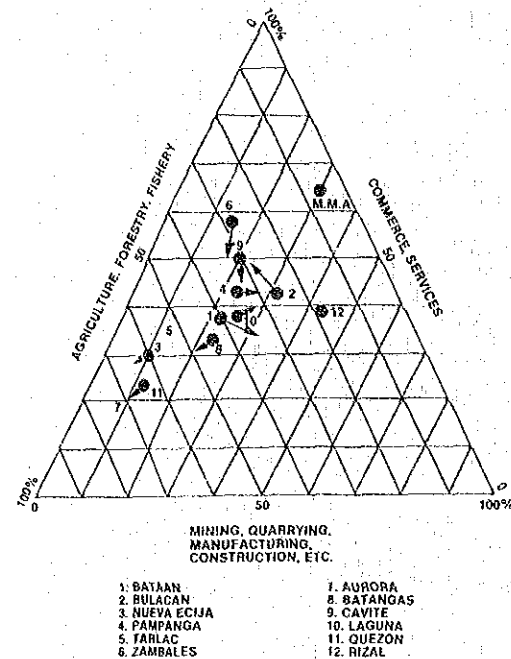


FIG. 1.2.8 COMPOSITION OF GAINFUL WORKERS BY MAJOR GROUP OF INDUSTRY

2) Structure of Local Industry

The composition of gainful workers by major industry group shows that the provinces within the GCLA fall into the following three (3) types (Fig. 1.2.8): (i) agriculture-based provinces (where agricultural workers exceed 50% of the total); (ii) commerce and services-based provinces (where workers engaged in commerce and services exceed 50% of the total); and (iii) multi-industrial-based provinces (including a combination of the primary, secondary and tertiary sector industries).

Provinces that belong to the first category includes Quezon and other provinces on the perimeter of the GCLA. MMA, the center of the GCLA, falls into the second category. The four (4) provinces contiguous to Manila (Bulacan, Cavite, Rizal, and Laguna) lie midway (50 km radius) between these two (2) regions, and have a compound industrial makeup which includes not only agriculture, but also industry and commerce.

3) Agricultural Land Use Distribution

The low-lying lands to the north of Manila and the coastal areas around Laguna de Bay are extensive agricultural lands primarily used for rice cultivation. The hilly agricultural lands on the gently rolling high land to the south of Manila are used for production of fruit trees, coffee, bananas, etc. (Fig. 1.2.9). The land even farther south is primarily used to raise coconuts. Coconut groves extend to the east coast as far as IRM.

Forest lands extend from the northern tip of Luzon south into Quezon, with their heaviest concentration found in the Sierra Madre Mountains. The area to the east of Manila, unlike the agricultural lands to the south and north, consists of expansive hilly grass lands which at present remain unutilized.

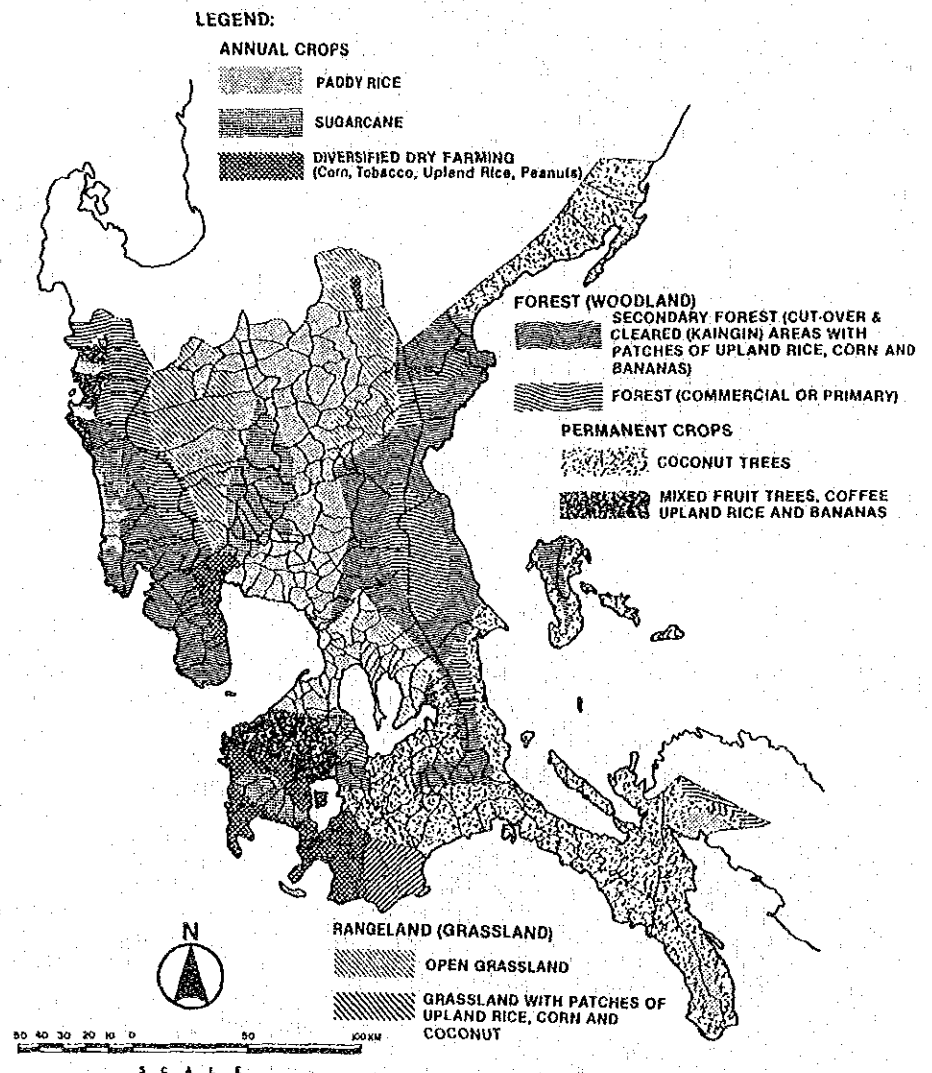


FIG. 1.2.9 AGRICULTURAL LAND USE

4) Marine Development

Although the GCLA (or Luzon) has the following two (2) coastlines: the Pacific to the east, and the South China Sea to the west, marine fish landings are concentrated along the west coast partly due to the large consumer metropolis of Manila located there (Fig. 1.2.10). On this west coast, Manila accounts for heavy marine fish landings, and in the southern part of the GCLA, major fishing industry bases may be found in Batangas and Quezon Provinces (Batangas and Lucena Cities).

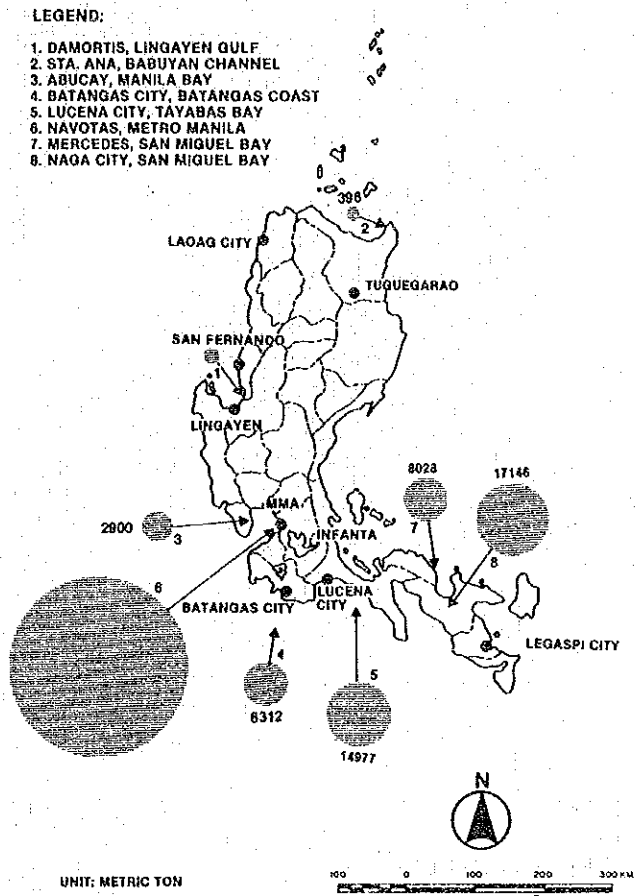


FIG. 1.2.10 MARINE FISH LANDING BY COMMERCIAL FISHING VESSELS

In contrast, development of the Pacific marine areas off the eastern coast of Luzon (especially the northeastern coast) is lagging due to factors such as: (i) long transport routes from the Pacific coast to the South China Sea coast; and (ii) lack of good harbors and roads to permit landing in Luzon, and transport to Manila.

5) Mineral Resources Development

Mineral shipments are distributed in a half-moon configuration centered on MMA (Fig. 1.2.11). The most productive provinces are Zambales and

Rizal. With the exception of copper development taking place in Zambales, mineral resources being developed in the GCLA consist almost entirely of construction materials such as cement, crushed stone, and gravel.

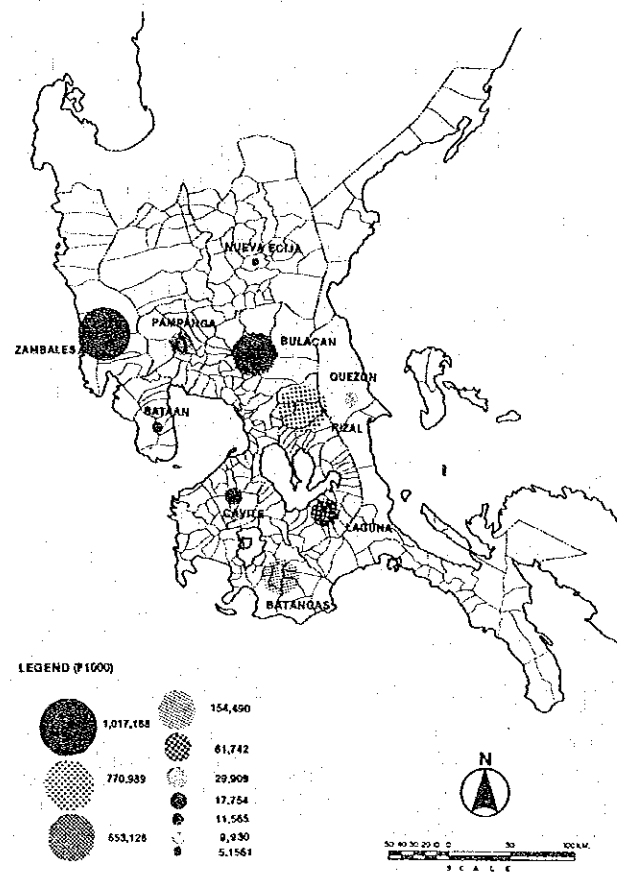


FIG. 1.2.11 PRESENT CONDITION OF MINERAL PRODUCTION (1981) REG. III & IV

6) Geographical Distribution of Manufacturing Establishments

Of all manufacturing establishments, 72.5% are located in MMA, 16.5% in the 50 km radius of MMA exclusive of the capital itself, and 11.0% in the region lying in a 50 to 100 km radius of MMA. These percentages vividly reveal the high concentration of such establishments in MMA.

Concentrations of manufacturing establishments are also found in the areas to the north and south of MMA, primarily owing to spillover from the capital. Such concentrations end, however, at a radius of approximately 50 km (Fig. 1.2.12). Another manufacturing belt stretches east of Manila (north coast of Laguna de Bay), but ends at a distance of about 30 km. Manufacturing pockets beyond the 50 km radius of MMA are distributed in major urban centers such as Lucena, Batangas, and San Fernando.

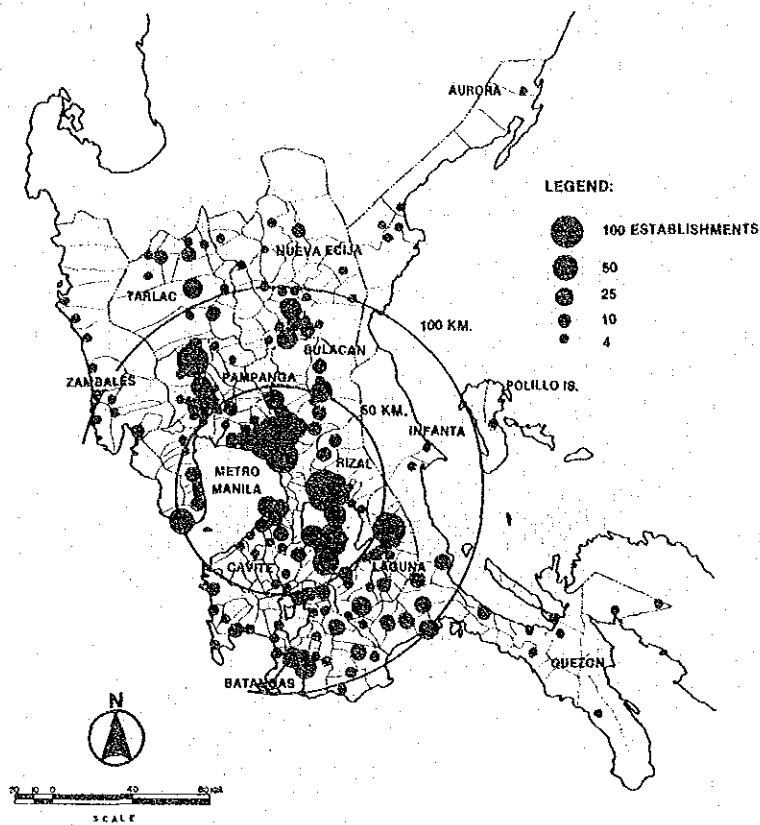


FIG. 1.2.12 GEOGRAPHICAL DISTRIBUTION OF MANUFACTURING ESTABLISHMENTS (MINING, QUARRYING, MANUFACTURING, ELECTRICITY, GAS, WATER AND CONSTRUCTION)

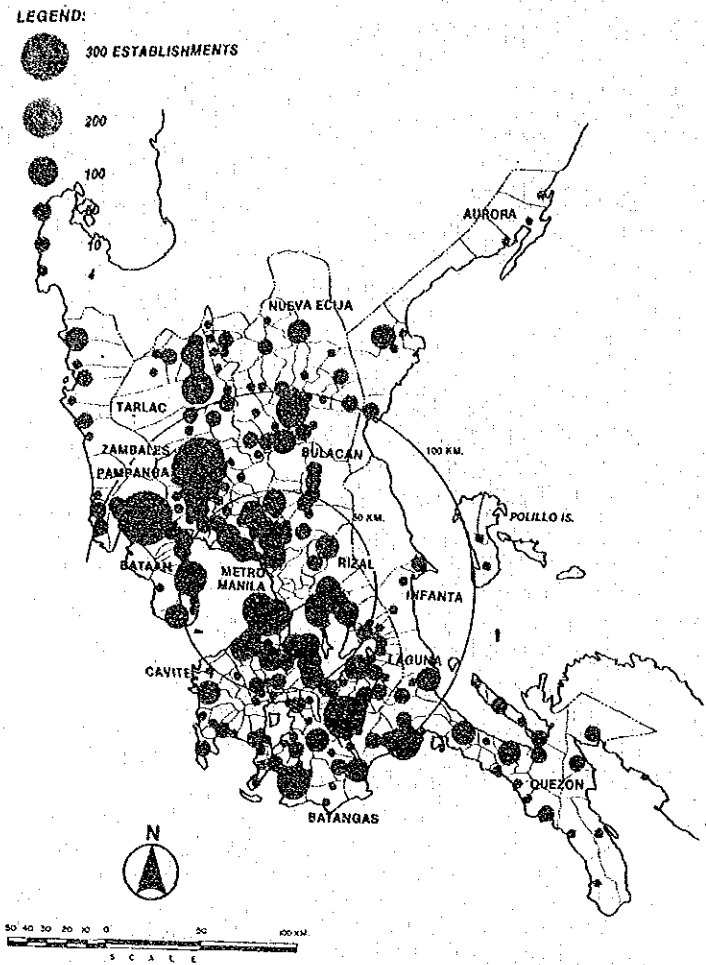


FIG. 1.2.13 GEOGRAPHICAL DISTRIBUTION OF COMMERCIAL SERVICE ESTABLISHMENT (WHOLESALE/RETAIL TRADE, TRANSPORT, STORAGE, COMMUNICATION, FINANCING, INSURANCE, REAL ESTATE, BUSINESS SERVICES, COMMUNITY, SOCIAL, PERSONAL SERVICES)

7) Geographic Distribution of Commercial and Service Establishments

The same geographic distribution pattern is found for commercial and service related establishments (Fig. 1.2.13). Concentrated in the base cities within the 50 km radius of MMA, establishments may be found along the axial routes beyond 50 km. The provinces having higher number of commercial and service establishments are Laguna and Pampanga.

The presence of numerous commercial and service establishments in Pampanga Province is understood to be the result of the following two (2) forms of development: (i) relay cities tying San Fernando, Angeles, etc., in the northern section (Regions I and II) with Manila; and (ii) cities acting as service bases for the province's expansive central granary belt.

Laguna Province is also recognized to have developed in a similar manner under the influence of MMA, i.e., with relay cities and regional centers such as San Pablo.

A comparison of percentages of gainfully employed workers engaged by the tertiary industries in each province (with the exception of MMA) shows that in addition to the four (4) provinces adjacent to MMA, the employment rate is high in Batangas Province (0.04). This is due to the strong commercial character of cities having port facilities (Batangas Port).

Transportation System

1) Skeleton Transportation System

The skeletal framework of the Luzon transportation system consists of the following two (2) parts: (i) roads interconnecting the major regions of the island itself; and (ii) ports handling marine traffic generated by domestic transport among the nation's various islands.

Manila Port, serving the needs of the highly concentrated capital region, handles 45% of all domestic cargoes. Owing to the off-center location of Luzon to the north of the other islands in the nation, secondary ports (e.g., Batangas) have also developed in the southern part of the broad Central Luzon Region. The road system, in reflection of the natural topography, forms a thin line extending to the length of the island in a north-south direction (including high-grade expressways within the radius of 50 km from Manila). An island-wide systematization of the land transport system is under way.

For the above reasons, transportation within Luzon primarily consists of land transport, and there is almost no dependency on marine transport.

2) Trunk Road System

The Manila North Road to the north and the Manila South Road to the south of MMA form the axis of the capital's expansive transport system. Extending from these trunk roads are smaller arteries connecting the major urban centers in each region to form a large, island wide network (Fig. 1.2.14).

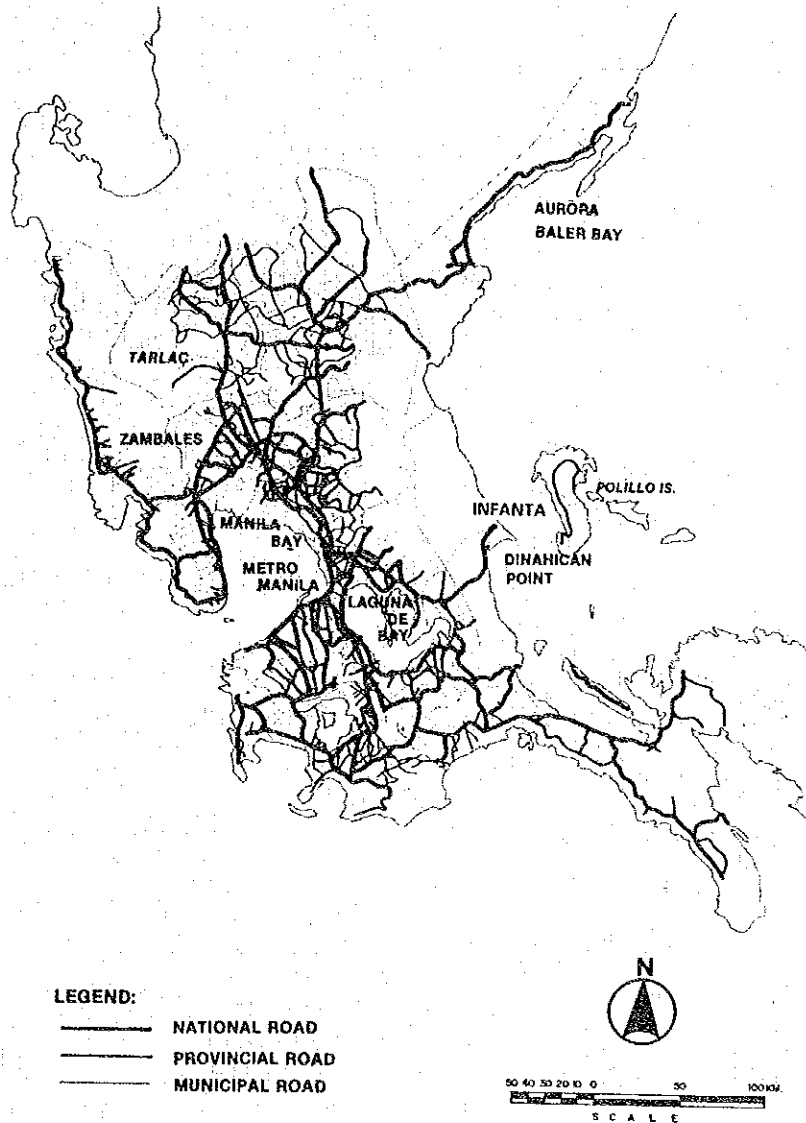


FIG. 1.2.14 TRUNK ROAD NETWORK OF GCLA

A study of the traffic volume on these trunk roads (Fig. 1.2.15) shows that vehicle traffic is concentrated toward both the north and south directions along the above-mentioned axial routes. With Manila at the center, traffic volume exceeds 10,000 vehicles/day within a radius of 150 km to the north of the city and a radius of 100 km to the south. Vehicle traffic exceeds 30,000 vehicles/day within a 50 km radius, in both the northern and southern directions.

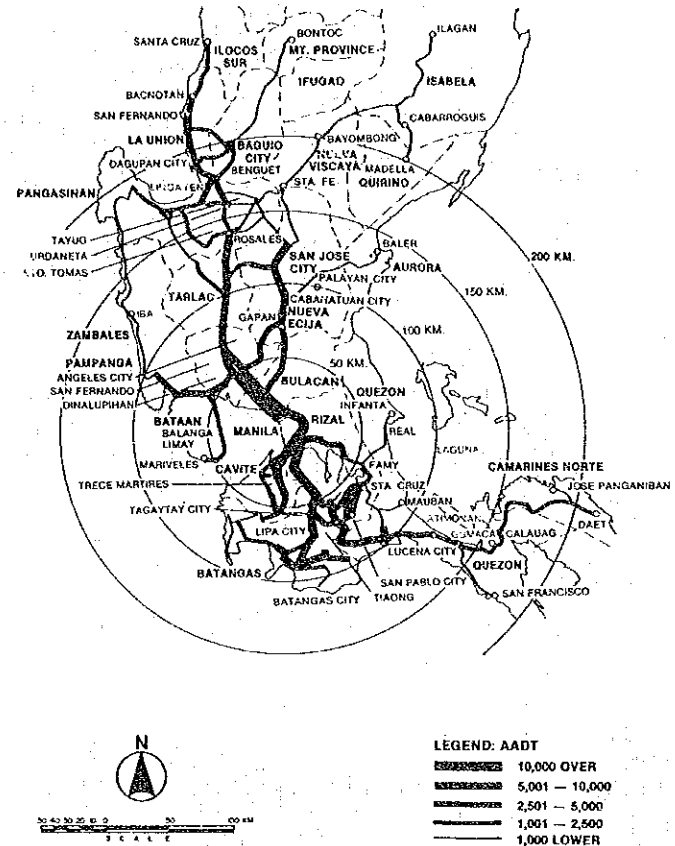


FIG. 1.2.15 TRAFFIC VOLUME ON TRUNK ROADS (AADT)

An origin destination traffic volume study (Fig. 1.2.16) clearly demonstrates that the traffic flow patterns for this region are based on connections into Manila. In the southern section, however, trip destinations are not at all times to Manila; rather, trips commencing at Batangas and ending in nearby cities (e.g., in Laguna Province) are relatively high in frequency.

3) Ports

Marine transport in the GCLA serves the following two (2) primary functions: (i) transport of foreign trade cargoes mainly into and from Manila; and (ii) transport of domestic cargoes. Ports serving as connecting points for this marine traffic with the land transport system consist of Manila Port and various other ports distributed around Luzon to cover their respective marine areas (Fig. 1.2.17).

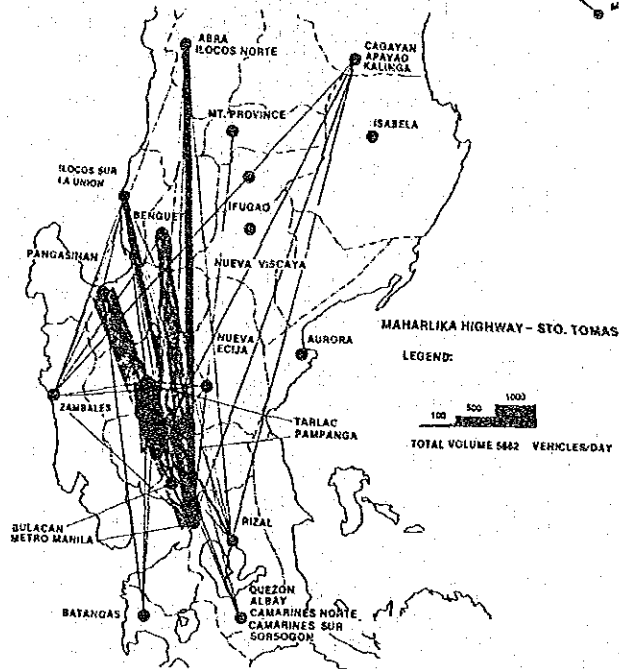
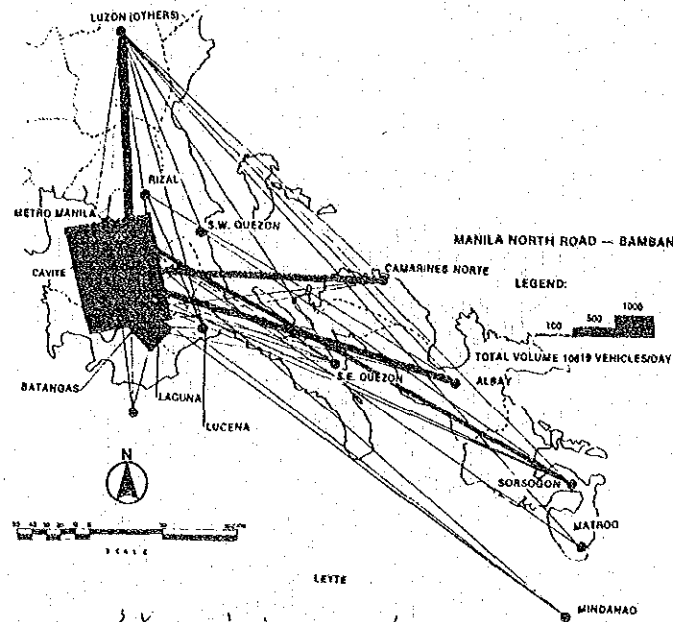


FIG. 1.2.16 O D TRAFFIC VOLUME (ALL VEHICLES)

Manila Port serves not only as one of the Philippines' most representative port for foreign trade, but also as an important base of domestic cargo transport. Cargoes arrive here from all points in the nation, and leave here for overseas destinations; similarly, overseas goods arrive here and are then distributed from here to all points nationwide. Domestic cargoes handled here amount to approximately 6 million tons/year, representing 45% of the national totals. Agricultural goods rank first. International cargoes on the other hand also amount to approximately 6 million tons/year, of which 83% are import items. The major import items are grain (28%), metal and chemical products, consumer goods, etc. The primary export items are wood and lumber (53%), copra, and other agricultural goods.

Batangas Port handled international and domestic cargoes in almost equal proportions. The area covered by the port consists primarily of Mindoro Island to the west. Among incoming cargoes, rice accounts for the highest percentage (26%), followed by lumber and fruit. Outgoing cargoes comprise mineral and bottles almost exclusively. Batangas Port may be said to have the following two (2) characteristics: (i) The port serves as a cargo distribution base for the GCLA as more than half of all cargoes unloaded are transported to Manila, Laguna Province and Cavite Province; and (ii) The port also serves as a processing base (production port) for gravel and cement materials unloaded here from neighboring production areas, after which they are exported.

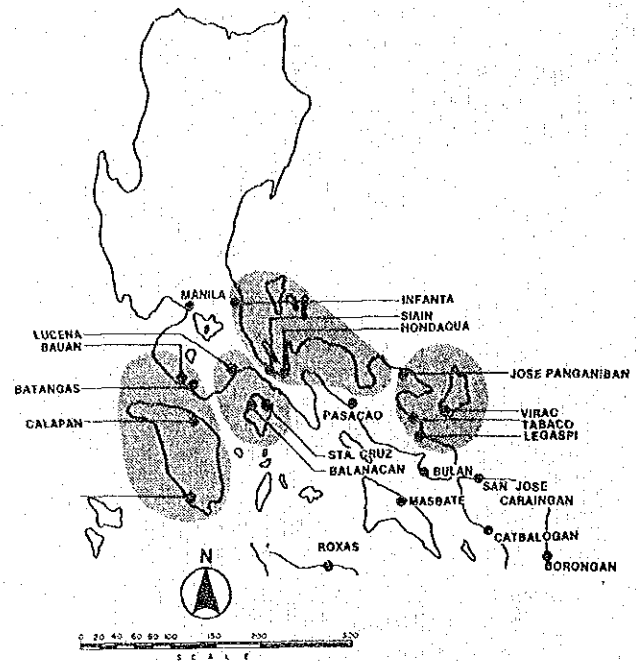


FIG. 1.2.17 MAIN PORTS OF LUZON AND COVERING AREAS

Lucena Port is used for domestic transport only with 75% of transport volumes consisting of cargo transport with the neighboring island of Marinduque. The major items handled are rice, copra, and other agricultural goods. Almost all these goods are transported to Laguna Province.

There are no ports within the east coast which can be compared to those just described within the GCLA. These ports serving a local function include Baler (Aurora Province), Real (Quezon), and Mauban (Quezon). The main items they handle are lumber, coconut, and marine products. Real is also the home port for regular ferry service to nearby Polillo Island.

Public Utilities and Social Service Facilities

1) Water

The GCLA's surface water basins are broadly divided into the following two (2) parts: eastern and western, separated by the Sierra Madre. The basin to the west (the Manila side) may be subdivided into the Pampanga River System and the Laguna de Bay basin system (Fig. 1.2.18). The Pampanga River System provides abundant water resources for the grainbelt in the central plain. The Laguna de Bay system, together with ground water, supports the agriculture and industries along the lake's coasts.

The rate of water supply diffusion in the GCLA was at 31.5% as of 1980 (34.9% in Region III, 27.8% in Region IV). Percentage of population served by level I water supply system against the total population is at 18.8% whereas the percentage served by level III is at 12.7% (level II service not yet existed).

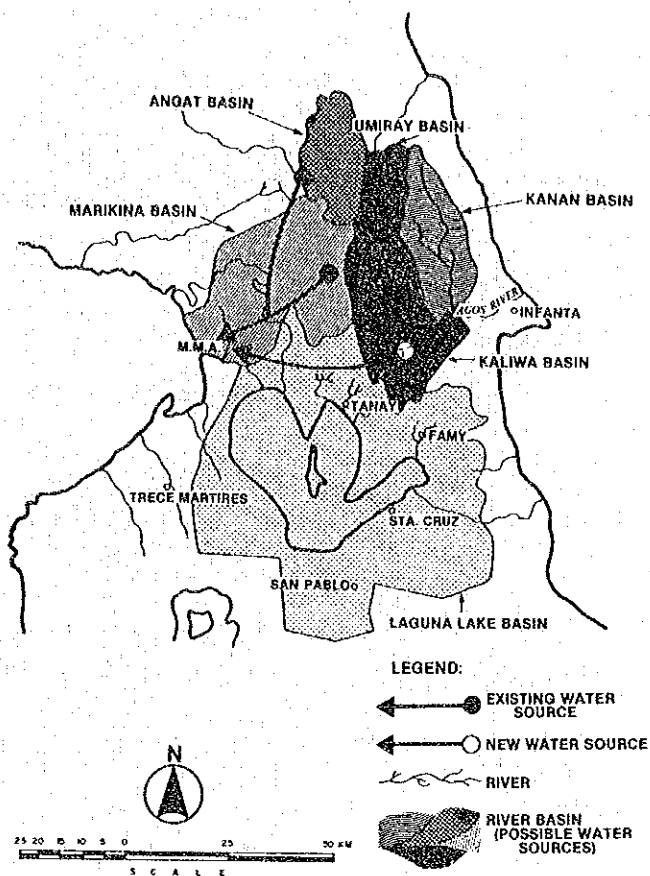


FIG. 1.2.18 WATER SOURCE AND MAJOR WATER BASIN

MMA lies sandwiched between the above-mentioned two (2) water systems, and relies primarily on surface water from the Sierra Madre (Marikina and Angat River Systems) and ground water. The supply-demand situation has been growing increasingly strained in recent years leading to the commencement of water resources development on the eastern side of the Sierra Madre (Agos River Basin).

2) Electricity

Luzon's transmission trunk line network (Luzon Power Grid System) is formed along an axis of 230 kv transmission lines running north-south of the entire length of the island (Fig. 1.2.19). This network comprises the following three (3) basic systems: the northern system relying mainly on hydroelectric power; the southern system relying on geothermal power; and the central system (Manila) relying on petrothermal power. A high-voltage (500 kv) transmission line hookup between these systems is planned.

The current breakdown of power sources is as follows: hydroelectric 18%, geothermal 7%, petrothermal 75%. Plans call for a reduction in petrothermal dependency to 19% by 1990.

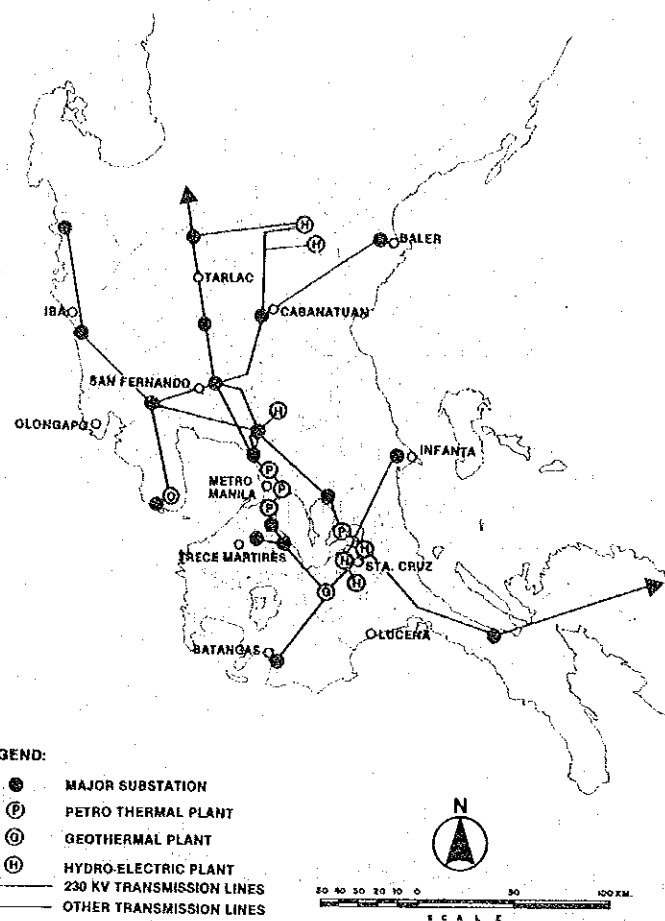


FIG. 1.2.19 LUZON POWER GRID

The rate of electrification in the GCLA is 79% compared with 53% nationwide. Within the region itself, MMA ranks highest with 93%, and the areas in a 50 km radius of the capital exceed 80%. Beyond the 50 km point, however, the rate of electrification drops off sharply (Fig. 1.2.20).

3) Telecommunications

Four independent microwave-transmission systems exist in the GCLA (Fig. 1.2.21). The rate of municipalities in the GCLA receiving telephone service is 33% in Region III and 20% in Region IV with the region wide average (excluding MMA) being 25% (0.34 telephones per 100 inhabitants), (Fig. 1.2.22).

4) Educational Facilities

The GCLA has elementary and secondary schools nearly in corresponding proportion to the population. Cities with population under 80,000 have one (1) to two (2) colleges, those with populations in excess of 100,000 generally have three (3) to five (5) colleges (Fig. 1.2.23).

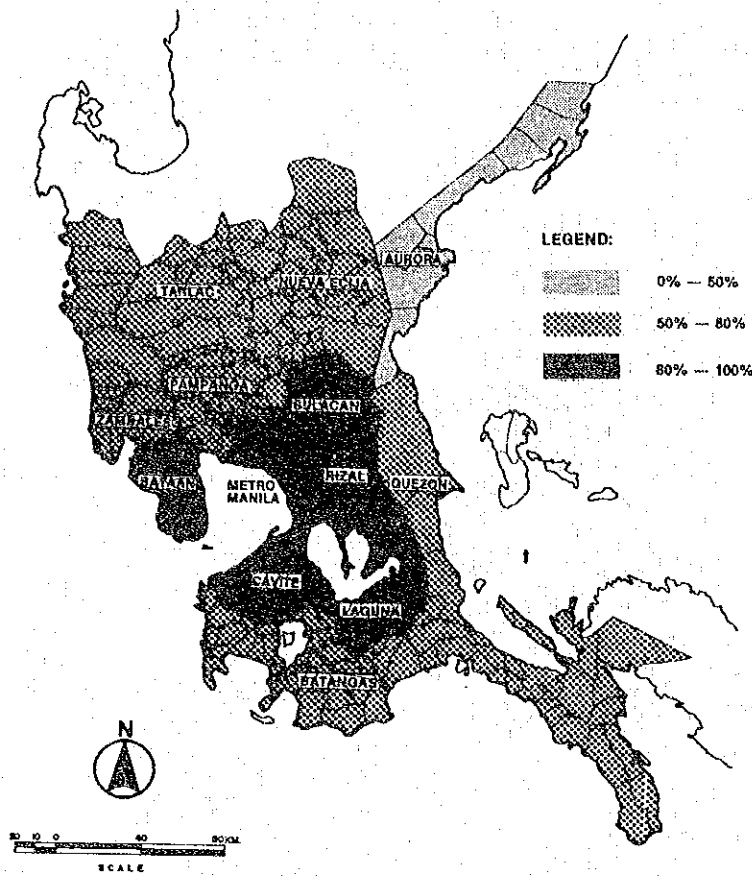


FIG. 1.2.20 PRESENT CONDITION OF ENERGIZATION

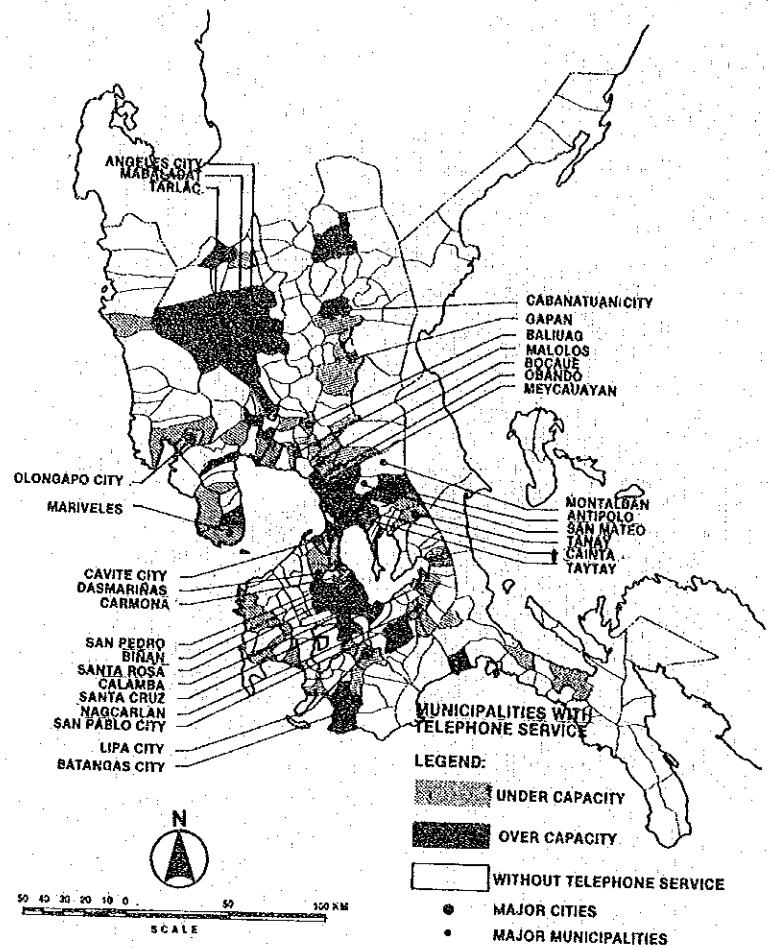


FIG. 1.2.22 TELEPHONE SERVICE AREAS

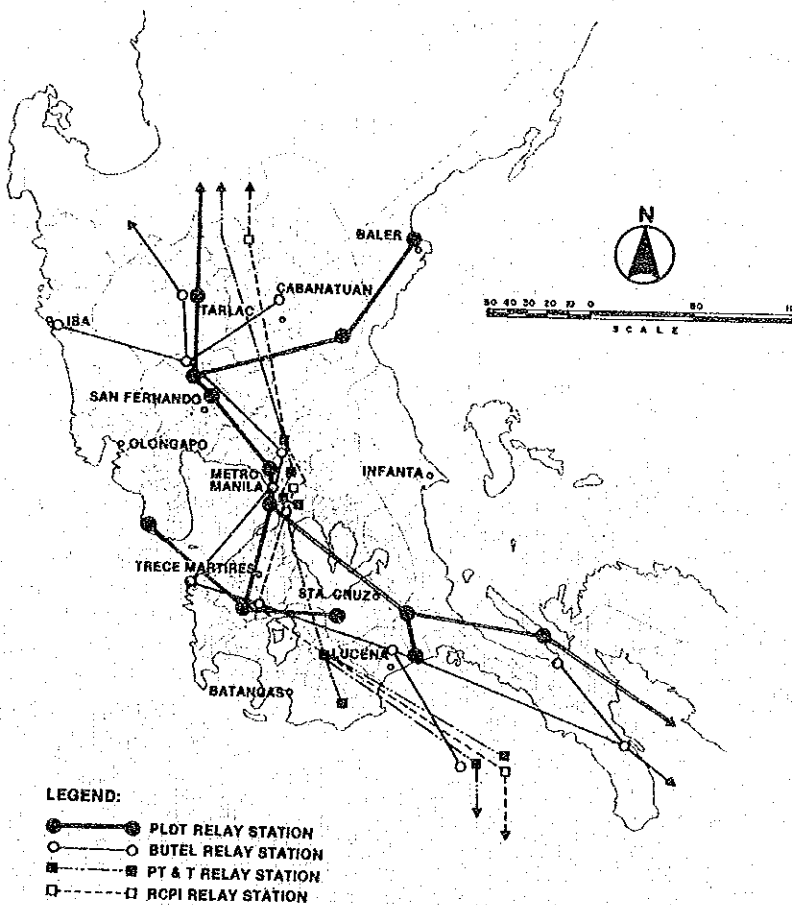


FIG. 1.2.21 MAJOR TELECOMMUNICATION NETWORKS

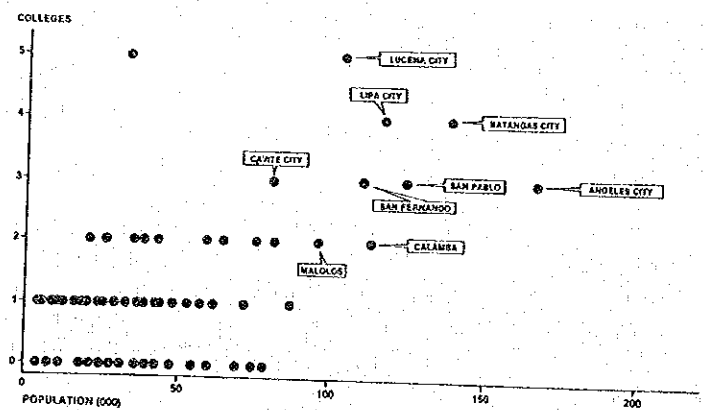


FIG. 1.2.23 COLLEGES/POPULATION

5) Medical Facilities

On the average, with the exception of MMA, municipalities in the GCLA have 1 hospital for every 25,000-50,000 inhabitants. The level of medical facilities improves sharply in cities with populations over 100,000 (Fig. 1.2.24). However, in comparison with regional urban centers such as Batangas, San Pablo, Lucena, and Lipa, medical facilities are generally less suitable in cities in the periphery of MMA due to their inability to keep pace with rapid population growth in recent years.

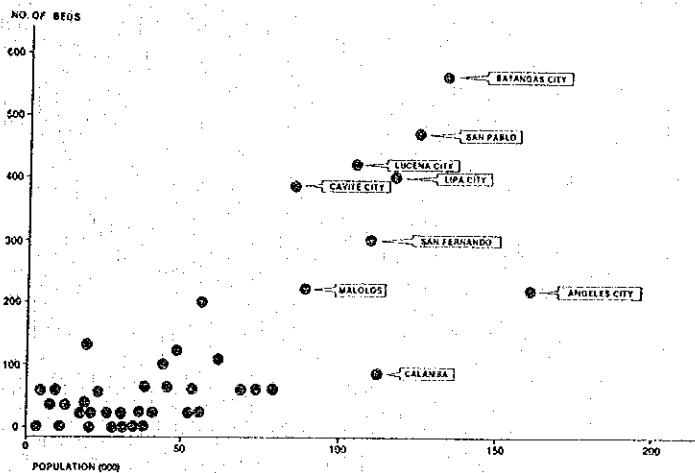


FIG. 1.2.24 MEDICAL FACILITIES (NO. OF BEDS)/POPULATION

Growth Corridor and Regional Structure

1) Growth Corridor as Axis of Overall Development

To date, Luzon and the GCLA have developed into a compounded and integrated pattern based on inter-regional ties. As the axis of this compounded and integrated development is functionally connected, an axial growth corridor has been formed. This growth corridor, as seen in the previous distribution pattern of municipalities, "starts at MMA, passes through relay cities and regional nuclei which serve, respectively, as relay bases with Manila and as regional centers of highly urbanized areas (within 50 km radius of MMA) and inland rural areas (mainly agricultural land and forests) situated along the axis tied functionally and spatially with MMA, and ends at coastal base cities which serve as nodes in the marine transport system." These various areas are connected and integrated via expansive trunk roads, and are supported by the various infrastructures described in the previous section (Fig. 1.2.25).

2) Internal Links in the Growth Corridor

Agro-forestry and marine products unloaded at the port city of Batangas are sent to Lipa City or relay cities in Laguna Province, and to heavily urbanized regions near Manila. Here, they are processed and then sent again

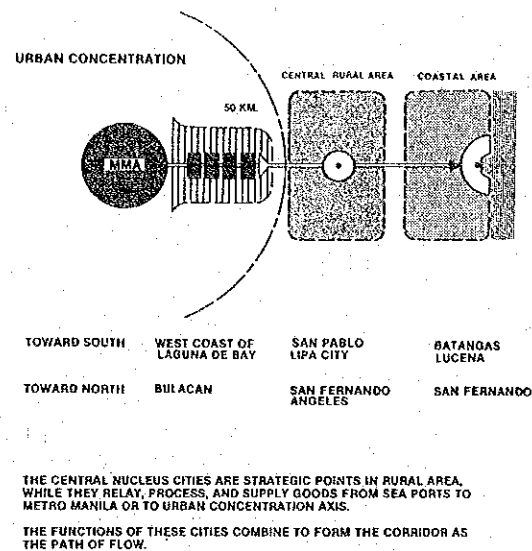


FIG. 1.2.25 REGIONAL STRUCTURE

either to Manila for domestic consumption or are loaded at Manila port for export overseas. Agricultural products from inland regions pass via the nucleus cities and fill the food demand of the population living along the growth corridor axis, centered on Manila.

3) Regional Structure of GCLA

The GCLA is characterized by the axial growth corridor and its regions described earlier (Fig. 1.2.26). Specifically, the corridor is centered on Manila, in the north it branches towards the Cagayan Valley (Region III) and Ilocos Norte (Region I), and in the south it branches from the west coast of Laguna de Bay toward Lucena and toward Batangas. This growth corridor not only defines the direction of regional activities within the GCLA, but also gives structure to the region as its main axis.

The above concludes the general discussion on the directions of the GCLA's regional development based on its current status of development, trends in infrastructural development, etc. In the future, further development in the GCLA shall be required based on these directions. The most essential consideration, however, is achieving even greater strength in the GCLA's regional structure through the promotion of development regions left outside the immediate scope of the above-mentioned growth corridor. These "outside" regions include both the western and eastern coastal regions. In the former, important efforts have already been started with the construction of the Bataan industrial complex, construction of the Zambales mining urban center, and development of tourist facilities along the coast in Cavite Province. The emphasis of future efforts must, therefore, be placed on rectifying the situation in the most neglected area to date which is the east coast region.

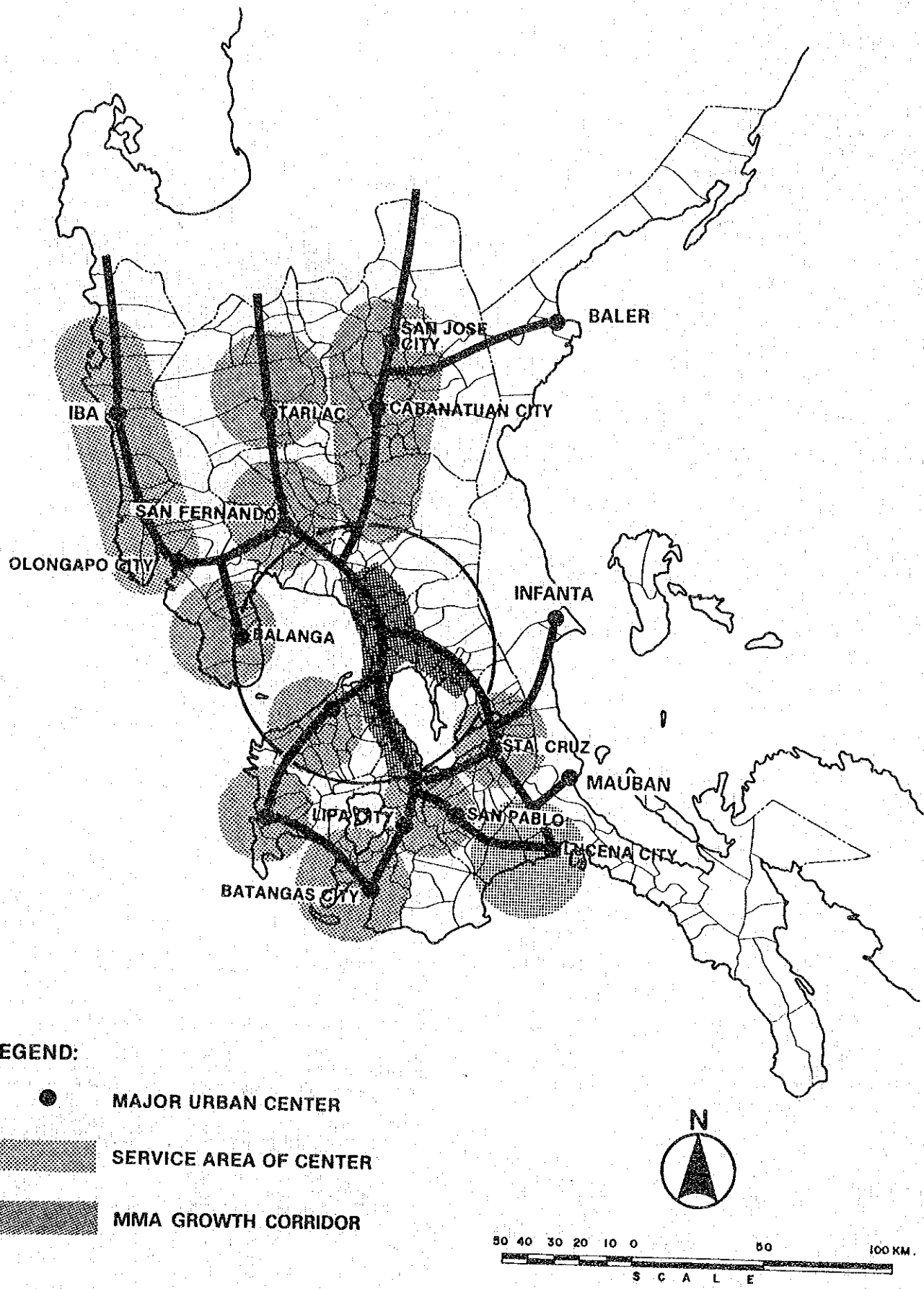


FIG. 1.2.26 REGIONAL STRUCTURE & MAJOR URBAN CENTERS

1.3 Eastern Development and Restructuring of GCLA

Goals of Eastern Development

IRM's urban development is considered a part of the regional development of the area to the east of Manila. Within the current regional structure of the GCLA, this eastern development has the following goals interrelated with those of the GCLA:

1) Correction of Level Differences Within GCLA

The eastern half of the GCLA is characterized by hills and mountains and, in particular, by the physical obstruction presented by Laguna de Bay, which has resulted in the region being left outside the north-south corridor described earlier. The eastern coastal region is especially cut off by the Sierra Madre mountain range which has left this region in a low state of development. As long as the present regional structure is permitted to continue, the western region centered on Manila shall continue to be in an advantageous position in terms of industry, etc., and the eastern region, including the eastern coastal area, shall be unable to extract itself from its current situation, leading to increasingly broader gaps between the western and eastern regions.

The first goal of eastern development is, therefore, to correct this east-west gap through a well-planned development.

2) Utilization and Development of Regional Resources

Whereas, intensive development has taken place in the north-south direction centered on Manila, as seen earlier, sufficient development has not been carried out in the areas stretching from the eastern part of Manila to the east coast with land and natural resources left idle in spite of the proximity of this region to Manila. The promotion of the development of these natural resources, thus, may serve not only to correct the above described regional gap, but also strengthen and stabilize the socio-economic conditions of the capital region.

3) Proper Allocation of Population and Industry

Although the rate at which population and industry have concentrated toward MMA declined in the recent years, the pattern of concentration itself still continues. This seriously exacerbates urban problems such as excessive density. At the same time, the population and industrial spillover from MMA is expanded outward leading to confusion in land use, collapse of productive farmland, destruction of the environment, and other problems in the areas peripheral to the capital.

Accordingly, the goals of eastern development must not only be focused on terminating the current outflow of population from this region to Manila, but also on seeking improvement of the urban problems of MMA and the western region through the development of the east coast region, and the regions east of Manila so that they may absorb population and industry in a well planned manner to properly distribute these elements within the GCLA.

Restructuring of GCLA Along the Eastern Corridor

The idea of an eastern corridor has been formed as a means of attaining these development goals and concepts. This calls for the creation of a powerful developmental axis integrating the attraction of population and industry to the eastern region with the development of the region, including the east coast region, as a way of restructuring the GCLA in order to achieve a more balanced development regionwide (Fig. 1.3.1).

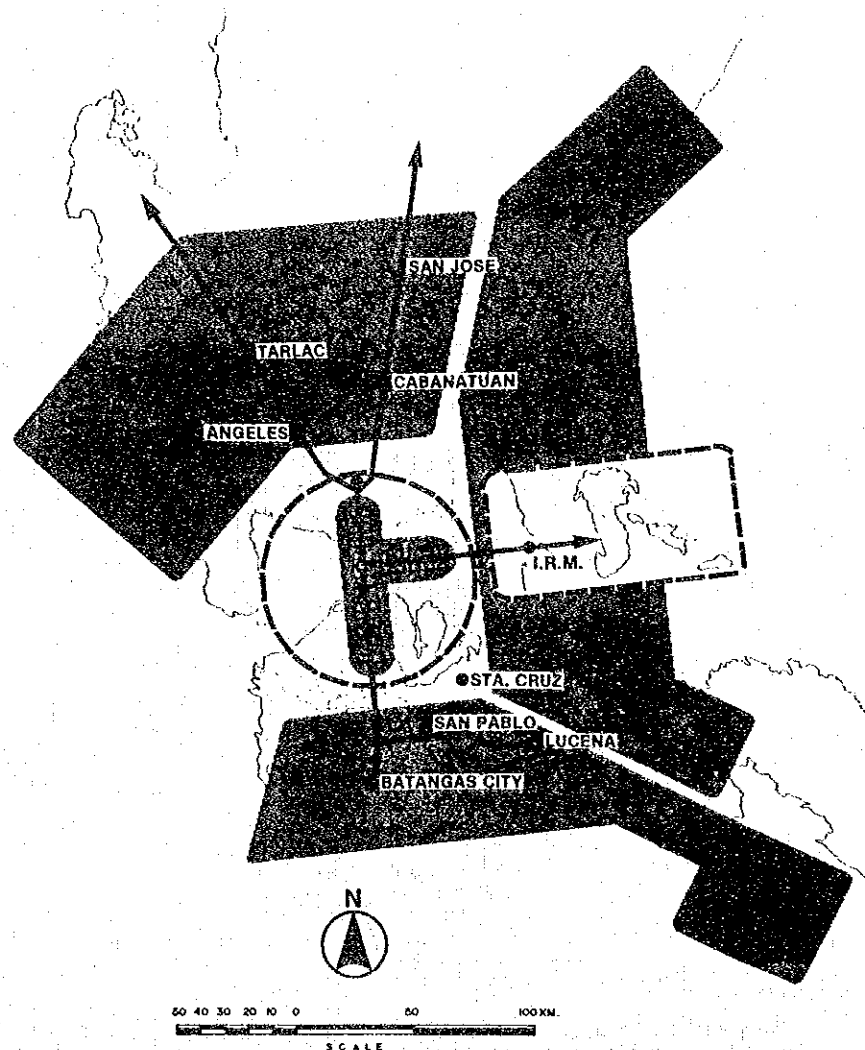


FIG. 1.3.1 REORGANIZATION OF REGIONAL STRUCTURE AND FORMATION OF EASTERN CORRIDOR

1.4 The Eastern Corridor and IRM

1.4.1 Outline of the Three Eastern Provinces

An outline of the region which is believed to be affected by the eastern corridor defined above is given here. This region, which has been left outside the main north-south growth corridor axis centered on MMA, includes the three (3) provinces described in detail below (Rizal, Laguna, and Quezon).

Rizal Province is immediately adjacent to MMA. Owing to topographical conditions (Hilly terrain), however, development is concentrated in the several towns (Tanay, etc.), and in the Marikina basin next to MMA. Development did not advance as in the provinces in the north-south direction of MMA. To date, it has taken the form primarily of agriculture, marine products, and livestock industries in the plain around the perimeter of Laguna de Bay. Urbanization itself has spread no farther than about 30 km from the center of MMA.

Within Laguna Province, industrial and urban development has taken place in several cities located along the west coast of Laguna de Bay which receive direct transportation services via the highway forming the axis of the north-south corridor. However, due to the physical obstruction of Laguna de Bay, the eastern and southern regions of the province do not receive any benefit from this growth corridor leaving them in a state of underdevelopment which has created a big gap between the east and west. In particular, the provincial capital of Santa Cruz has, as yet, been unable to develop into a full-pledged urban base to provide services to the entire province.

Quezon Province is divided into the following two (2) administrative districts: (i) the southern plain centered in Lucena, the provincial capital; and (ii) the east coast region fronting the Pacific (Infanta, Real, General Nakar, Polillo Islands). The former district lies on the fringe of the GCLA and, as noted above, is poorly developed. The latter district, home to IRM, extends as far as the Pacific Ocean, and although relatively close to Manila has not been developed full scale owing to the constraint posed by the presence of the Sierra Madre mountain range.

1.4.2 Eastern Corridor

Comprehensive Development of the Eastern Region

In order to achieve development of the eastern region which remains poorly developed in spite of its proximity to MMA and its high potential for development of its agro-forestry, marine and other natural resources, it is necessary to form an "eastern corridor axis" as a framework which runs horizontally across Luzon and the GCLA and connects the east and west coasts, and to undertake comprehensive development of the eastern region centered on this axis (Fig. 1.4.1).

This eastern corridor shall be a development axis which shall powerfully consolidate the following mutually related types of development:

- (i) Enhanced distribution of population and industry in the capital region by attracting to the eastern region of the GCLA the development concentrated in MMA and the western part of Rizal Province where development potential is high;
- (ii) Construction of a base for development of the east coast region, and comprehensive development of the east coast region around this base;
- (iii) Development of natural resources such as the hill regions of the Sierra Madre range which are now idle despite their extreme proximity to MMA, and active application of such resources to the socio-economy of MMA;

This eastern corridor shall also link the vertical eastern region growth corridor which connects Rizal, Laguna, and Quezon Provinces. This shall not only serve to promote development of the underdeveloped eastern region, but shall also fortify the eastern corridor and enhance potential for achieving development in the region.

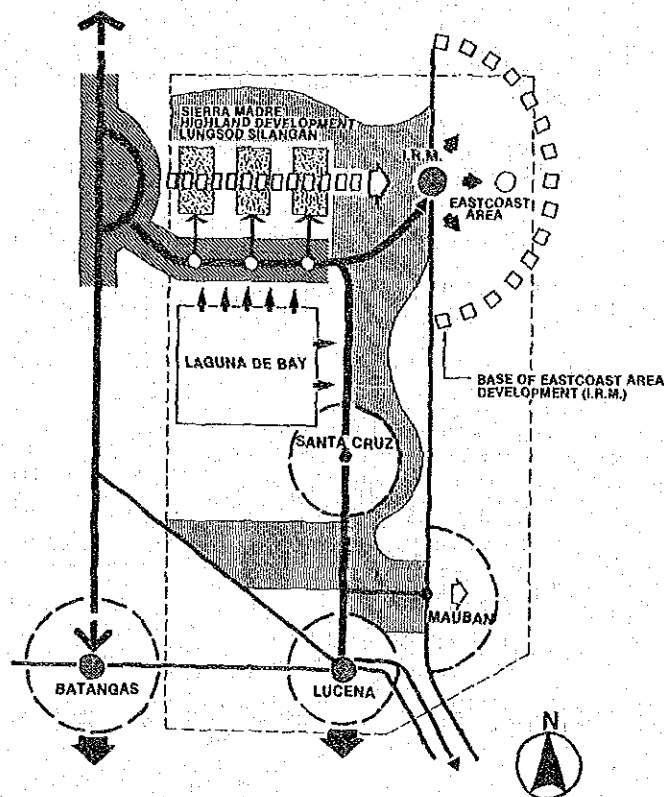


FIG. 1.4.1 EASTERN CORRIDOR AXIS

Structure of the Eastern Corridor

The eastern corridor axis having the aforementioned comprehensive development goals must have a growth corridor structure to serve as a base for the formation of an urban center in Luzon as described above. In other words, this comprehensive development axis starts in MMA, passes through the region of intensified urban development attracted from MMA and environs and through the major cities of inland Rizal Province, and continues to the coastal development bases on the east coast. In this way, the growth corridor shall consist of an axis and a base.

1) Axis to Attract Population and Industry Away From MMA

The coastal regions around Laguna de Bay in Rizal Province are already intensively developed in terms of agriculture, etc., and they are approaching excessive density in terms of population and industry. In order for these regions to absorb and share future increases in population and industry in MMA, it shall be necessary to develop the hill regions, which are presently not the focus of effective land and natural resource development, in harmony with development of agro-forestry industries to serve as a replacement providing adequate services for the population, industries, and urban functions attracted away from Manila.

2) Base of Development on East Coast

IRM, which is to act as a base for development of the eastern coast, shall lie at the center of the east coast region (including the offshore area), and shall also lie at the closest point on the east coast in terms of travel time to MMA. Furthermore, it shall lie directly on the aforementioned east corridor axis and shall be developed as part of the comprehensive development of the rest of the GCLA and eastern region via this axis. In this respect, IRM shall be the only selected urban center on the east coast.

At present, there are three (3) centers in the GCLA which can be accessed from the west coast as follows: IRM, Mauban (Quezon Province), and Baler (Aurora Province). An evaluation of these three (3) centers in terms of their fitness as an urban base for the east coast is discussed below.

3) Transportation Base

A comparison of the inland service areas of each of these three (3) centers in terms of travel time reveals that IRM, with the ability to cover MMA and the area within a 30 km radius of the capital within approximately 3 hours, is the most advantageous center to act as a concentrated base for transport from the east coast to the GCLA (Fig. 1.4.2).

On the other hand, in terms of appropriateness as a base for the east coast region, the evaluation can be made at the following three (3) regional levels (Fig. 1.4.3):

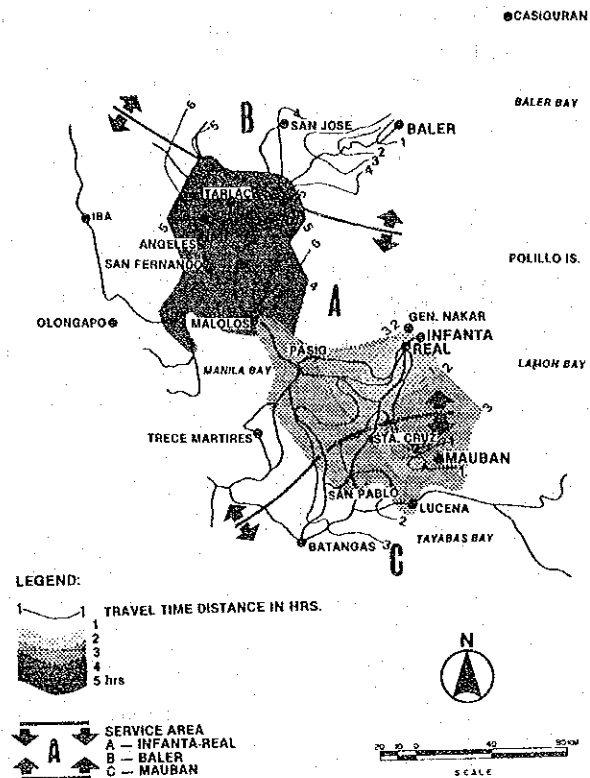


FIG. 1.4.2 SERVICE AREA OF BALER, INFANTA AND MAUBAN

(i) IRM's sphere (direct coastal sphere) in terms of travel time of marine transport includes the Polillo Islands, one of the major points of development on the east coast. Transport of coconuts, charcoal, and other products produced by these islands to Luzon and everyday commodities required by the 55,000 inhabitants of these islands from Luzon is presently carried out via IRM which is seen to be the most rational location for such a transport base.

(ii) If the east coast were subdivided according to secondary ports at Aparri and Legaspi, IRM would be able to serve nearly the entire east coast region of the GCLA with a proper sharing of duties with these secondary ports.

(iii) From nearly any point in the east coast region, the time required to reach IRM is less than that needed to reach Manila. This shall permit IRM to share part of the functions currently served by the Manila Port.

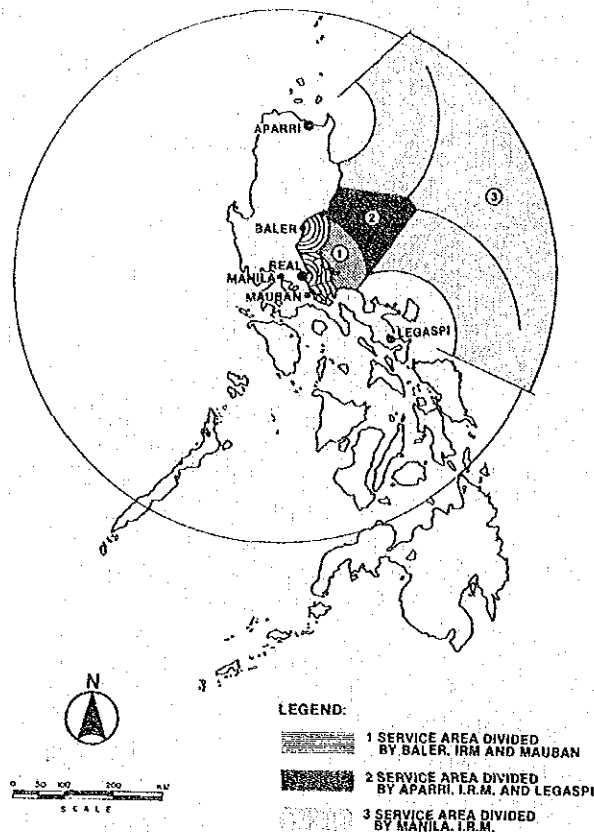


FIG. 1.4.3 HIERARCHICAL SERVICE AREA OF I.R.M. BY MARINE TRANSPORTATION

4) Urban Formation

The urban center on the east coast must serve not merely as a point of transit for natural resource materials, but also as an urban center which draws a permanent population.

Because IRM lies at the geographical center of the east coast, agro-forestry, and marine resource products which are developed on the east coast can centrally be collected here so that they can contribute to industrialization. Also, as demonstrated by the fact that a round-trip to Manila can be made in one (1) day for public utility vehicles and 1/2 day for private vehicles, IRM lies well within the direct economic sphere of Manila, thus, sharply raising the feasibility of developing urban industries and an urban structure in IRM compared with Mauban or Baler.

5) Regional Living Center for Improvement of the Standard of Living in the East Coast Region

The region centered on Mauban in the southern part of the east coast region of the GCLA lies within a 50 km radius of Lucena, the provincial capital, so there is no need for Mauban to serve as a center of life in the region. On the other hand, the east coast region centered on IRM does not lie within a 50 km radius of any urban base. Furthermore, a total of 110,000 persons including the residents of the Polillo Island reside in the living sphere centered on IRM (estimated population for the year 2000: 250,000 Persons). As a result, the formation of a regional life center at IRM to provide all types of urban services can have the greatest effectiveness in raising the living standards of the inhabitants of the east coast region.

6) IRM's Place in the Broad Regional Framework

To summarize, the position which IRM holds within the broad regional framework is described below.

In order to correct the regional imbalance between the eastern and western areas of the GCLA, to make use of regional resources which are now left idle, and to achieve appropriate distribution of population and industry, a restructuring of the GCLA must be undertaken to include a powerful eastern corridor axis.

IRM shall be developed as the final point on the eastern corridor axis which begins at Manila and runs as far as the eastern coast. In this respect, IRM shall be referred to as the "base city of the east coast development".

This base city of the east coast development shall serve as the base for natural resources development and distribution, and as the center of regional life as an urban center for permanent settlement.

(a) **Base for Natural Resources Development.** It is clear that development of the east coast region shall be aimed at the development of agro-forestry and marine natural resources as the first step. The urban base on the east coast shall function as the concentrated base for development of such resources and shall also provide all types of services necessary to carry out such development.

(b) **Base of Distribution.** In order to achieve development of the natural resources, it is necessary to improve the distribution routes to transport agro-forestry and marine products to their markets. The east coast base city must, therefore, also serve as a distribution base where such products can be collected for transport to these markets.

(c) **Urban Center for Permanent Settlement (Urban Formation).** To accomplish the balanced regional structure described above, in addition to the functional roles just outlined, the east coast city must also become an urban center for permanent settlement to serve as a base of life on the east coast on a par with the scale and living levels seen in the western cities.

To achieve this status, the city must function not only as a base of natural resources development and distribution as outlined above, but must also have an economic and social foundation as a city capable of promoting urban industries which are based on these other functions.

(d) **Center for Regional Life.** The role of the base city for the development of the east coast must be to function as a center of regional life by providing medical, educational, and cultural services required to raise the standard of living of the residents of the entire east coast region which is currently quite low.

2

**PRESENT STATUS AND
DEVELOPMENT POTENTIALS OF IRM**

2.1 Existing Conditions

2.1.1 Planning Area and its Physical Characteristics

An area of 15,270 hectares (see Fig. 2.1.1) covering most of the flat and populated parts of the three (3) municipalities, i.e. Infanta, Real, and General Nakar, has been designated as the Project/Study Area (IRM). IRM represents only 7.5% of the total area, but 76.8% (1980) of the total population of said three (3) municipalities. IRM constitutes the socio-economic center for the three.

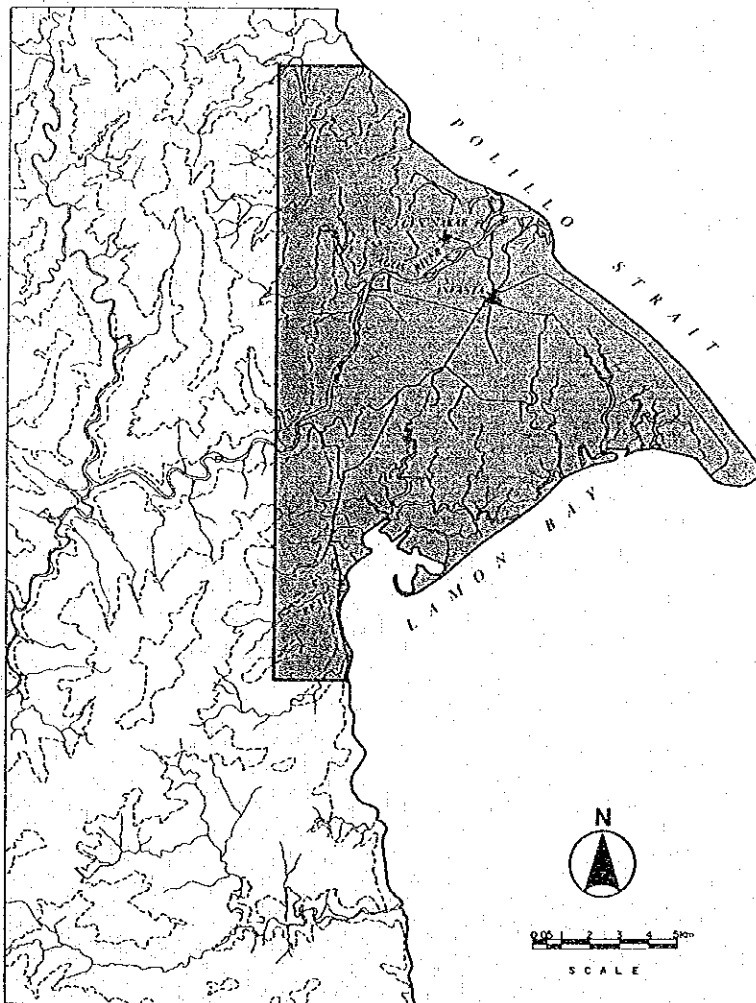


FIG. 2.1.1 BOUNDARY OF PLANNING AREA (I.R.M.)

Jurisdiction

IRM consists of fifty-one (51) of the smallest units of jurisdictions called barangays (36 barangays from Infanta, 10 from General Nakar, and 5 from Real, see Fig. 2.1.2). Urbanized barangays are called poblacions, which are the centers of the municipalities and show the traditional settlement pattern in the area. Old settlements are found chiefly in the flat part of General Nakar, the area along the Agos River, the plains of Infanta, coastal, and swamp areas.

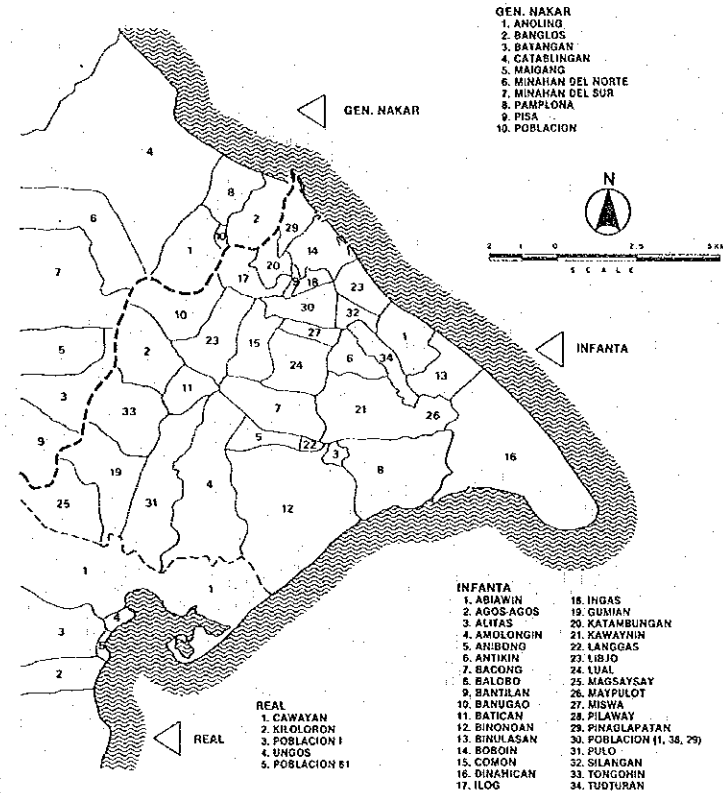


FIG. 2.1.2 BARANGAY MAP

Topography

IRM is an area of land mostly composed of alluvial plains protruding from the Sierra Madre mountains which lie along the eastern portion of Luzon. The elevation of swamps in the southern part of IRM is less than one meter above sea level. In the central plain, the peninsular sandbars, and the narrow mountain skirts, it is one to ten meters above sea level, and in the hilly parts, it is over ten meters above sea level (see Fig. 2.1.3).

Water System

The Agos River, (water volume $116.6 \text{ m}^3/\text{s}$) generating from the Sierra Madre, runs through said hilly parts and flows to the northern plains separating Infanta from General Nakar. The plains, however, are not flooded by the Agos River, they stand from four to five meters above sea level, and they rise toward the river. Rainwater drains to swamps and coastal areas via a number of creeks, and through which estuary flooding in the rainy season reportedly reaches the Infanta urban area (Fig. 2.1.4).

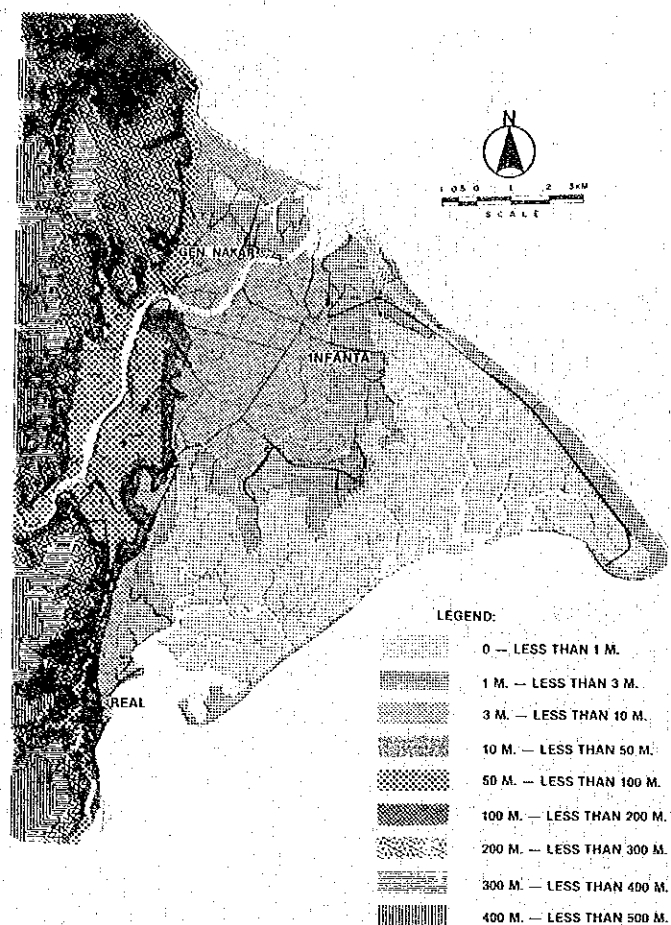


FIG. 2.1.3. TOPOGRAPHY OF I.R.M. (CONTOUR MAP)

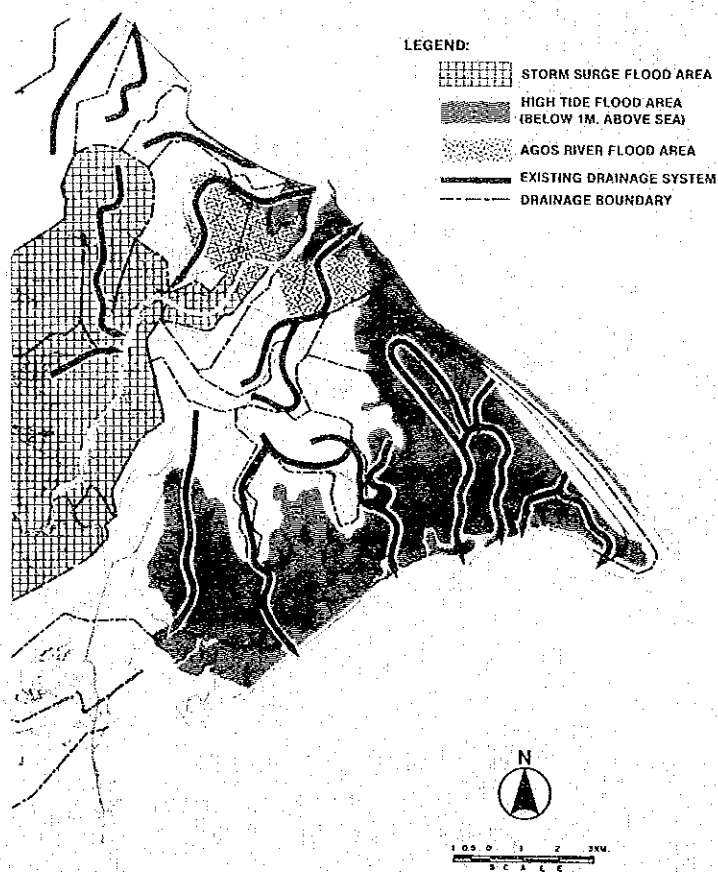


FIG. 2.1.4 DRAINAGE SYSTEM AND FLOODED AREA

Soil and Geology

The soil of I.R.M. is composed of alluvium in the flat lands and pyroclastics and volcanic flows with interbeds of fine sedimentary clastic in the hilly parts (see Fig. 2.1.5). The geology of I.R.M. highly corresponds to its topography. The swamp area less than one meter above sea level has hydrosol, while the peninsula extending to Dinahican with an elevation of one to ten meters is of alluvial earth; sand carried by the Agos River, is classified as "burguey, loamy sand"; and the plains are of denatured alluvial deposits classified as "quina silt loam". In the hilly parts, "antipolo sand clay" is generally distributed up to the contour line of ten meters above the sea (Fig. 2.1.6).

Climate

The climate of the area can be characterized by its high humidity which rarely becomes lower than 80% throughout the year.

Although the amount of rainfall during June to September is less than that of Manila, the overall annual rainfall of Infanta is 1.85 times greater than that of the capital. The average temperature is 1 to 2 degrees lower in Infanta than in Manila except during June to September.

The Philippines is frequented by a considerable number of typhoons during the typhoon season, and due to its general direction of movement, the east coast of Luzon is directly more affected than that of the west coast areas (Fig. 2.1.7).

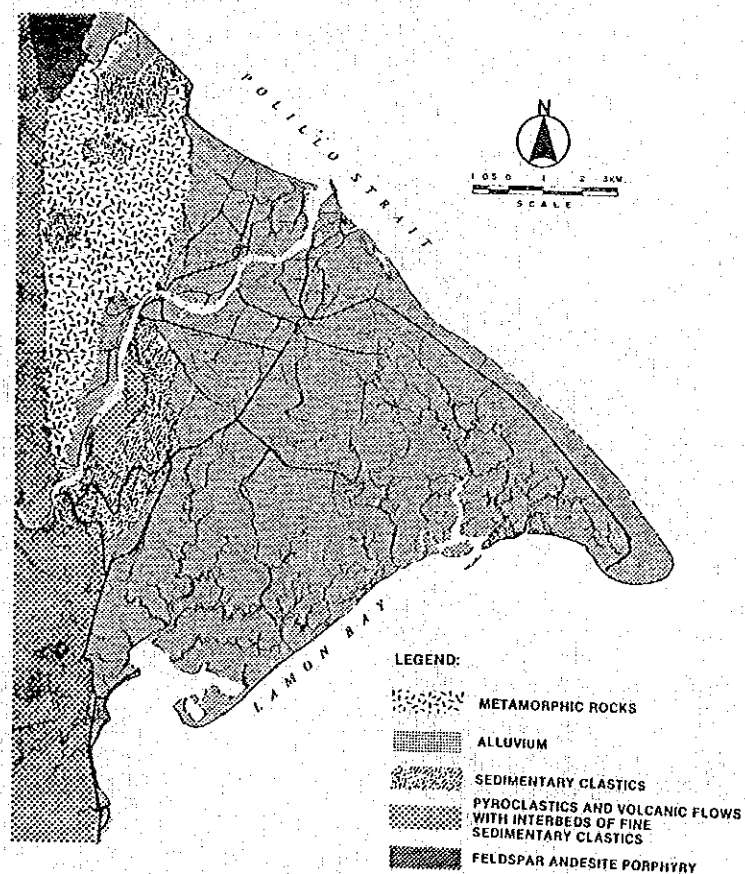


FIG. 2.1.5 GEOLOGIC MAP

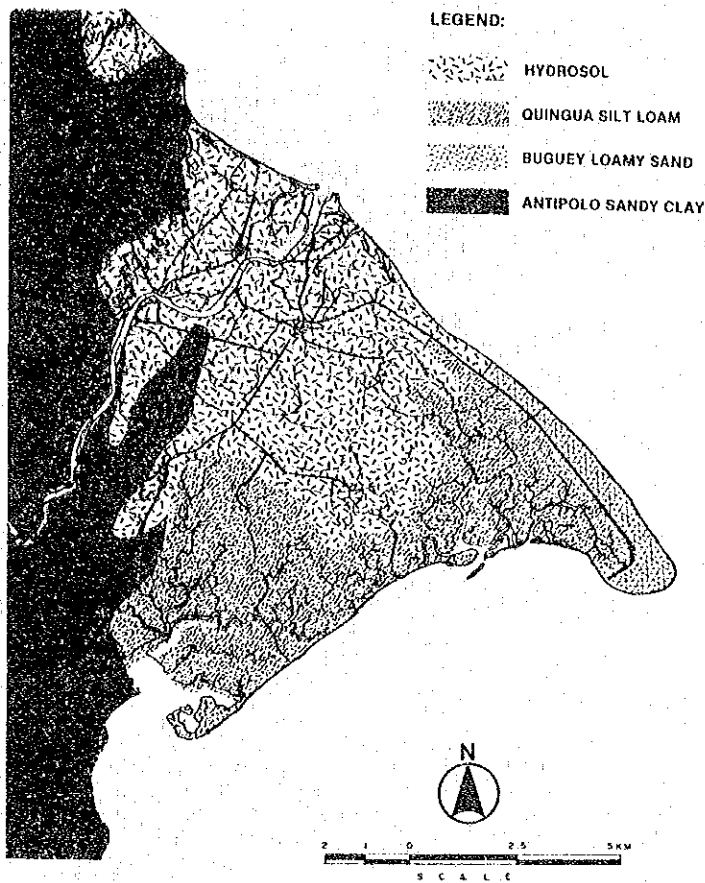


FIG. 2.1.6 SOIL MAP

2.1.2 Socio-Economic Characteristics

Population Distribution

1) Zonal Population

IRM has an estimated population of 44,423 and an estimated total of 7,859 households (1983), 66.2% of which is in Infanta, 21.2% in Real, and 12.6% in General Nakar (Table 2.1.1). The Infanta plateau has the largest zonal distribution (41.6%), followed by Real (20.4%), Infanta coastal area and swamps (respectively, about 12%, 13%), and the hilly part of General Nakar (the smallest 4.1%) (see Fig. 2.1.8, Table 2.1.2 for zonal population distribution in 1980).

As for dynamic changes from 1975 to 1980, Real and Infanta coastal areas showed high increase rates and Real showed the highest average annual increase rate (3.8%). The said 41.6% share was sustained by the Infanta plateau where change coincided with the average change rate in IRM as a whole. Population increase was slow in the Infanta swamps and General Nakar plains, while population decreased in General Nakar hills.

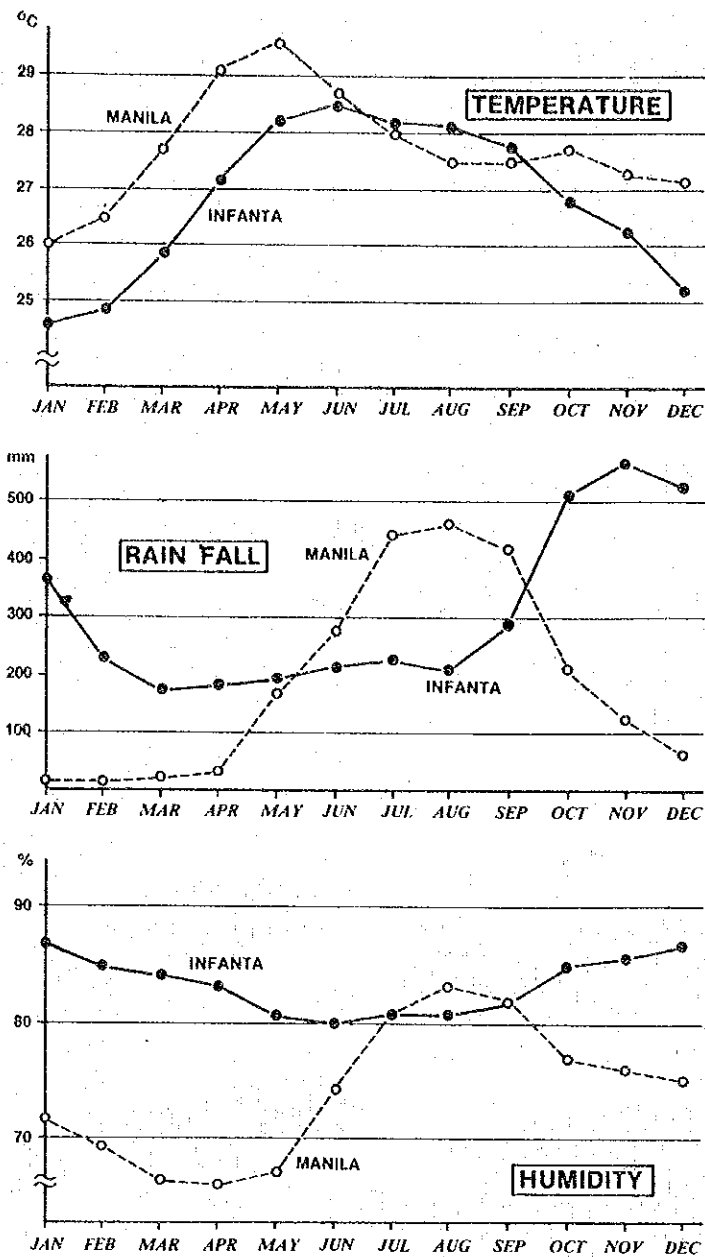


FIG. 2.1.7 COMPARISON OF CLIMATE DATA MUNICIPALITIES (1983)

Table 2.1.1 POPULATION OF IRM BY

Municipality	(Person, %)	
	Population	Household
Infanta	29,418 (66.2)	5,302 (67.5)
Real	9,412 (21.2)	1,576 (20.1)
Gen. Nakar	5,593 (12.6)	981 (12.5)
Total	44,423 (100.0)	7,859 (100.0)

Source: JICA Study Team

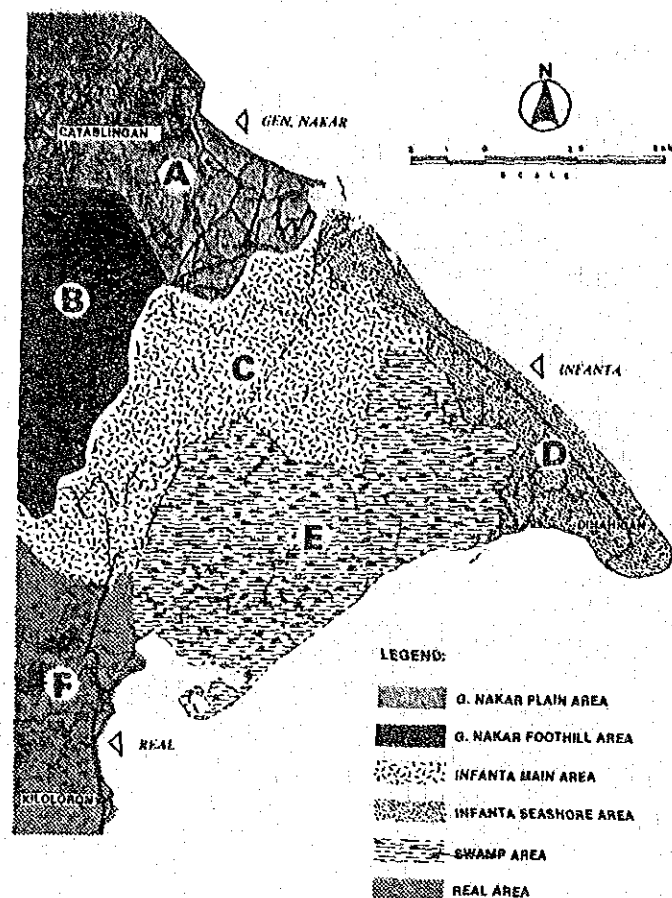


FIG. 2.1.8 MAJOR GROUP OF BARANGAYS

Table 2.1.2 POPULATION OF IRM BY ZONE

Study Area	1970		1975		1980		Persons Yearly Increased Rate 1975/1980
	Population	%	Population	%	Population	%	
Study Area	32,359	100.0%	37,763	100.0%	41,780	100.0%	2.6
G. Nakar							
A	3,001	9.3%	3,330	8.8%	3,767	9.0%	2.3
B	1,861	5.8%	1,927	5.1%	1,693	4.1%	-0.9
Infanta							
C	13,471	41.6%	15,656	41.5%	17,368	41.6%	2.6
D	3,639	11.2%	4,309	11.4%	4,852	11.6%	2.9
E	4,543	14.0%	5,406	14.3%	5,594	13.4%	2.1
Real							
F	5,844	18.2%	7,235	19.2%	8,506	20.4%	3.8

Source: NCSO

2) Barangay Population

Barangays with populations of roughly 1,000 are distributed half around the swamps from Real to the areas along Infanta Road on the bank of the Agos River and downtown Infanta, and farther to Dinahican. In the swamp area are barangays with a population of 500 or less. Those in the plains of General Nakar have a population of 500 or more (Figs. 2.1.9 to 2.1.11).

Demographic changes in those barangays from 1970 to 1980 were characterized by the following: (i) barangay population decrease, which was exceptional in the 1970 to 1975, spread out to Infanta plains and swamps in the 1975-1980 period; (ii) majority of the barangays showed an average population increase rate of 3% per annum, while population increase rates in excess of 3% per annum were shown by barangays along Infanta Road (Magsaysay), those in the coastal development base (Dinahican), and those in Real downtown and south areas thereof. Seemingly due to the outspread of the Infanta urban area, barangays adjacent to Infanta proper also showed over 3% increases while the population of Infanta Poblacion itself remained unchanged or declined (Figs. 2.1.12 and 2.1.13).

3) Population Density

The population density of IRM has become slightly heavier from the 2.1 persons per hectare in 1970 to 2.5 in 1975 and 2.7 in 1980. Of the municipalities, the highest density is shown by Real despite the presence of hills. Real plains is in fact a high density residential area.

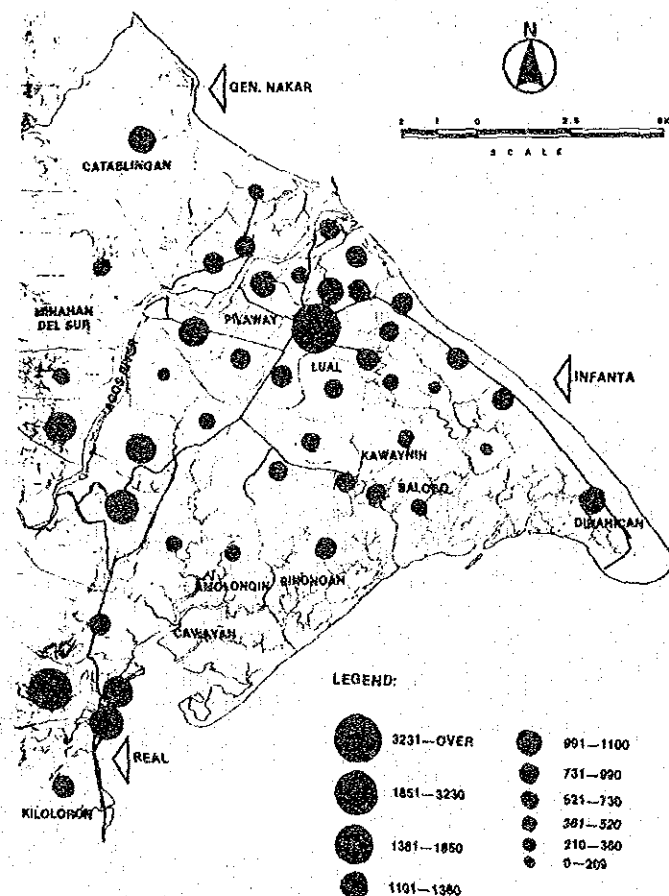


FIG. 2.1.9 TOTAL POPULATION BY BARANGAY AS OF 1970

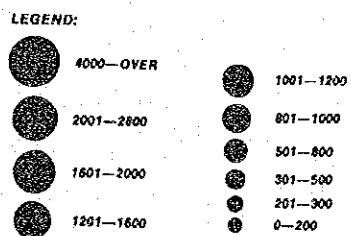
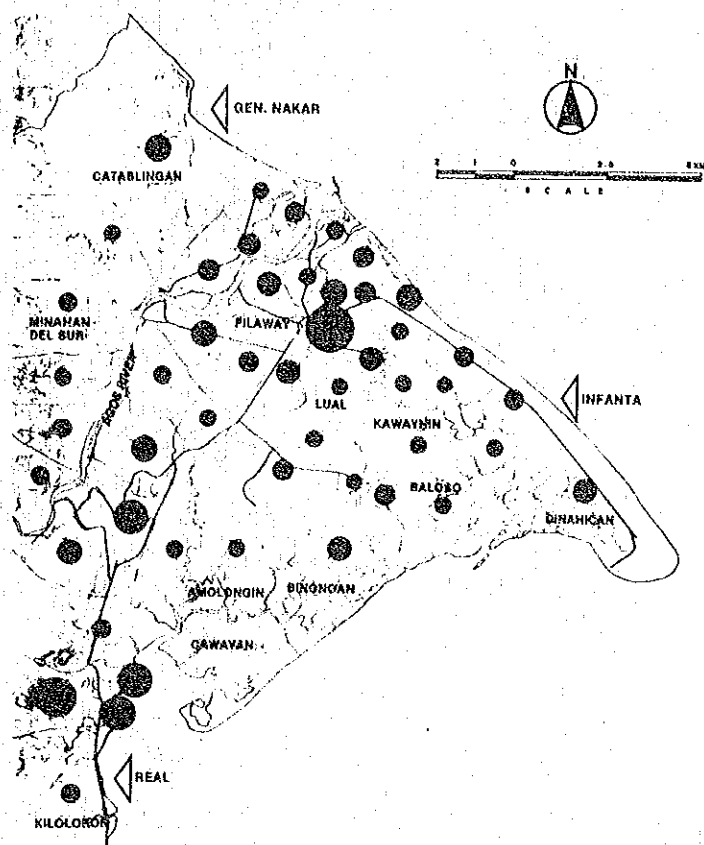


FIG. 2.1.10 TOTAL POPULATION BY BARANGAY AS OF 1975

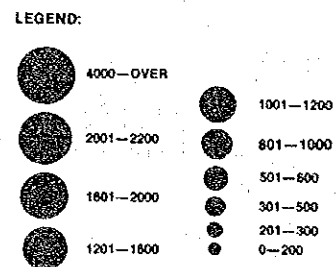
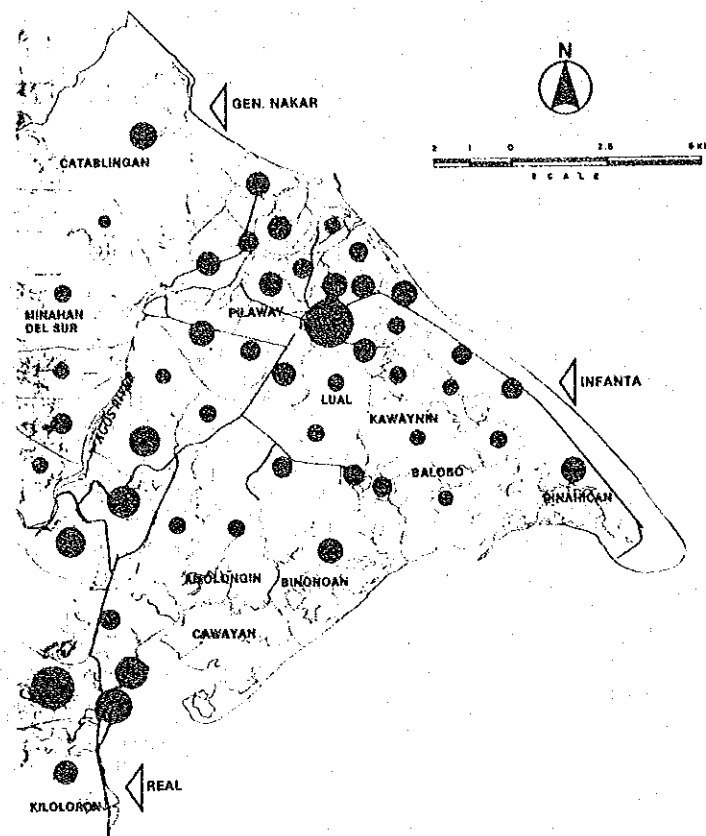
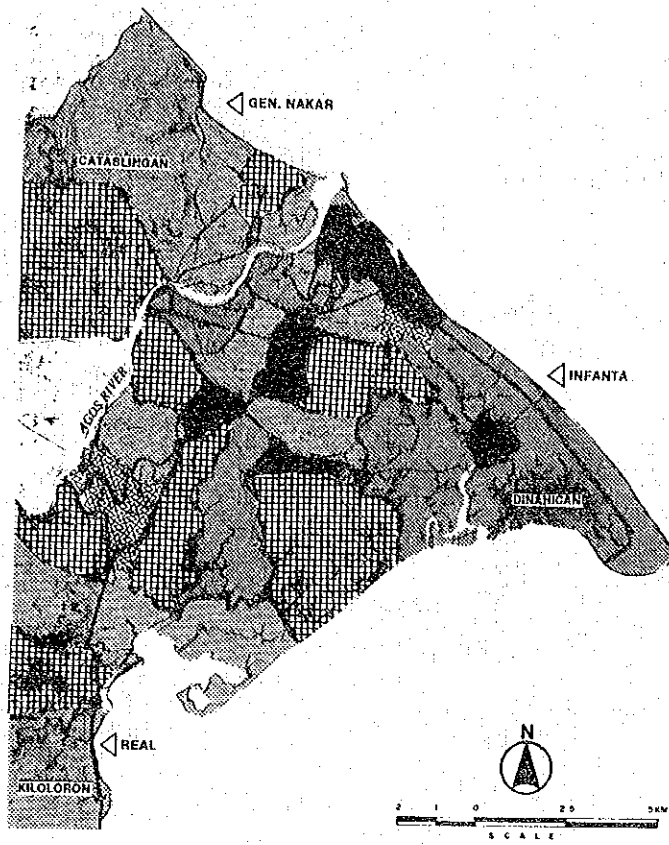


FIG. 2.1.11 TOTAL POPULATION BY BARANGAY AS OF 1980



LEGEND: DIFFERENTIAL PERCENTAGE

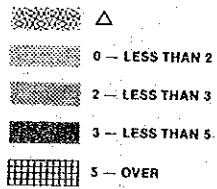
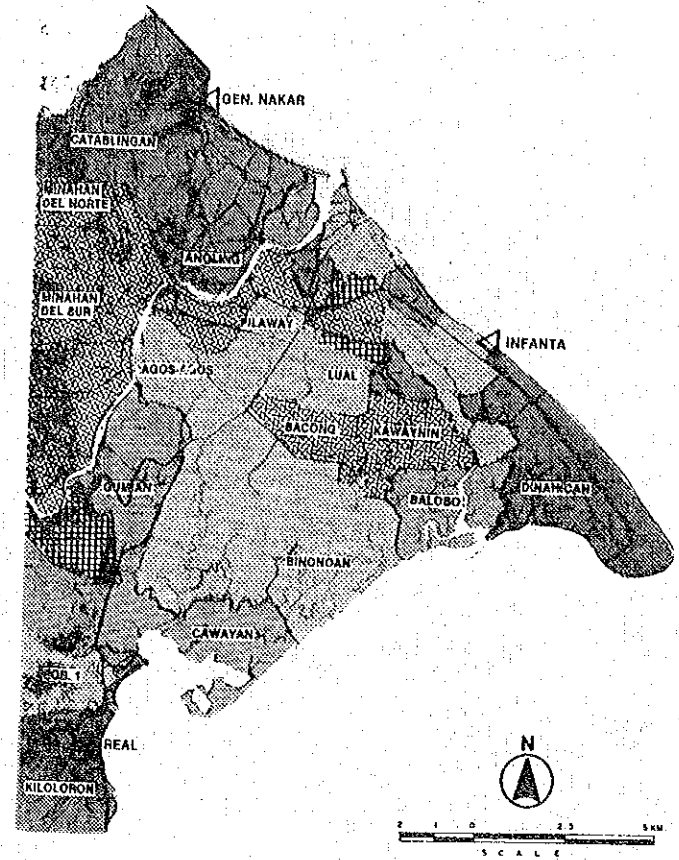


FIG. 2.1.12 ANNUAL GROWTH RATE OF POPULATION FROM 1970-1975



LEGEND: DIFFERENTIAL PERCENTAGE

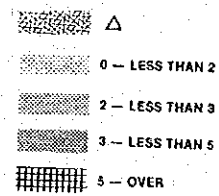


FIG. 2.1.13 ANNUAL GROWTH RATE OF POPULATION FROM 1975-1980

Of the barangays, Poblacion 61 in Real shows the highest density of over 100 persons per hectare (see Figs. 2.1.14 to 2.1.16). Relatively high densities are seen in Infanta Poblacion, and due to urban outspread, barangays around it as well as in General Nakar Poblacion experience the same densities.

4) Urban Population

Considering the poblacion population as urban population, both urban population and urbanization rate have decreased in General Nakar and Infanta, while they increased in Real from 1975 to 1980. The percentage of rural type industrial (agricultural, fishery and forestry) workers to residential workers in the poblacion is 17.7% in Infanta, 42.8% in Real, and 41.5% in General Nakar, indicating that Real and General Nakar downtown areas remain the living compounds of farmers and fishermen.

Population Structure and Movement

1) Age Composition

The 39.1% ratio of minor population (under 15) to total population in IRM is lower than the National average, while the 3.1% ratio of older (65 and older) population is higher than its corresponding national average. The ratio of working age population to total population is 57.9% in IRM.

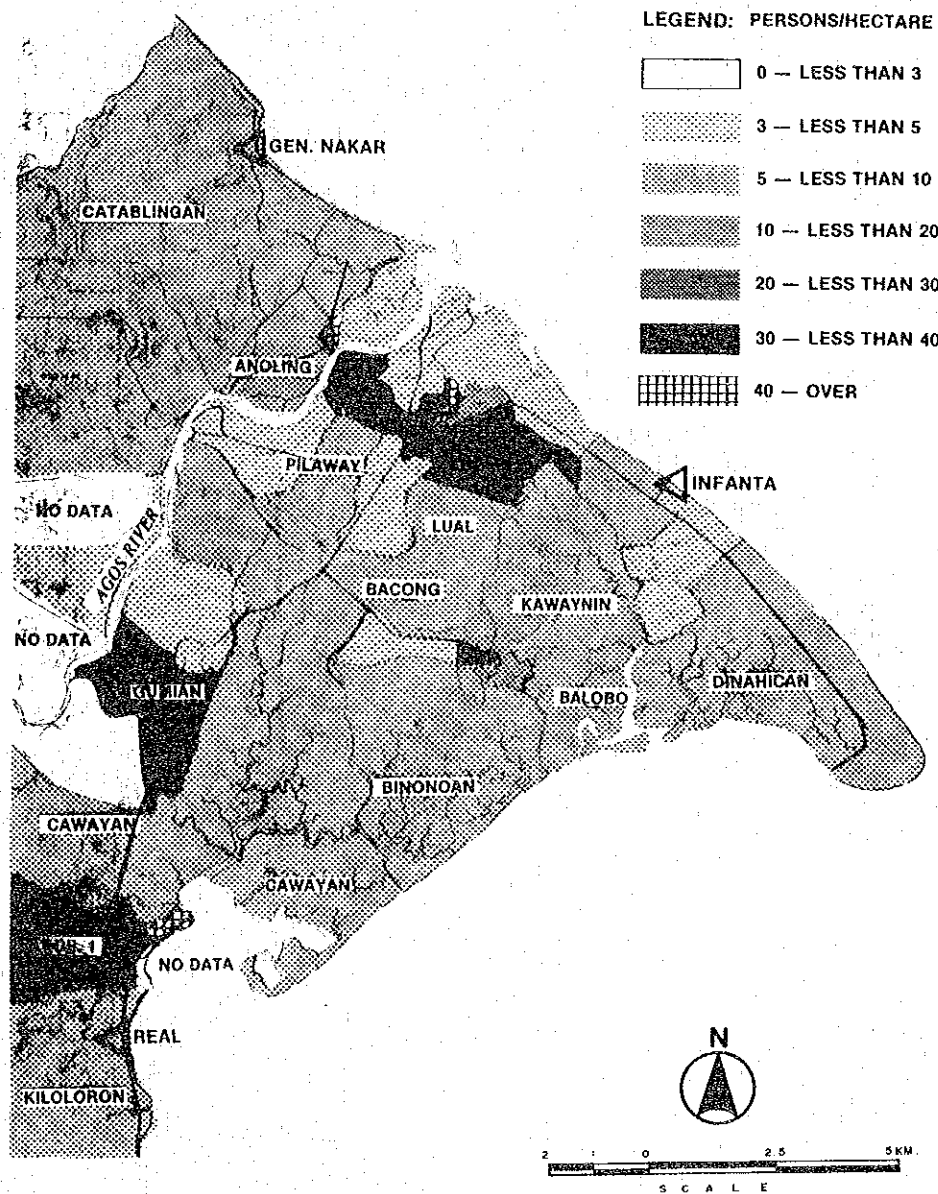


FIG. 2.1.14 POPULATION DENSITY 1970

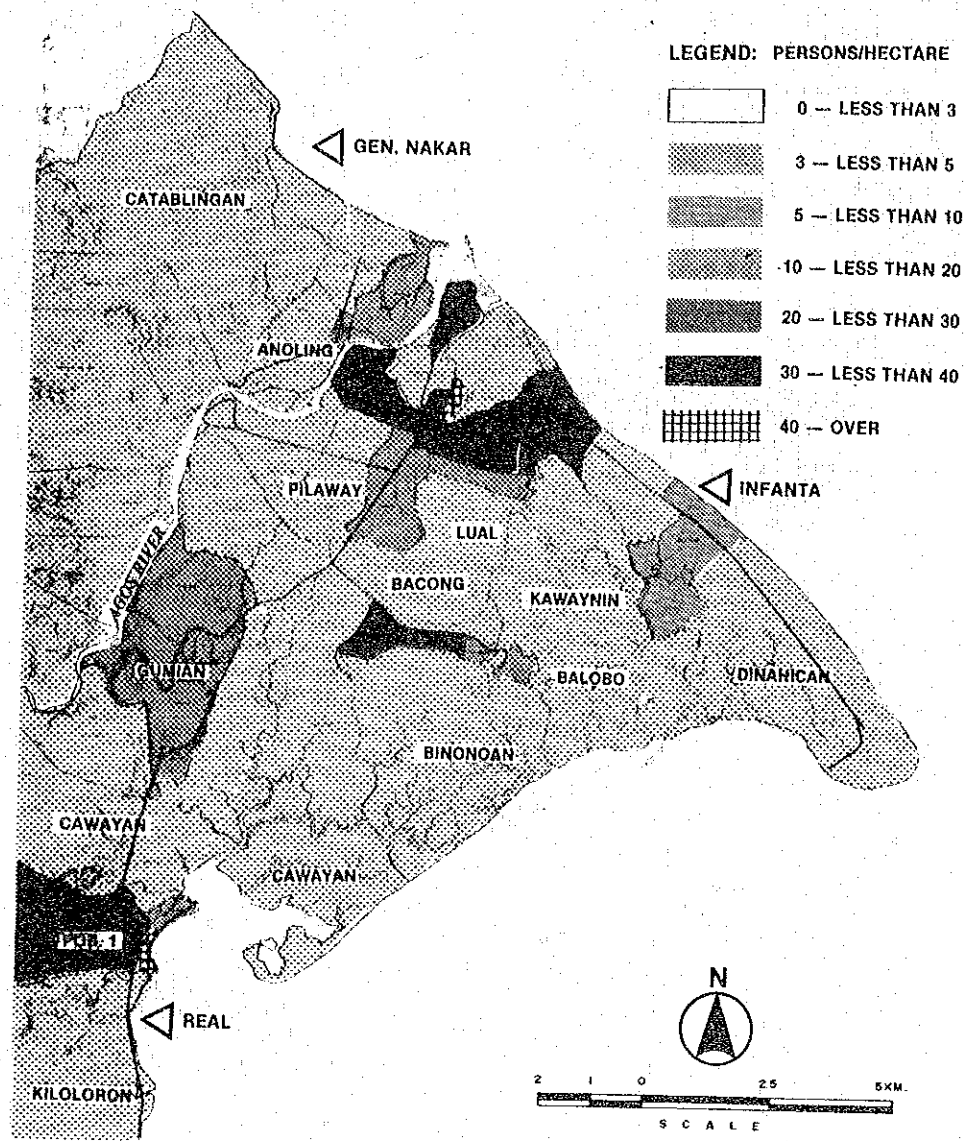


FIG. 2.1.15 POPULATION DENSITY 1975

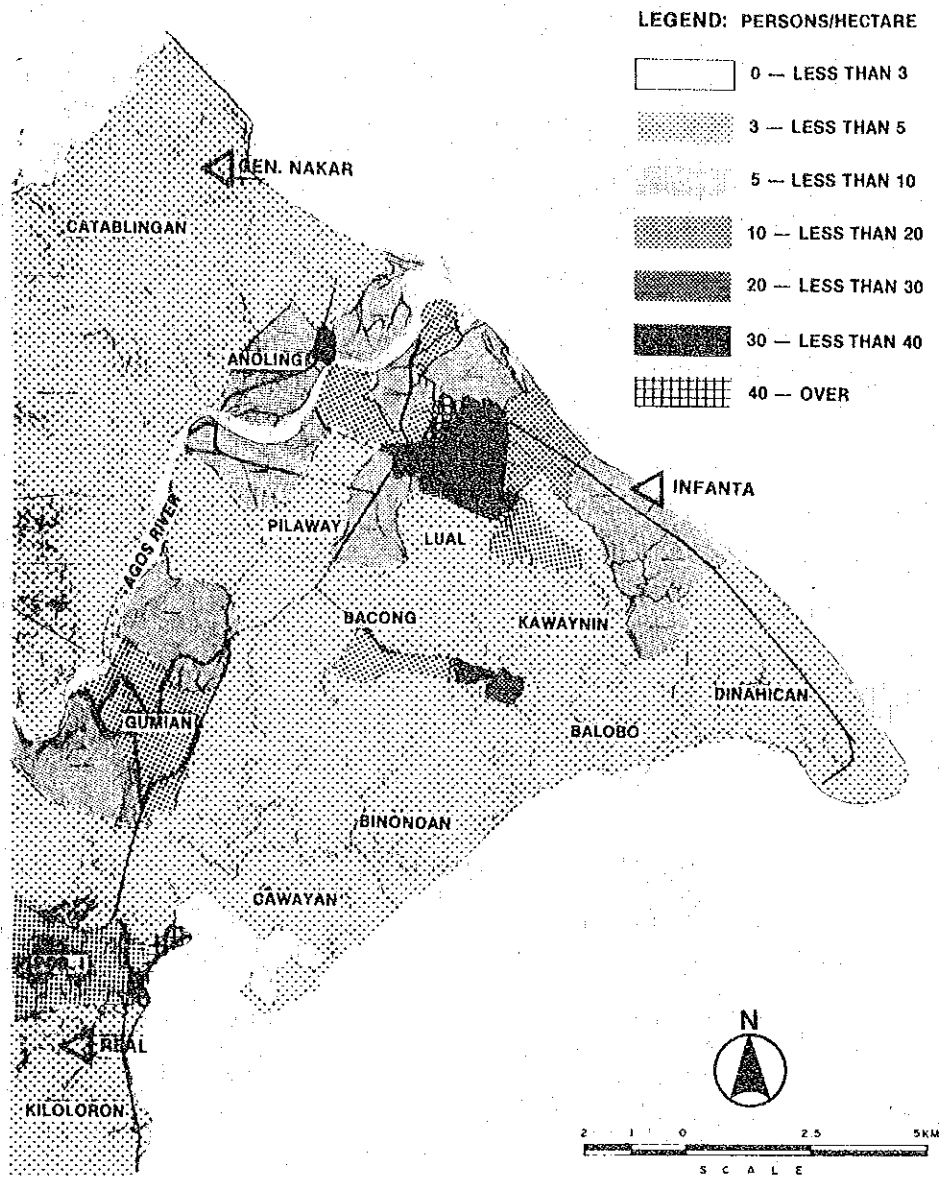


FIG. 2.1.16 POPULATION DENSITY 1980

2) Occupational Composition

Of those who are at work (which account for 26.1% of IRM's total population, while those not at work account for 73.9% and 37.6% of the non-working population are students), 33% are engaged in agricultural activities, 22% are non-agricultural laborers, 15% are in service industry, 11% are professionals, 10% are in sales commerce, and 9% are engaged in miscellaneous activities (see Table 2.1.3). The composition ratios of managers, office workers, and sales clerks in IRM are lower than the national averages, reflecting the agricultural nature of IRM's economy.

3) Social Movements

During the period 1975 to 1983, annual average population flow into IRM was 257 of which 144 were from the three (3) municipalities (that is, the area outside IRM), and 113 were from outside these municipalities. Of the 144 (inflow from the hilly parts of the municipalities) 11 or 77% settled at Infanta (Fig. 2.1.17).

During the same period, an annual average of 202 persons emigrated, 20 of which went to portions of the three municipalities out of IRM, and 182 went outside the municipalities (of the 182, 86 went to Manila). Of the 182, 63.7% was from the Infanta part of IRM.

These records indicate that Infanta has been the most dynamic of the three municipalities, both in attracting immigrants and in supplying emigrants to Manila and other external areas.

Economic Distribution

1) Household Income

In IRM, annual average household income is 8,400 Pesos (1983). Real shows the highest average household income of 108,000 Pesos, followed by Infanta's 8,300 pesos and General Nakar's 5,900 Pesos. By the classification of activities, farming households show an average income of 7,100 Pesos, fishing households at 6,500 Pesos, those in forestry at 8,100 Pesos, those in manufacturing at 8,400 Pesos, those in retail sales at 13,300 Pesos, and those in transportation at 10,800 Pesos.

Table 2.1.3 PERCENTAGE OF POPULATION

	PERCENTAGE OVER TOTAL WORKERS			
	Gen. Nakar	Infanta	Real	Average
1. Professional, Technical Related Workers	4.3	12.0	9.7	10.7
2. Administrative, Managerial Workers	1.3	0.6	0.6	0.7
3. Clerical and Related Workers	1.8	3.2	5.3	3.4
4. Sales Workers	5.2	10.5	12.0	10.2
5. Service Workers	9.4	15.6	16.5	15.1
6. Agricultural, Animal Husbandry	59.6	35.8	5.8	32.6
7. Forestry	0	0.2	0	0.1
8. Fishermen	1.8	4.9	10.8	5.7
9. Production Workers, Transport Equipment and Laborers	16.7	17.2	39.3	21.5

Source: JICA Study Team, 1983

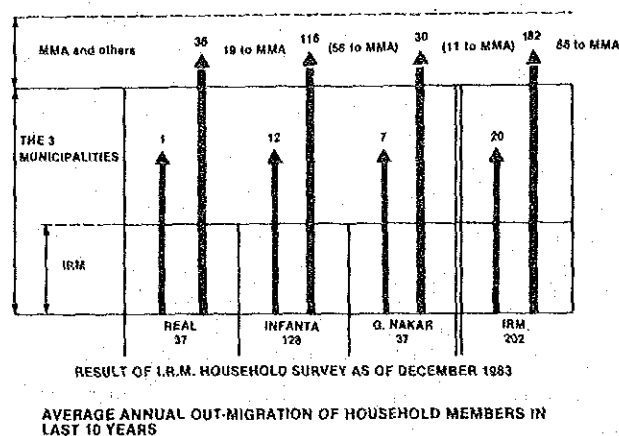
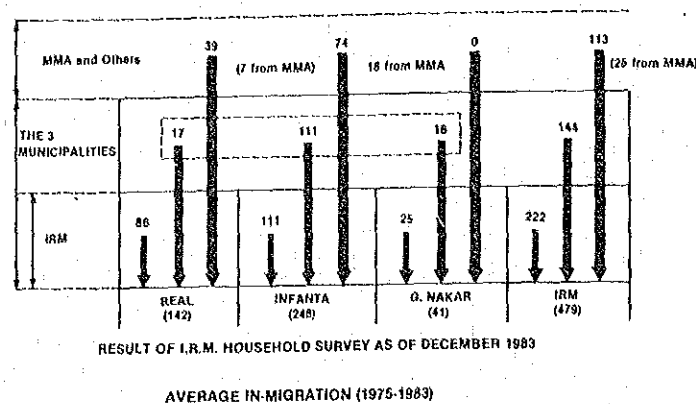


FIG. 2.1.17 AVERAGE ANNUAL IN-MIGRATION AND OUT-MIGRATION OF I.R.M.

By industrial origins, agriculture represents 44.2% of total income, social services, 29.5%, and all other activities 26.3%. By municipality, Infanta shows a reliance on agriculture at 44.5%, which is higher than the IRM average, Real shows a low reliance on agriculture at 5.5%, Real shows a higher reliance on fishery than Infanta, and Real also shows a high reliance on manufacturing. This indicates that agriculture and social services are the major sources of income in Infanta, while such source is diversified into fishery, manufacturing, and wholesale and retail commerce in Real.

2) Population at Work

A total of 11,596 people are at work in IRM. The high agricultural reliance of IRM is indicated by the fact that the primary industries represent roughly 60% of this total, while the secondary industries represent approximately 10% and the tertiary industries, about 30% (Table 2.1.4).

Infanta and General Nakar are agricultural towns, where farmers' ratio to population are slightly over 50% and roughly 70%, respectively, while Real is a fishery town, where fishermen's ratio of 31% exceeds the farmer's ratio of 18%.

Table 2.1.4 WORKERS IN THE STUDY AREA (1983)

	Gen. Nakar	Infanta	Real	Total
Primary Industry	932 (73.4)	4,758 (59.0)	1,098 (48.5)	6,788 (58.5)
Agriculture	895 (70.5)	4,245 (52.6)	401 (17.7)	5,541 (47.8)
Forestry	0 (0)	17 (0.2)	0 (0)	17 (0.1)
Fishery	37 (2.9)	496 (6.2)	697 (30.8)	1,230 (10.9)
Secondary Industry	72 (5.7)	668 (8.2)	218 (9.6)	958 (8.3)
Mining	0 (0)	6 (0)	0 (0)	6 (0)
Manufacturing	16 (0.7)	291 (3.6)	43 (1.9)	350 (3.0)
Construction and Others	56 (4.9)	371 (4.0)	175 (7.7)	602 (5.2)
Tertiary Industry	265 (20.9)	2,639 (32.7)	946 (41.8)	3,850 (33.2)
Utilities	3 (0.2)	61 (0.8)	0 (0)	64 (0.6)
Wholesale & Retail Trade	54 (4.3)	547 (6.8)	240 (10.6)	84 (7.3)
Transportation & Communication	29 (2.3)	454 (5.6)	266 (11.8)	749 (6.5)
Social & Personal Services	179 (14.1)	1,516 (18.8)	440 (19.5)	2,135 (18.4)
Finance & Insurance	50 (0)	611 (0.8)	0 (0)	61 (0.5)
Total	1,269 (100.0)	8,065 (100.0)	2,262 (100.0)	11,596 (100.0)
Ratio of Workers to Total Population 15 and Over	43.2	44.3	39.0	43.0
Ratio of Number of Dependent Family to a Worker	4.41	3.65	4.16	3.83

Note: Figures in parentheses are percentage share to total

Source: JICA Study Team

Table 2.1.5 SHARES OF WORKERS OF EACH INDUSTRY ZONE (IRM, 1983)

Industry Zone	%						Total
	Gen. Nakar	Infanta			Real	Total	
	A	B	C	D	E	F	
Agriculture	12.0	4.1	44.4	12.3	19.9	7.2	100.0
Forestry	0	0	47.1	29.4	23.5	0	100.0
Fishery	3.0	0	6.7	32.0	1.6	56.7	100.0
Mining & Quarrying	0	0	100.0	0	0	0	100.0
Manufacturing	1.7	2.9	42.9	8.0	32.3	12.3	100.0
Electricity	0	4.7	71.9	7.8	15.6	0	100.0
Construction	1.5	7.8	51.8	4.5	5.3	29.1	100.0
Wholesale & Retail	5.1	1.3	44.4	14.3	6.4	28.5	100.0
Transportation	3.6	0.3	46.1	6.8	7.7	35.5	100.0
Financing	0	0	88.5	8.2	3.3	0	100.0
Community, Social Personal	7.6	0.8	53.2	8.3	9.5	20.6	100.0
Total	8.2	2.8	42.9	12.9	13.8	19.5	100.0

Source: JICA Study Team

By major zones, Infanta plain (Zone C), which is the economic industrial center, has the largest share of 42.9% in total number of those at work in IRM, followed by Real (Zone F). However, agriculture has the largest share of those at work in Infanta plain, while fishery has the largest share in Real. Infanta plain has the largest share at 44.4% of total farmers in IRM followed by the swamp zone (19.9%), and coastal zone (12.3%). Of the total fishermen in IRM, Real has the largest share at 56.7%, followed by Infanta coastal zone (32%), the two (2) together representing about 90% of the IRM total (Table 2.1.5).

The industrial sector composition of people at work in each barangay is plotted on a triangular scale (see Fig. 2.1.18). The barangays in IRM generally show high primary industrial composition ratios and low secondary industrial composition ratios, therefore, concentrating in the left hand bottom corner of the triangle.

The following conclusions are drawn in connection with the distribution of workers in each barangay:

- (a) Barangays with high concentration of tertiary industries

It is unquestionable that the poblacions of each municipality are typical cases of barangays with high concentration of tertiary industry. Moreover, the barangay of Comon adjacent to the Poblacion of Infanta has also this characteristic. The poblacion of Real does not belong yet to this classification. Although, also included in this classification in exception is the Barangay of Kawayan at Real.

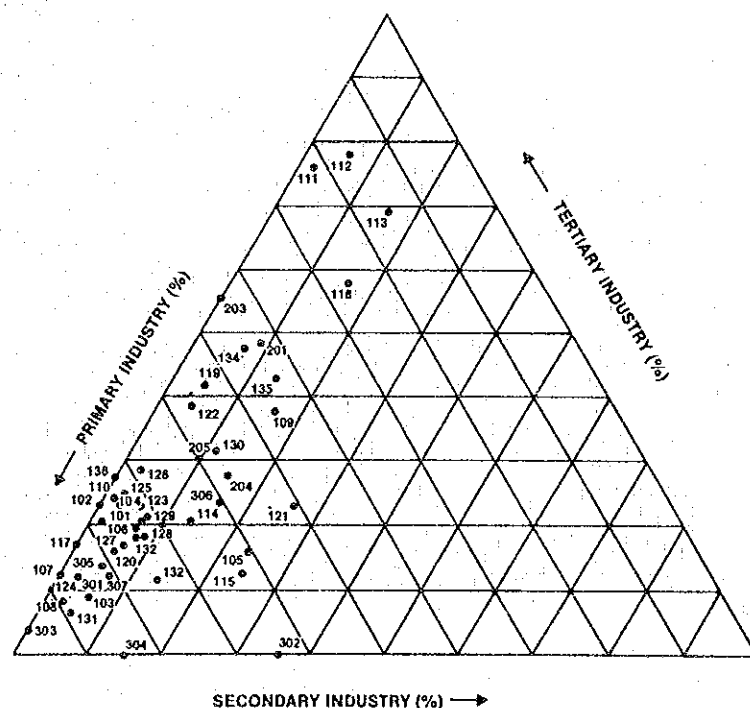


FIG. 2.1.18 COMPOSITION OF GAINFUL WORKERS BY MAJOR GROUP OF INDUSTRY

(b) (Barangays with concentration of both primary and tertiary industries)

The Poblacion of Real belongs to this group. This indicates that the urban area of Real is characterized as a settlement of workers engaged in a primary industry (fishery in this case, as described later).

Furthermore, the barangay of Bantilan adjacent to the Poblacion of Infanta, Silangan, which has a local center in the swamp, Tongohin located along the Infanta Road, etc., are cases of barangays belonging to this classification.

(c) Barangays with high percentage of primary industries

All of the 37 remaining barangays belong to this classification. These are barangays relying on agriculture and fishery.

These data indicates that hilly districts along the Infanta Road, the totality of General Nakar (excluding the poblacion), etc., have low percentages of workers. The barangays with high percentages of workers are the poblacion of Infanta and the adjacent barangays, Dinahican, and Libjo that are local centers of the transportation network of the swamp, etc.

3) Number of Workers by Sector

There are 6,788 workers engaged in the primary industry of IRM, with agriculture accounting for 5,541 workers, forestry for 17 and fishery for 1,230. By municipality, Infanta accounts for 4,758 workers of the primary industry, Real 1,098 (16.2%), and General Nakar 932.

The distribution of primary industry workers in IRM is shown in Fig. 2.1.19. As shown, the distribution of primary industry workers in IRM corresponds approximately to the demographic distribution patterns with the exception of the poblacions.

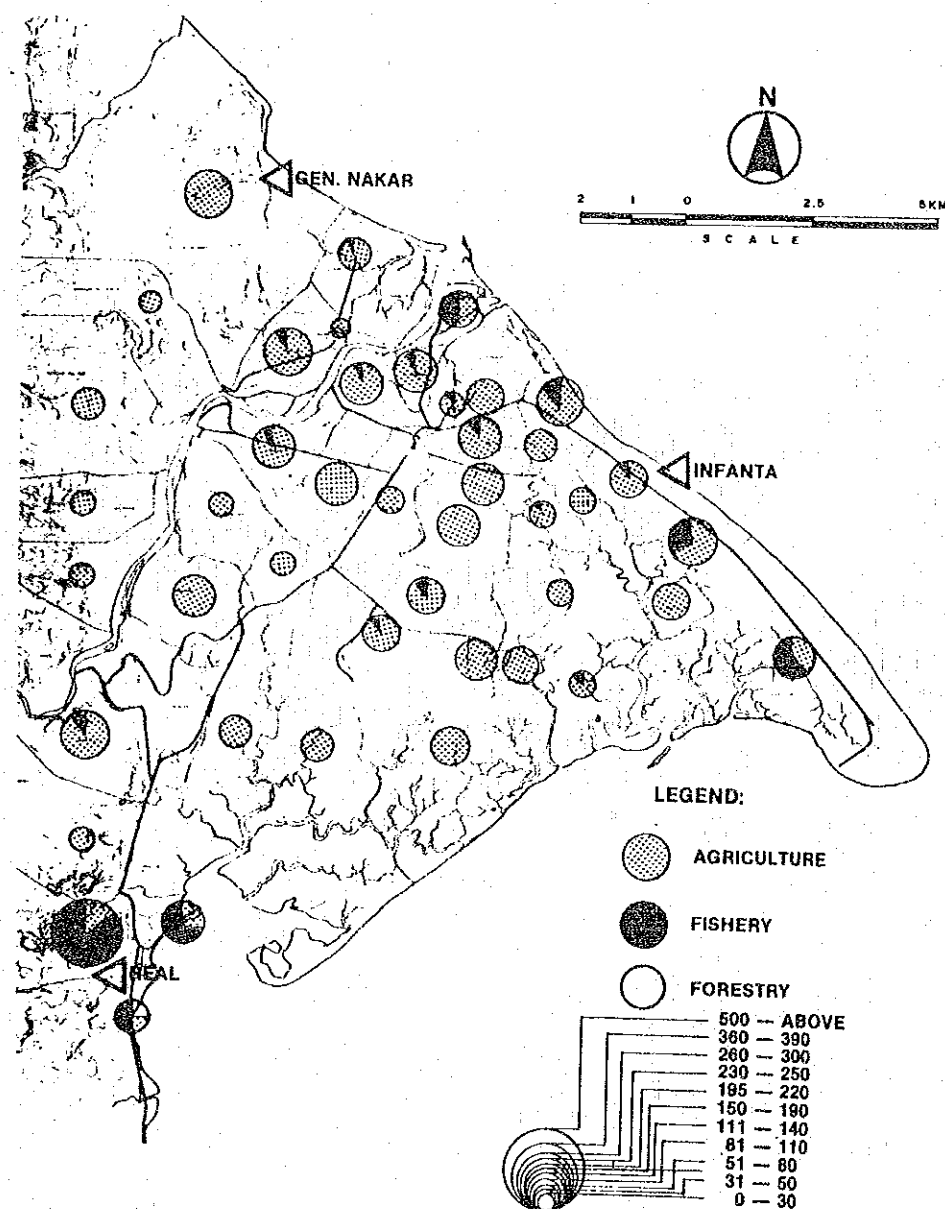


FIG. 2.1.19 COMPOSITION OF GAINFUL WORKERS IN PRIMARY INDUSTRY

In connection with the distribution of farmers and fishermen, most of the barangays located at the seashore that have mixed agricultural/fishery workers are the Poblacions of Real, Barangays of Ungos and Dinahican of Infanta. These settlements are barangays relying principally on fishing.

The distribution of fishery workers is conspicuous also in the swamps. On the other hand, agricultural workers are widely scattered throughout the study area principally in the flatlands of Infanta, but there are also agricultural settlements in the swamps. In the latter case, they are engaged in the plantation of nipa palm trees in the swamps.

Furthermore, agricultural settlements are also present in the hilly districts of Infanta (right bank of the Agos River), principally in Magsaysay.

The secondary industry consists principally of the construction sector (602 workers corresponding to 62.8% of the secondary industry). In reality, however, there is no private establishment in IRM engaged in the construction industry and, therefore, these workers are presumably engaged in public works such as repair of roads, etc.

The distribution of the secondary industry workers by barangay is shown in Fig. 2.1.20. The principal concentrations are the Poblacion of Infanta, the adjacent Barangays of Bantilan, Ilog, and Magsaysay, the Poblacion of Real, and the adjacent Barangay of Ungos, etc.

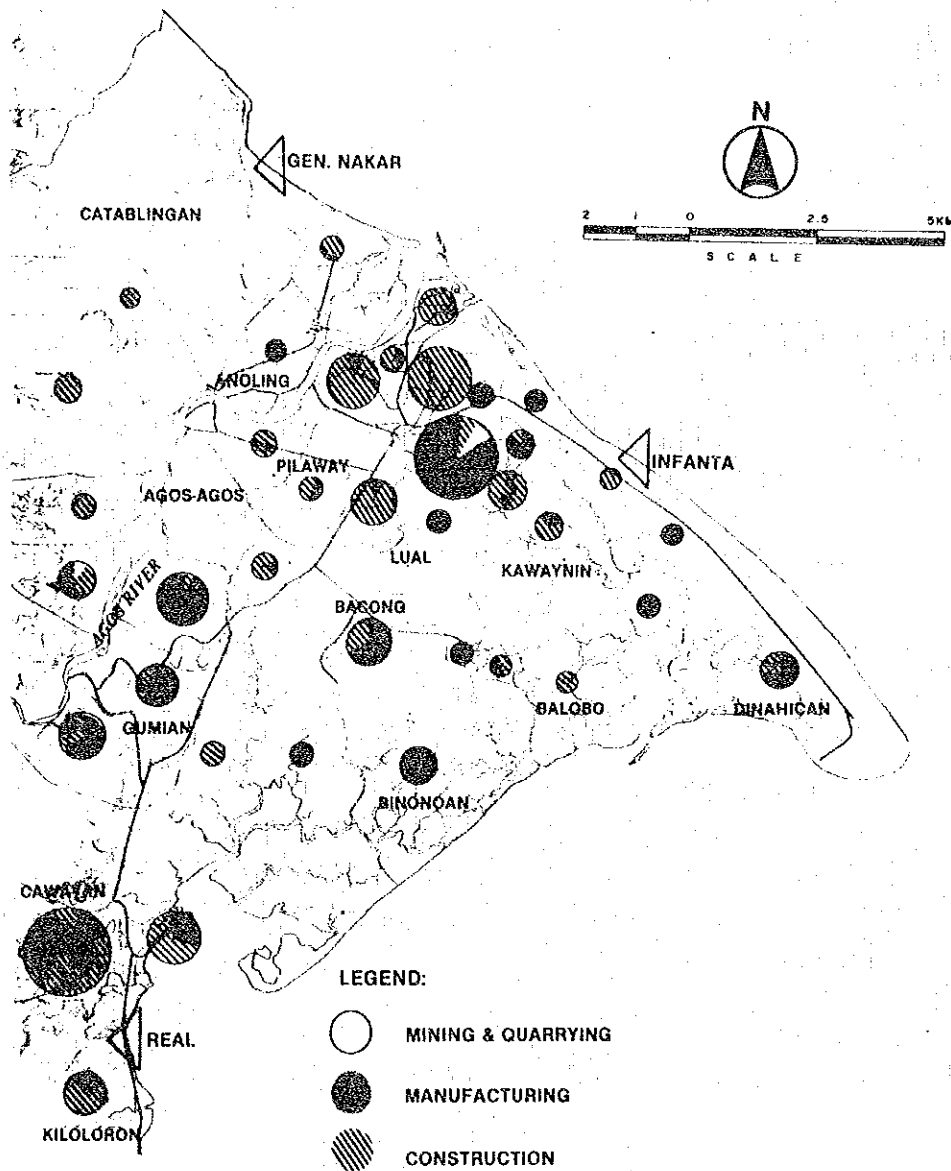


FIG. 2.1.20 COMPOSITION OF GAINFUL WORKERS IN SECONDARY INDUSTRY

Of these concentrations, Bantilan, Ilog, and the poblacion are mostly construction workers. Manufacturing workers are also widely scattered throughout the flatland of Infanta swamps, although negligible in number.

There are 3,850 tertiary industry workers in the study area that are distributed as follows:

(i) The social and personal services account for the majority, i.e., 55% of the total. The sector constitutes the largest tertiary industry of IRM because it comprises not only workers of public services (administrative service, schools, etc.) but also nonsteady and temporary labor service workers, irrespective of the kind of industry and/or business.

(ii) The wholesale/retail trade consisting principally of small scale sari-sari (variety) stores, and the transportation/communication sector consisting principally of tricycles account for 41.3% of the tertiary industry as a whole. The distribution of the tertiary industry expressed in terms of their compositions is shown in Fig. 2.1.21.

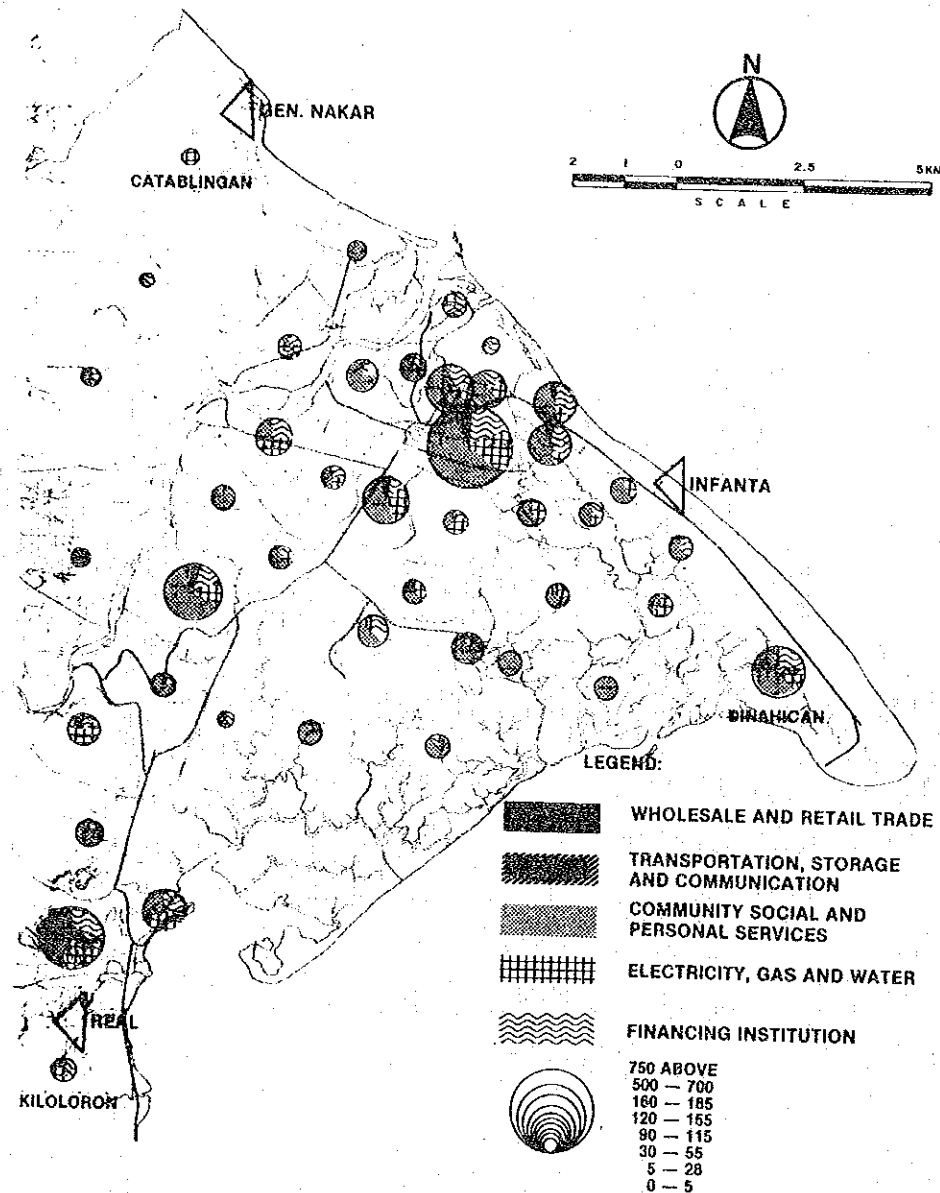


FIG. 2.1.21 COMPOSITION OF GAINFUL WORKERS IN TERTIARY INDUSTRY

As shown, the Poblacions of Infanta and Real are the most important centers of concentration of tertiary industry workers. Furthermore, the concentration of tertiary industry in other parts of IRM are seen at the following:

- (i) Barangays adjacent at the Poblacions (Bantilan, Silangan and Ungos);
- (ii) Major settlements along the seashore (Dinahican, Libjo, etc.); and
- (iii) Hilly district along the Infanta Road (Tongohin).

These concentrations are local centers in terms of transportation, fishery, etc., within IRM. Therefore, they are presumed to be centers of absorption of labor, seasonal and temporary in character, as well as centers of general services related to the aforesaid businesses.

Furthermore, there is also a small-scale distribution of tertiary industry in each barangay mostly consisting of social and individual services represented by teachers of schools, workers of local administrative organizations, etc., that provides basic public and social services required by the local community.

2.1.3 Industrial Characteristics

Discussed in this section are the agricultural activities and business establishments (The major industry in IRM is agriculture).

Agricultural Sector

1) Farming Households by Crop Planted

The total number of farming households in IRM is estimated at 3,529 (1983), the majority of which, or 67.3% are exclusively rice growing households. Such households represent 75% of the total in Infanta, 50% in Real, and 37.3% in General Nakar. The second most important crop is coconut, but households exclusively growing coconuts represent only 3.8% of total farming households. On the other hand, those growing both rice and coconut show high composition ratios, such as the majority at 54.7% in General Nakar, and the second largest ratios in Infanta and Real respectively. This shows that rice growers are also growing coconuts (Table 2.1.6).

Table 2.1.6 FARMING HOUSEHOLDS BY TYPE OF CROP PLANTED (IRM, 1983)

	Household			
	Gen. Nakar	Infanta	Real	Total
Paddy	242 (37.3)	2,082 (75.0)	51 (50.0)	2,375 (67.3)
Coconut	48 (7.3)	75 (2.7)	11 (11.1)	134 (3.8)
Coconut & Paddy	356 (54.7)	489 (17.6)	23 (22.2)	868 (24.6)
Livestock	—	36 (1.3)	17 (16.7)	53 (1.5)
Farming & Fishing	5 (0.7)	94 (3.4)	0 (0.0)	99 (2.8)
Total	651 (100.0)	2,776 (100.0)	102 (100.0)	3,529 (100.0)

Note: Figures in parentheses are (%) share to total.

Source: JICA Study Team

2) Composition of Farming Households by Crop

Farm crops shown in each of the barangays are as follows (Fig. 2.1.22):

(i) In the flat area of General Nakar, rice is the major crop but many rice growers also grow coconuts (Group 1). Up the hills along Agos River, the majority are exclusively and non-exclusively coconut growers except in Pisa where many grow rice in paddies opened in narrow lands along the Agos River.

(ii) In Infanta (Groups 3, 4 and 5), majority are exclusively paddy rice growers but in the barangays of Group 3 where sporadic coconut groves are seen in the flat land, 20% to 30% of farming families also grow coconut. The characteristics of the coastal/peninsular part extending to Dinahican (Group 4) where rice growing is also the major activity are that farmers are also engaged in fishery activities. Group 5, predominantly swamp area, shows a high ratio of paddy rice growers and a low ratio of coconut growers.

(iii) Real (Group 6) shows a mixed composition, and in Kiloloron, all farming families grow coconut exclusively or otherwise.

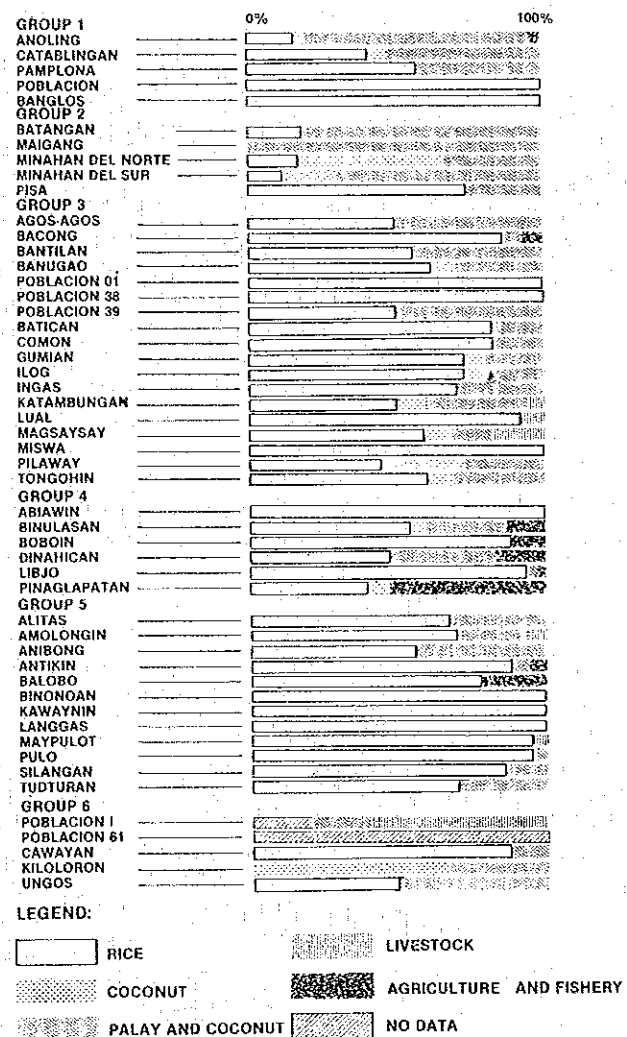


FIG. 2.1.22 COMPOSITION OF AGRICULTURAL HOUSEHOLD BY CROP

3) Crop Values

Those growing both rice and coconuts generally show a high household shipment value of crops. In Real, however, exclusive coconut growing households show a higher value. As for paddy rice, the exclusive growers in Infanta show the highest crop value.

4) Yield Income

Average rice yield is 2,375 kilograms per hectare and 1,690 kilograms per rice growing household per year. Average income from rice is 5,300 Pesos/household/year. Coconut growing households have an average farm of 1.46 hectares, an average yield of 4,000 to 5,000 shells/year, and an average income of 7,400 pesos/year.

Business Establishments

1) Profile

A total of 589 business establishments are registered in IRM, the majority at 56.4% are in sales and commerce, followed by transport/communications at 29.2%, the two (2) together representing about 86% of the total while manufacturing represents only 8.7% of the total.

The 589 establishments employ a total of 1,297 persons (including family workers). Sales commerce and transport/communications have a combined share of roughly three-quarters of the 1,297, while the secondary industries (mining and manufacturing) have a share of an appreciable 17%.

Most of the 589 business establishments are very small in size, as indicated by the average of 2.2 workers per establishment. Those in mining/manufacturing and finance show larger averages, while those in transport/communications show the smallest average of 1.3 workers per establishment. Establishments with five workers or less represent 94.4% of total establishments and account for 77.3% of total workers. Those in sales commerce, mostly the so-called "Sari-sari" stores and in transport/communications, mostly those operating tricycles, constitutes over 80% of those with five workers or less. Establishments with more than 5 workers count 34 which are mostly in sales commerce and manufacturing and are mostly in Infanta (Tables 2.1.7 to 2.1.9).

2) Distribution

In the order of Infanta, Real, and General Nakar, the distributions of both establishments and workers are in the proportion of 7:2:1. The number of workers per establishment is 2.4, 1.8 and 1.9, respectively. Thus, Infanta is the center of IRM's regional economy, while Real and General Nakar are still in the pre-urbanization stage (Table 2.1.10).

By poblacions, Infanta has the major share of both establishments (36.8%) and workers (43.4%), and shows by far the largest average of 13.7 workers per population of 1,000. On the other hand, the poblacion in Real has only 8.1% share and shows an average worker per population of 1,000 smaller than such average in areas outside the poblacion, thus, indicating a low level of urban maturity.

By barangays, the distributions of establishments and workers generally follow the population distribution pattern and are heavy in urban areas of Infanta and Real, as well as in the area halfway around the swamps, the belt with the highest physical advantages of being on the elevation of

Table 2.1.7 NUMBER OF ESTABLISHMENTS AND WORKERS

ITEM Municipality/Industrial Group	NO. OF ESTABLISHMENTS				NO. OF WORKERS				Average no. of workers/ establishment
	Gen. Nakar	Infanta	Real	Total	Gen. Nakar	Infanta	Real	Total	
Mining, Quarry	1 (1.7)	2 (0.5)	0 (0)	3 (0.5)	1 (0.9)	12 (1.3)	0 (0)	13 (1.0)	4.3
Manufacturing	5 (8.6)	37 (9.2)	9 (6.9)	51 (8.7)	6 (5.7)	153 (6.9)	54 (19.5)	213 (16.4)	4.2
Electricity, Gas	0 (0)	0 (0)	1 (0.8)	1 (0.2)	0 (0)	0 (0)	2 (0.7)	2 (0.2)	2.0
Construction	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	—
Wholesale, Retail Trade	36 (62.1)	230 (57.4)	66 (50.8)	332 (56.4)	87 (76.3)	501 (55.3)	131 (47.3)	719 (55.4)	2.2
Transportation, Storage, Comm.	15 (25.9)	114 (28.4)	43 (33.1)	172 (29.2)	19 (16.7)	147 (16.2)	64 (23.1)	230 (17.7)	1.3
Financing, Insurance	0 (0)	2 (0.5)	7 (0.8)	3 (0.5)	0 (0)	44 (4.9)	6 (2.2)	50 (3.9)	16.7
Community, Social, Personal Service	1 (1.7)	16 (4.0)	10 (7.7)	27 (4.6)	1 (0.9)	49 (5.4)	20 (7.2)	70 (5.4)	2.6
Total	58 (100.0)	401 (100.0)	130 (100.0)	589 (100.0)	114 (100.0)	906 (100.0)	277 (100.0)	1,297 (100.0)	2.2

Note: Figures in parentheses are (%) share to total.

Source: JICA Study Team, 1983

Table 2.1.8 NUMBER OF ESTABLISHMENTS BY SIZE OF ESTABLISHMENTS

No. of Workers	G.N.					INFANTA					REAL					TOTAL				
	TO TAL	1-2	3-4	5-9	10 OVER	TO TAL	1-2	3-4	5-9	10 OVER	TO TAL	1-2	3-4	5-9	10 OVER	TO TAL	1-2	3-4	5-9	10 OVER
Mining/Quarrying	1	1	0	0	0	2	0	1	1	0	0	0	0	0	0	3	1	1	1	0
Manufacturing	5	5	0	0	0	37	19	8	8	2	9	5	2	1	1	51	29	10	9	3
Electricity, Gas	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0
Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wholesale, Retail	36	22	13	1	0	230	172	48	10	0	66	56	5	5	0	332	250	66	16	0
Transportation Storage, Commu.	15	15	0	0	0	114	109	4	1	0	43	42	1	0	0	172	166	5	1	0
Financing, Insurance	0	0	0	0	0	2	0	0	1	1	1	0	0	1	0	3	0	0	2	1
COMMUN., SOCIAL PERSONAL SERVICES	1	1	0	0	0	16	8	7	1	0	10	8	2	0	0	27	17	9	1	0
T O T A L	58	44	13	1	0	401	308	68	22	3	130	112	10	7	1	589	464	91	30	4

Source: JICA Study Team

Table 2.1.9 NO. NUMBER OF WORKERS BY SIZE OF ESTABLISHMENT

No. of Workers	G.N.					INFANTA					REAL					TOTAL				
	TO TAL	1-2	3-4	5-9	10 OVER	TO TAL	1-2	3-4	5-9	10 OVER	TO TAL	1-2	3-4	5-9	10 OVER	TO TAL	1-2	3-4	5-9	10 OVER
MINING/QUARRYING	1	1	0	0	0	12	0	4	8	0	0	0	0	0	0	13	1	4	8	0
MANUFACTURING	6	6	0	0	0	153	27	31	60	35	54	8	7	9	30	213	41	38	69	65
ELECTRICITY, GAS	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	2	2	0	0	0
CONSTRUCTION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WHOLESALE, RETAIL	87	36	45	6	0	501	258	172	71	0	131	82	15	34	0	719	376	232	111	0
TRANSPORTATION, STORAGE, COMMUN.	19	19	0	0	0	147	127	13	7	0	64	60	4	0	0	230	206	17	7	0
FINANCING, INSURANCE	0	0	0	0	0	44	0	0	10	34	6	0	0	0	6	50	0	0	16	34
COMMUN., SOCIAL PERSONAL SERVICES	1	1	0	0	0	49	15	27	7	0	20	11	9	0	0	70	27	36	7	0
T O T A L	114	63	45	6	0	906	427	247	163	69	277	163	35	49	30	1297	653	327	218	99

Source: JICA Study Team

Table 2.1.10 NUMBER OF WORKERS IN THE STUDY AREA (IRM, 1983)

Municipality District	person, %							
	No. of Establishment		No. of Workers including Family Workers		No. of Workers Per 1,000 heads	Workers per Establishment		
Gen. Nakar	A Total		51	8.9%	93	7.3%	2.5	1.8
	Poblacion		20	3.5	28	2.2	5.0	1.4
	Others		31	5.4	65	5.1	2.0	2.1
Gen. Nakar	B Total		6	1.0	15	1.2	0.9	2.5
	A+B		57	9.9	108	8.4	2.0	1.9
Infanta	C Total		330	57.3	807	62.9	4.6	2.4
	Poblacion		212	36.8	556	43.4	13.7	2.6
	Others		118	20.5	251	19.6	1.9	2.1
Infanta	D Total		48	8.3	85	6.6	1.8	1.8
	E Total		22	3.8	66	5.1	1.2	3.0
Real	C+D+E		400	69.4	958	74.7	3.4	2.4
	F Total		119	20.7	216	16.8	2.5	1.8
	Poblacion		62	10.8	104	8.1	2.0	1.7
Real	Others		57	9.9	112	8.7	3.3	2.0
	G. Total		576	100.0	1,282	100.0	3.1	2.2
	Poblacion		294	51.0	688	53.7	7.0	2.3
Real	Others		282	49.0	594	46.3	1.9	2.1

Source: JICA Study Team

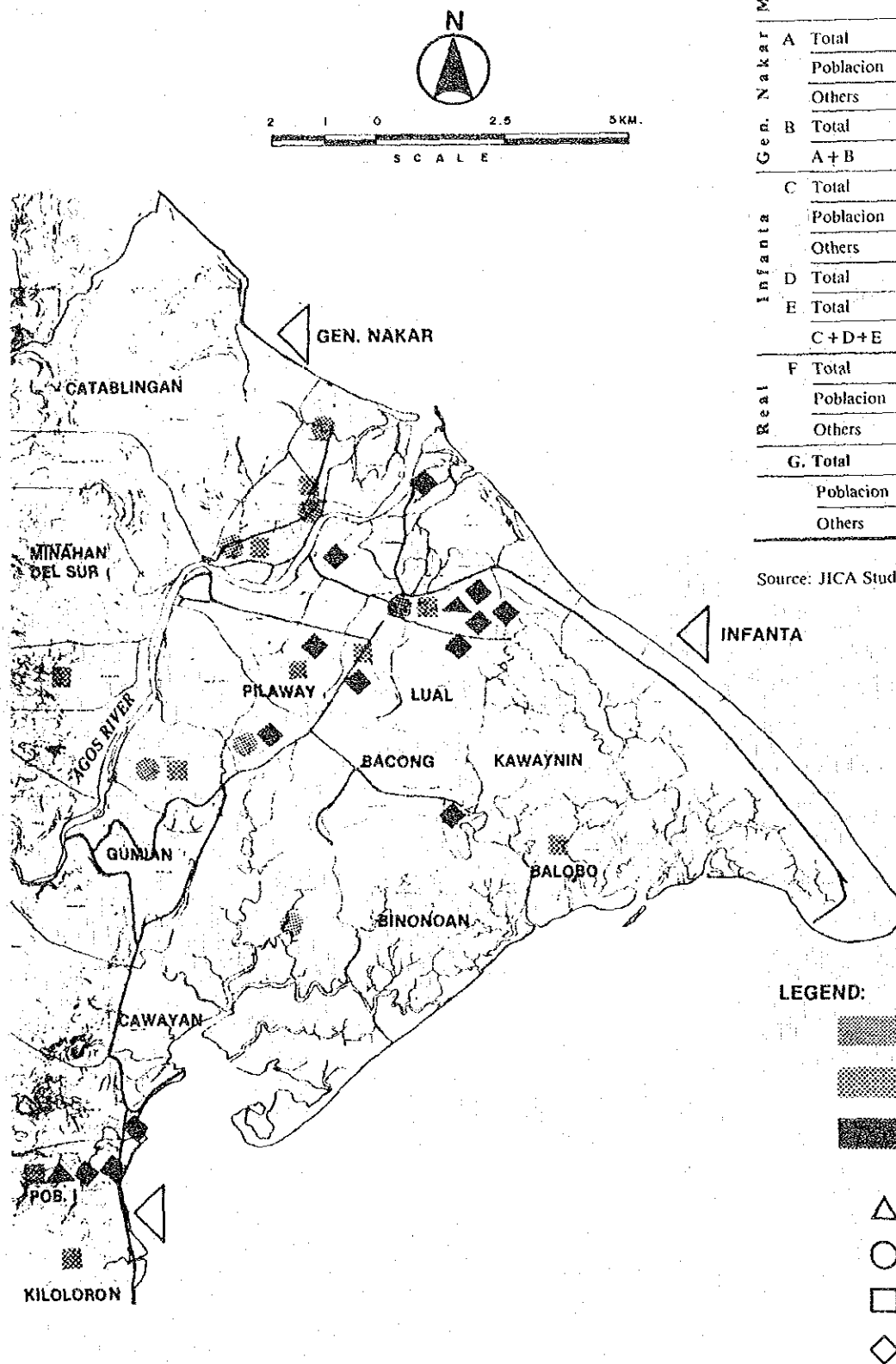


FIG. 2.1.23 ESTABLISHMENT (AGRICULTURE, MANUFACTURING, FINANCING AND COMMUNITY SERVICES)

three and four meters above sea level and along the major traffic flow line in IRM are the Infanta Road and Dinahican Road (Figs. 2.1.23 to 2.1.29).

The sectoral distribution structure of business establishments can be summarized as follows:

(i) Sari-sari stores and other establishments in sales commerce are concentrated in the central downtown area of each municipality at 68.7% in Infanta, 34.3% in General Nakar, and 25% in Real. Two or three such establishments are found in each barangay. In response to population outspread from poblacions, barangays neighboring a poblacion show a high concentration of establishments such as in Bantilan and Comon in Infanta, Ungos in Real, and Anoling in General Nakar.

(ii) Establishments in the transportation business (tricycles) tend to position themselves more around than in urban areas. Barangays with five or more tricycle establishments are all located on the peripheral of Infanta.

(iii) Manufacturing establishments, although small in number, are chiefly located outside urban areas and in barangays along Infanta Road.

3) Activity of the Establishments by Sector

(a) Mining and Manufacturing

All establishments of the mining sector of IRM are gravel pit, with 2 located in Infanta and 1 located in General Nakar. The annual output of these three (3) establishments amounts to 537,000 Pesos (1983).

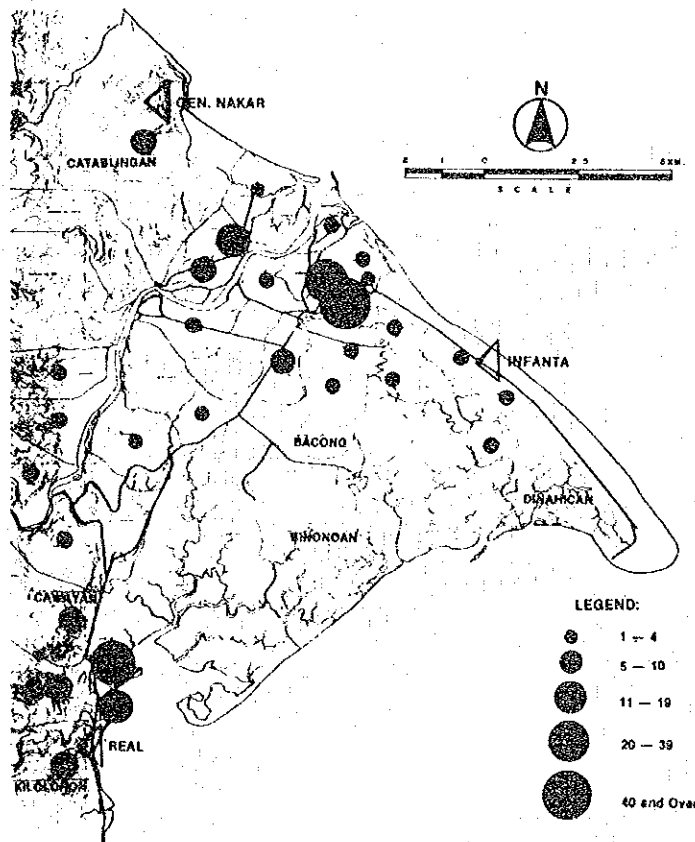


FIG. 2.1.24 ESTABLISHMENT (WHOLESALE & RETAIL TRADE)

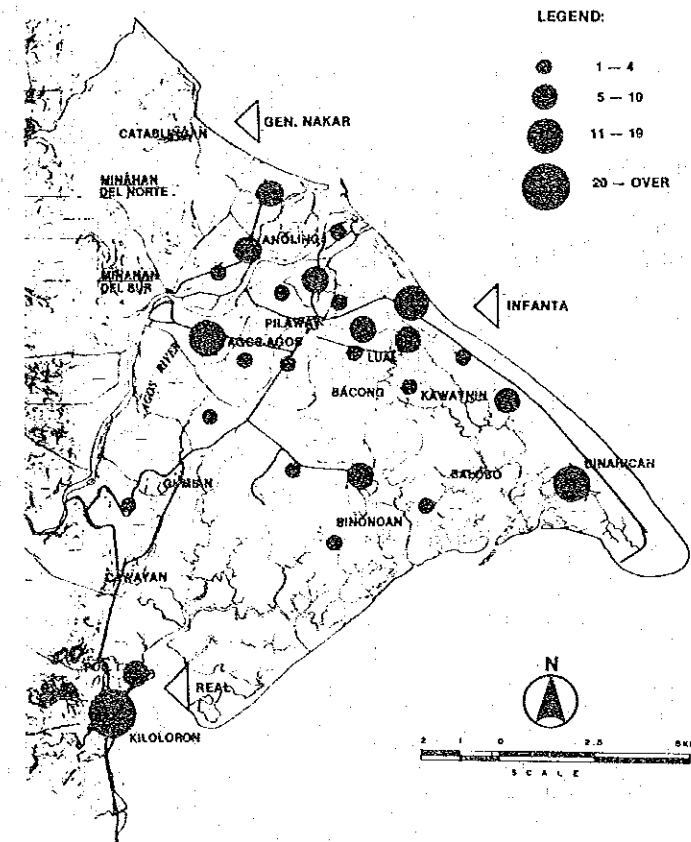
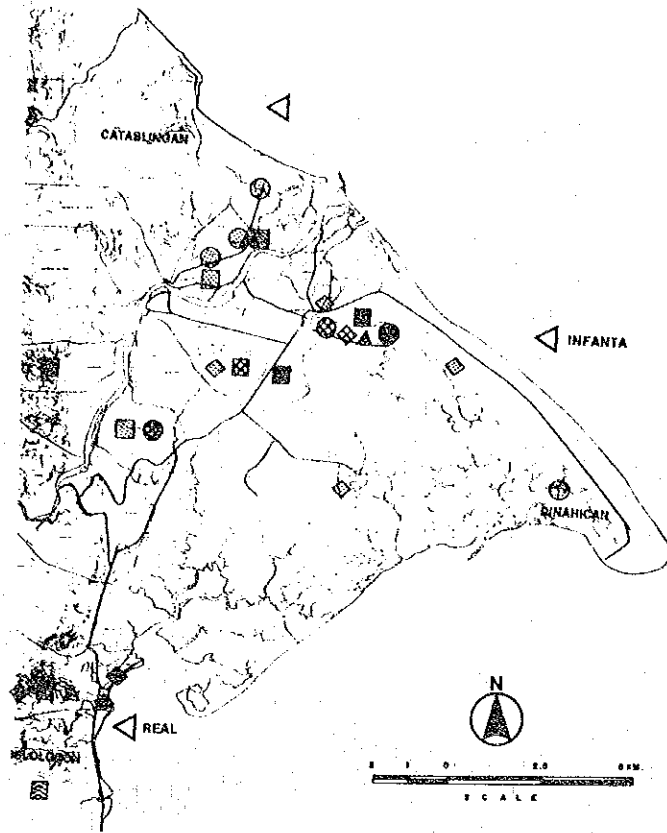


FIG. 2.1.25 ESTABLISHMENT (TRANSPORTATION & COMMUNICATION)



LEGEND: (PERSON)

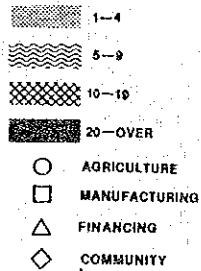
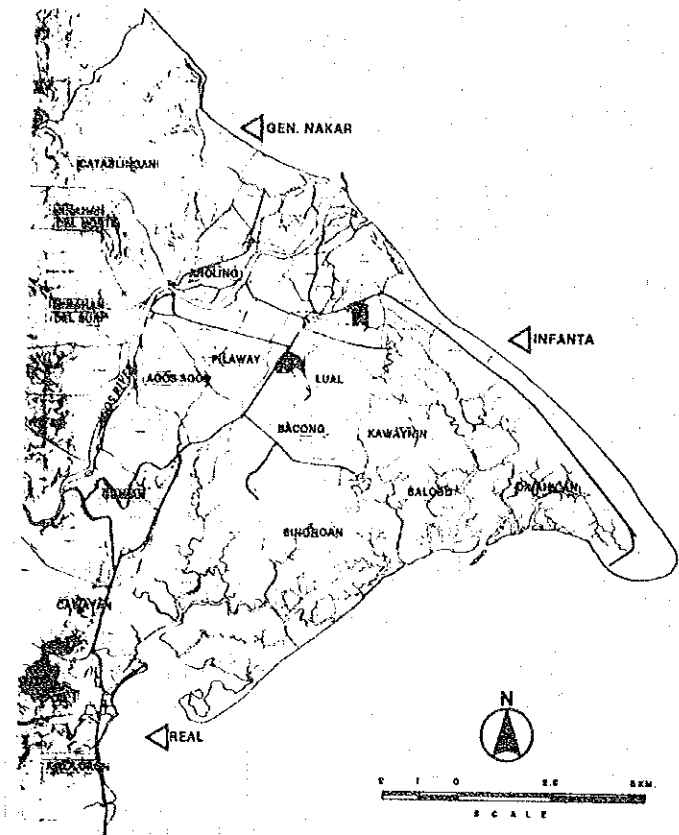


FIG. 2.1.26 WORKERS (AGRICULTURE, MANUFACTURING, FINANCING, COMMUNITY)



LEGEND: (PERSON)

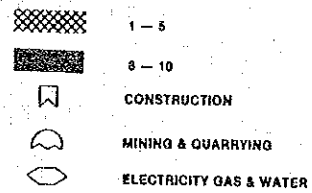


FIG. 2.1.27 WORKERS (ELECTRICITY, GAS, WATER, MINING, QUARRYING & CONSTRUCTION)

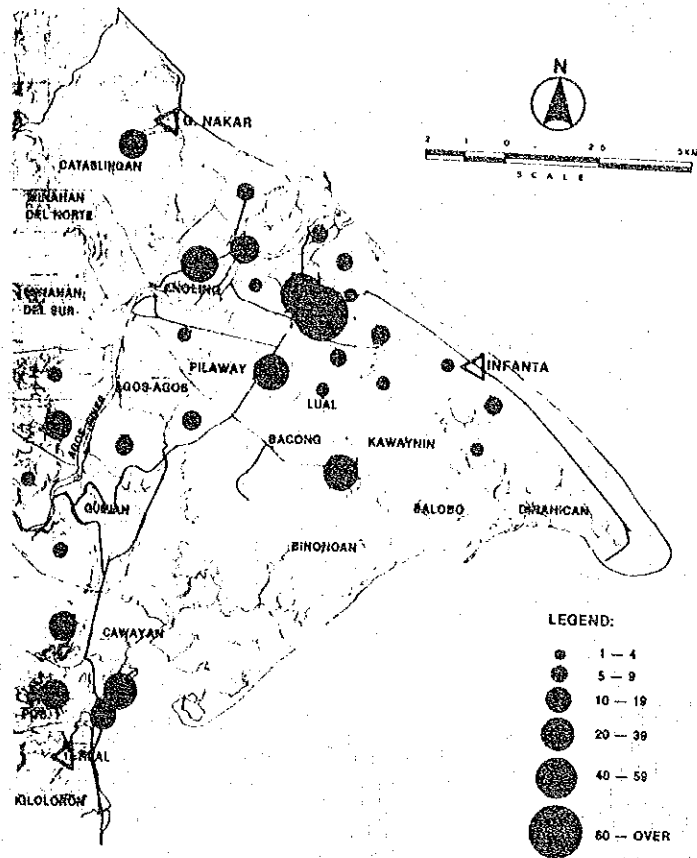


FIG. 2.1.28 WORKERS (WHOLESALE & RETAIL TRADE)

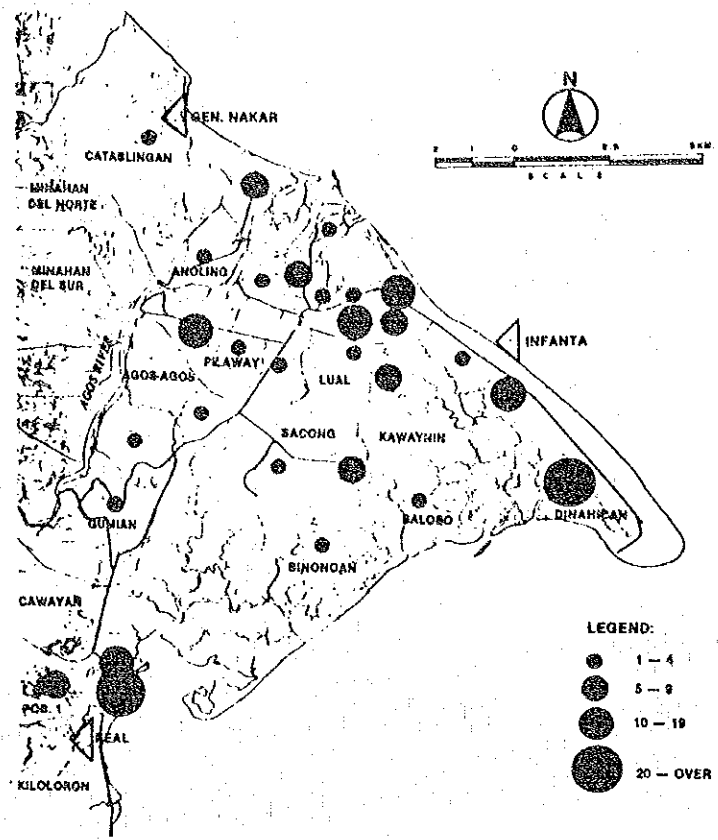


FIG. 2.1.29 WORKERS (TRANSPORTATION & COMMUNICATION)

In the manufacturing sector, there are 51 establishments employing 213 workers with an output of 7,863,000 Pesos. The sewing establishments play the leading part in terms of the number of establishments, the forestry establishments in terms of the number of workers, and the saw mill in terms of shipment value.

The manufacturing establishments located in the study area mostly consist of service industries supplying the daily necessities, with the exception of a very small number of other establishments (e.g. saw mills of Real).

The proportion of the output of manufacturing industries by size of establishment has the following characteristics:

(i) Most of the output of the manufacturing industry of General Nakar consists of small businesses with 1 or 2 workers.

(ii) In Infanta, there is a predominance of medium sized establishments with 5 to 9 workers.

(iii) Establishments with 10 or more workers account for majority of the output of manufacturing industries located in Real.

The following conclusions are drawn from the output distribution by municipality of the output of manufacturing industries in the study area:

(i) Infanta accounts for practically most of the output of industries related to the daily necessities such as tailoring, bakery, rice mill, welding, and distillery because it has the most number of population in the study area. In terms of rice production, most of the rice cultivated in the municipality are used to supply IRM itself.

(ii) Wood industry includes such wood related industries as furniture-making, wood carving, rattan, tanning, charcoal-making, etc. Real plays a leading part in this sector due to the advantage of its port.

(iii) All saw mills are located in Real Port which accounts for 100% of the output of IRM.

(b) Wholesale/Retail Commerce

In the wholesale/retail commerce sector, there are 332 establishments that account for 719 workers and a turnover of 14,107,000 Pesos.

Of this total, wholesale commerce accounts for barely 4.4% since the presence of wholesale establishments in IRM is very rare.

(c) Wholesale Commerce

The turnover of wholesale commerce is barely 590,000 Pesos/year. There are 2 establishments in Infanta and 1 establishment in General Nakar, consisting of 2 copra dealers and 1 fish dealer. Both copra dealers have 1 worker each, with a turnover of 10,000 to 200,000 Pesos/year, and are therefore considered private establishments.

On the other hand, the fish dealer is located in the urban area of Infanta. It has 4 workers and an annual turnover of 500,000 Pesos.

The wholesale establishments have the following functions:

(i) Producer and wholesaler that gather products such as copra, lumber, charcoal, fish, etc., from Infanta and deliver these to market places in Manila and other consumer centers.

(ii) Consumer center and wholesaler that bring in daily necessities from Manila and other places in order to distribute them in the market places (retail commerce) of Infanta.

The dealers described above account for function (i), but the local wholesale commerce is not so developed because dealers and manufacturers from Manila and other major economic centers of the country carry out direct gathering of local products.

As for the function (ii), local retail establishments purchase their commodities directly from wholesalers of Manila and other centers.

(d) Retail Commerce

The turnover of the retail commerce establishments of IRM totalled 13,517,000 Pesos (1983). This turnover divided by the population of IRM is approximately 324 Pesos/inhabitant/year (population as of 1980).

The principal characteristics of the retail commerce of the IRM are as follows:

(i) As mentioned in the case of the wholesale commerce, the commodities procured in the local market places are mostly rice, bread, and some wood products. Most of the commodities handled by the retail commerce of IRM come from Manila and other centers of the country.

(ii) As for the imports from outside the study area, they are handled through the following routes as in the case of the wholesale commerce: Direct wholesale purchase by the local retail establishments in Manila and other major centers in the country; and bulky and heavy commodities that can be gathered in the form of relatively large transportation batches, such as drinks, beer, etc., are delivered by Manila manufacturers and wholesalers.

(iii) Sari-sari (variety) stores play a predominant part in retail commerce not only in IRM but also in the Philippines. They are grocery stores or generally stores stocked with various kinds of daily necessities. Most of them are small-scale shops. In some cases, they have both the scale and the functions of a supermarket.

These stores are scattered throughout the settlements of IRM, and sell basic daily necessities to the population.

These stores obtain the commodities they sell from the large scale sari-sari stores located in principal urban centers.

Consequently, the retail sellers of IRM also function as wholesalers to supply the sari-sari stores with the required commodities.

In terms of the share of turnover by municipality, Infanta accounts for approximately 80%, while General Nakar accounts for an extremely low percentage of approximately 3%. In terms of turnover per capital, Infanta outnumbers Real by 100 Pesos, indicating that it is the center of commercial activities in IRM.

However, it must be borne in mind that the turnover per capital of Real is relatively high presumably because Real is the center of the administrative district. Substantial shopping is done by transit passengers from Polillo Islands and other related places in Real.

(e) Service Sector

According to the standard industrial classification of the Philippines, the service sector is included in Group 9 comprising the community, social, and personal services. The service sector taken into consideration in this study does not include all kinds of service mentioned in this classification, and refers only to the service industry of the private sector.

There are 26 establishments in IRM that belong to one of the following classifications: Restaurant/Hotel; Repair; Amusement; and Others

These establishments of the service sector account for 69 workers and a turnover of 1,088,000 Pesos for 1983.

Restaurants/hotels form the largest number of establishments, workers, and turnovers followed by amusement establishments (cinema).

Barber shops, beauty parlors and photo service shops are included in the classification "others".

As shown, the social demand requiring this kind of service of the private sector is still negligible both socially and individually with the exception of some specific functions (restaurants and movie houses which are the only kind of amusement). IRM is considerably below the average of Region IV in terms of the number of workers and turnover of the service sector per 1,000 inhabitants.

(f) Transportation Sector

The transportation businesses operating regularly in IRM consists of bus, jeepney, and tricycle services. The tricycle transportation service plays a dominant part in the transportation of both passengers and commodities in the study area.

The tricycle transportation business of the study area consists of extremely small establishments, most of them are private ones, consisting of 1.2 workers/establishment on the average.

The annual turnover of each tricycle ride is at an average of 58,400 Pesos for Infanta and Real and 10,600 Pesos for General Nakar.

In view of these figures, it is estimated that the total turnover of the tricycle transportation business as a whole is 7,867,000 Pesos in 1983 representing, therefore, a business of considerable importance within IRM.

(g) Other Establishments

The other kinds of establishments operating in IRM are the financing business and the warehouse business.

The financing establishments are the Rural Bank of Infanta, and Real accounting for 34 and 6 workers respectively. The annual turnover of these establishments sum up to 1.37 Million Pesos. The insurance sector operating in Infanta is the United System Life Plan (10 workers).

There is one establishment in Real engaged in warehousing sector. The warehouse is used to store copra shipped from Real and Polillo with a warehouse charge of approximately 1,000 Pesos per day.

2.1.4 Land Use Characteristics

Overall Land Use Structure

The overall land space utilization structure of IRM (Fig. 2.1.30) consists of the following: (i) spontaneous agricultural land use in conformity with the natural conditions of the land, such as topography and geology; (ii) urban land which accommodated socio-economic, and administrative services for IRM; and (iii) roads for connecting various activities in IRM with each other. See Fig. 2.1.31 and Table 2.1.11 for land areas by present land uses. Fundamental characteristics of the present land use in IRM are as follows (Fig. 2.1.31):

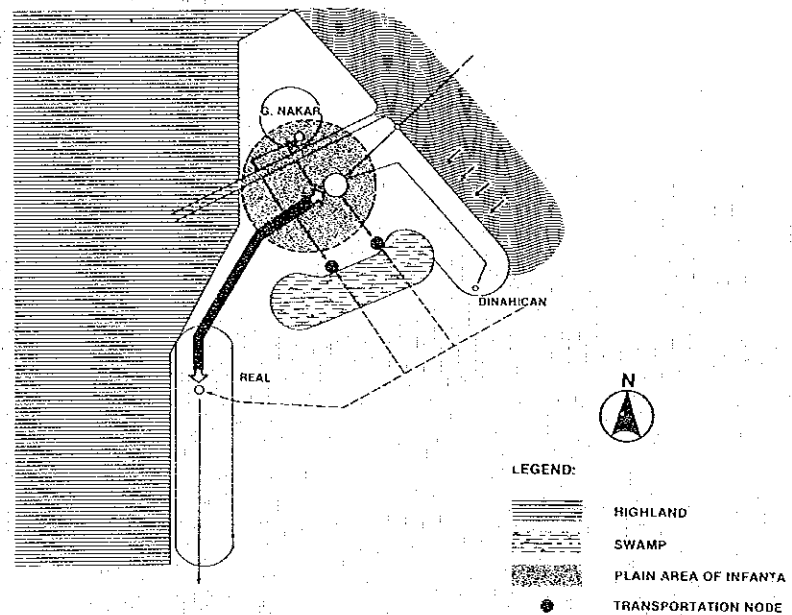


FIG. 2.1.30 EXISTING URBAN STRUCTURE

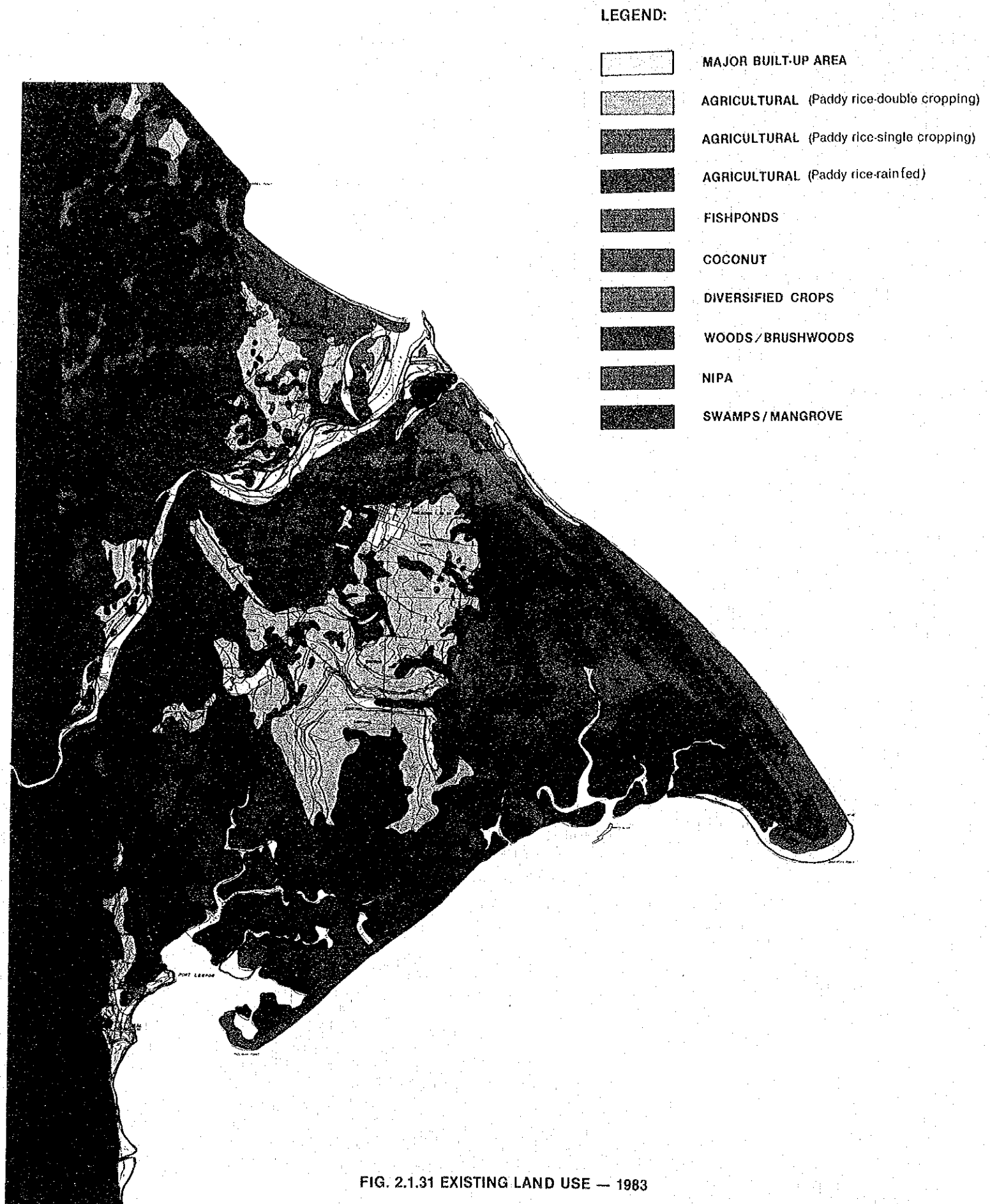


FIG. 2.1.31 EXISTING LAND USE — 1983

Table 2.1.11 LAND USE AREAS (IRM, 1983)

Classification	Gen. Nakar	Infanta	Real	G. Total
Coconut Groves	1,349.7 (31.1)	1,865.1 (21.1)	34.1 (1.6)	3,248.9 (21.3)
Mangroves	—	1,627.6 (18.5)	368.4 (17.3)	1,996.0 (13.1)
Nipa	—	439.9 (5.0)	149.1 (7.0)	589.0 (3.9)
Woods & Brushwoods	2,109.2 (48.6)	818.2 (9.3)	1,352.3 (63.5)	4,279.7 (28.0)
Paddy Rice Single Cropping	—	651.0 (7.4)	—	651.0 (4.3)
Paddy Rice Double Cropping	451.3 (10.4)	1,548.4 (17.6)	49.0 (2.3)	2,048.7 (13.4)
Paddy Rice Rainfed	—	123.2 (1.4)	—	123.2 (0.8)
Built-Up Areas	17.4 (0.4)	96.8 (1.1)	27.7 (1.3)	141.9 (0.9)
Swamps	—	395.9 (4.5)	—	395.9 (2.6)
Fish Ponds	—	712.6 (8.1)	29.8 (1.4)	742.4 (4.9)
Diversified Crops	325.5 (7.5)	8.8 (0.1)	40.5 (1.9)	374.8 (2.5)
Others	86.8 (2.0)	510.2 (5.8)	78.7 (3.7)	675.7 (4.4)
Area of Municipality	4,339.9ha	8,797.7ha	2,129.6ha	15,267.2ha

Note: Figures in parentheses are share (%) to total.

Source: JICA Study Team

1) Spontaneous Land Use

The geological classification of the land of IRM generally coincides with the topographical classification by elevation above sea level. These classifications which governed the present spontaneous land are the swamp areas with elevation of one meter or less above sea level; the peninsular sandbar with the elevation of one to three meters, which is chiefly used for coconuts; plains of Infanta and General Nakar with the elevation of one to ten meters, which are chiefly planted to rice; and the hills rising over ten meters above the sea, which are chiefly for coconuts.

2) Urban Structure-Centers and Traffic System

The center of each of the three (3) municipalities is rationally located, and supplies various urban services to the area.

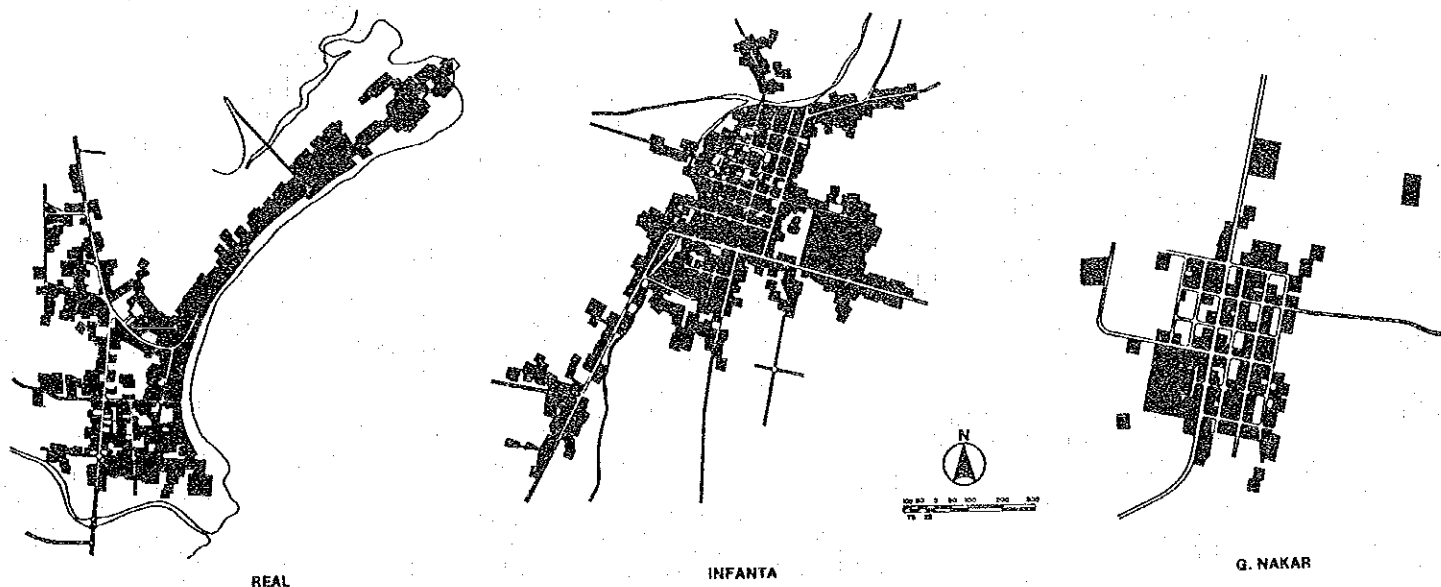


FIG. 2.1.32 EXISTING BUILT-UP AREAS

Table 2.1.12 CHARACTERISTICS OF LAND USE (IRM)

Area	Above Sea Level	Soil	Characteristics
A. Swamp	Below 1m	Hydrosoil	Mangroves, Nipa, etc.
B. Sandbar extending towards Dinahican Point	1m — 3m	Buguey, loamy sand	Extensive, agricultural area, mainly coconuts
C. Infanta, Gen. Nakar heights areas	1m — 10m mainly, 4m-5m	Quingasilt-loam	Intensively cultivated land, mainly paddy
D. Stretch of hills, foot of Sierra Madre mountains	10m-over	Antipolo sandy clay	Forest, coconuts

Source: JICA Study Team, 1983

The center of Real is located on the node of Infanta Road, which leads to Manila, and the marine transport base serving the eastern waters, and functions as entrance to IRM.

The center of Infanta is conveniently located at the middle of the Infanta plain with easy access to the coastal area, to the swamp area, and to General Nakar and functions as the center of IRM.

The center of General Nakar, located in the middle of the flat land between the coastal line and the hills situated close to the center of Infanta functions as the sub-center of IRM.

In addition, small centers are formed where barangay roads, which lead from Infanta center or Infanta Road, meet with swamp creeks or the coast line. These small centers function as fish (coastal catches and cultured) landing points or relay points of passengers (for shopping in Infanta) or goods (such as coconuts, charcoal), and as IRM sub-centers.

The flow of goods carried in and out, or within IRM all converge at Infanta Road which connects the centers of Infanta and Real and which constitutes the spine of IRM's urban structure and the axis of economic activities in IRM.

Spontaneous Agricultural Land Use

The above-mentioned classification by elevation can be matched with the characteristic land uses as follows (Table 2.1.12):

Area A: This is an expanse of swamp area on the south of Infanta. In this area, where elevation is one meter or less above the sea level, tidal range is from 1.09 meters to 1.14 meters. The soil of this area called hydrosoil is usually submerged, and is generally covered with natural vegetation such as mangroves and nipas. Fish ponds have been opened in the swamp area which is suited for fish culture.

Most of the agricultural activities in IRM are limited to land with an elevation of one to ten meters above sea level.

Area B: This is a peninsula with sandbars extending to Dinahican, formed with relatively new alluvial earth and sand carried by the Agos River. The soil is classified as buguey, loamy sand. The problem of salty soil and inadequate supply of irrigation water prevent this land from being utilized for agricultural purposes, except for sea water-tolerant coconuts, as well as small scale banana and root vegetable farms.

Area C: The plains of Infanta and General Nakar, where soil is denatured alluvial deposits classified as quingua silt-loam, represents the great majority of agricultural activities in IRM. In this area are intensive farms of rice, coconut, and corn, as the major crops. Most of the Infanta plain, which extends within the elevation range of four to five meters above the sea level, shall be covered and served by the Agos River Irrigation Project.

Area D: The hills on the western edge of IRM is suited for coconut plantations where developed coconut forests grow in the hills.

Urban Land Use

The basic characteristics of land use in the centers of the three municipalities are discussed hereunder.

1) Urbanization

The centers of the three (3) municipalities are the areas where roads have been developed in a lattice pattern, but in Infanta and Real urbanization has progressed beyond the centers and along the major roads (Fig. 2.1.32). The urbanized areas are 46.8 hectares in Infanta, 35.6 hectares in Real, and 11.8 hectares in General Nakar, and vacant lots still remain in the latter two (2) for further urbanization.

The average ratios of ground floor size and total floor size to land size are 15.5% and 10.5%, respectively, in Infanta (where average number of building floors is 1.33 stories) 11.5% and 12.0%, respectively, in Real (average 1.04 stories), and 9.9% and 10.5% respectively in General Nakar (average 1.06 stories). In Infanta, buildings stand along the road, and wooden and nipa houses are seen along the coastal line. In General Nakar, buildings are generally wooden or mortar finished timber frame with a mixture of nipa houses (Table 2.1.13, Figs. 2.1.33 to 2.1.35).

2) Land Utilization

(a) **Infanta** - Markets along the Bantilan River, which flows from the west to the north of the downtown area, and other commercial areas are scattered in the downtown, while schools and other public facilities are located on the town peripheral. Housing land account for 42.4% of the urban center, public facilities land account for 15.8%, and commercial land at 12.7% (Fig. 2.1.36, Table 2.1.14).

(b) Real - In this municipality, urbanization pattern is that of mixed linear formation of downtown areas along Infanta Road or the coastal line, rather than the area formation seen in Infanta. Along Infanta Road are commercial and public facility lands while along the coastal line are the rows of fishermen's houses from the urban center to Real Port. Housing land represents 53.2% of the urban center, roads represent 11.7%, and vacant lots, 15.4% (Fig. 2.1.37).

(c) General Nakar - General Nakar has a small urban center, where major land uses are housing (many housing premises are also used for agricultural purposes), roads, and public facilities, and therefore, it does not fully represent the character of an "urban center". Major uses in this "urban center" are housing (31.0%) public facilities (20.0%), roads (17.2%), and forests (16.7%) (Fig. 2.1.38).

Table 2.1.13 BUILDINGS IN BUILT-UP AREAS (IRM, 1983)

	GEN. NAKAR		INFANTA		REAL	
	Central District	All Built-Up Area	Central District	All Built-Up Area	Central District	All Built-Up Area
Built-Up Area (1,000m ²)	118.25	118.25	307.68	467.59	236.16	356.00
No. of Buildings	123	123	521	725	455	790
Building Area (1,000m ²)	11.71	11.71	60.17	72.45	25.29	40.81
Floor Area (1,000m ²)	12.41	12.41	80.00	96.47	26.05	42.59
Building Density (per ha)	10.4	10.4	16.9	15.5	19.3	22.2
Building Ratio (%)	9.9	9.9	19.9	15.5	10.7	11.5
Building Vol. ratio (%)	10.5	10.5	26.0	20.6	11.0	12.0
Ave. Stories of Buildings	1.06 ^{F1}	1.06 ^{F1}	1.33 ^{F1}	1.33 ^{F1}	1.03 ^{F1}	1.04 ^{F1}

Source: JICA Study Team

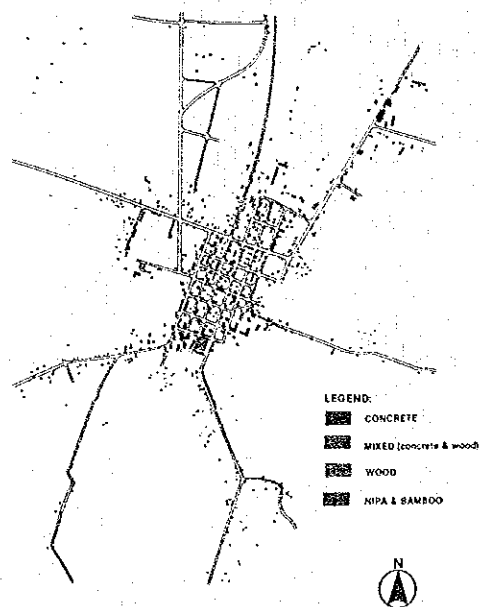


FIG. 2.1.33 BUILDING INVENTORY BY STRUCTURE (INFANTA)

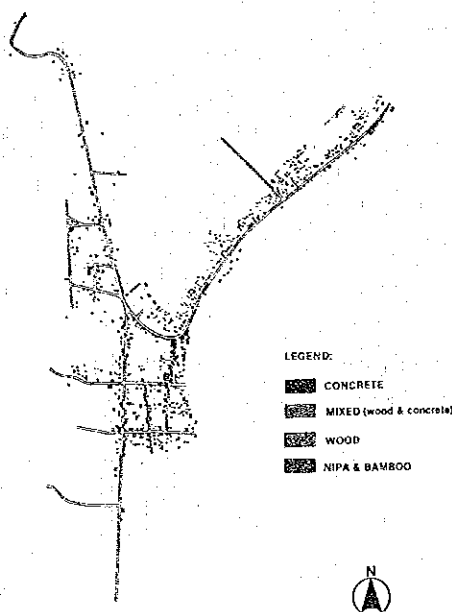


FIG. 2.1.34 BUILDING INVENTORY BY STRUCTURE (REAL)

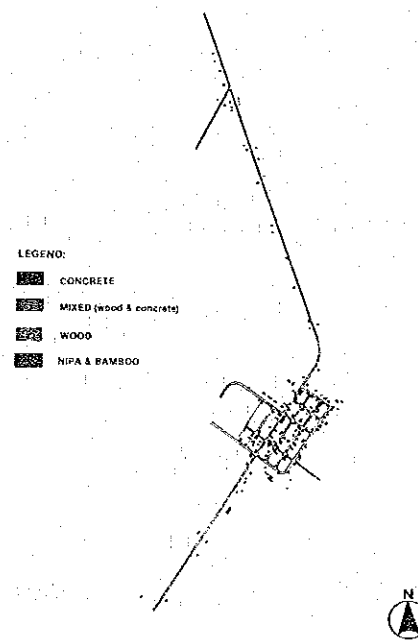
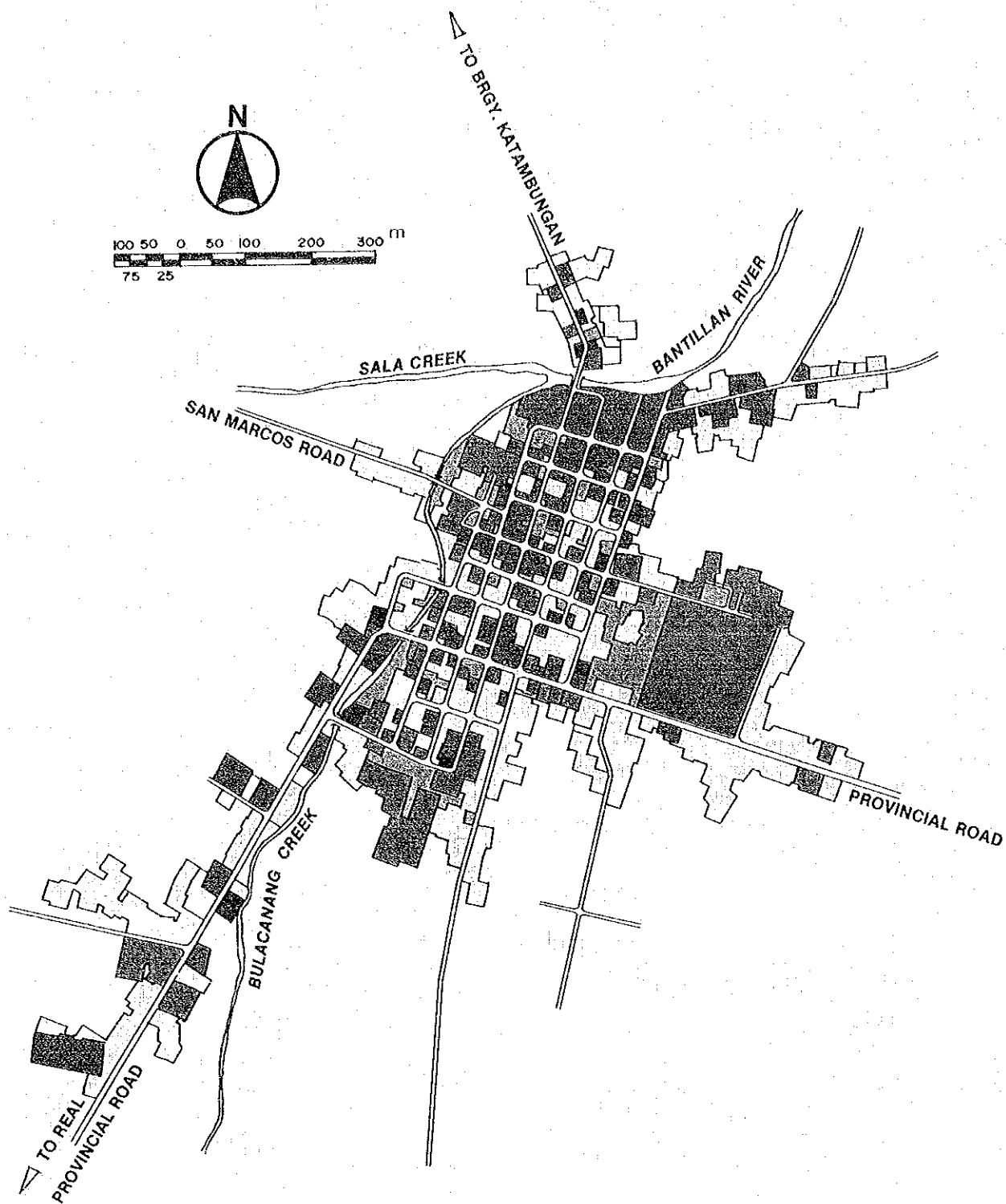


FIG. 2.1.35 BUILDING INVENTORY BY STRUCTURE (GEN. NAKAR)



LEGEND:

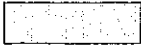







	RESIDENTIAL (SINGLE FAMILY)		TRANSPORT, UTILITIES AND COMMUNICATION
	RESIDENTIAL (MULTI-FAMILY)		MANUFACTURING
	COMMERCIAL		OPEN SPACE (IDLE)
	INSTITUTIONAL (PUBLIC, SEMI-PUBLIC)		AGRICULTURAL (LIVESTOCK)

FIG. 2.1.36 EXISTING LAND USE OF BUILT-UP AREA (INFANTA)

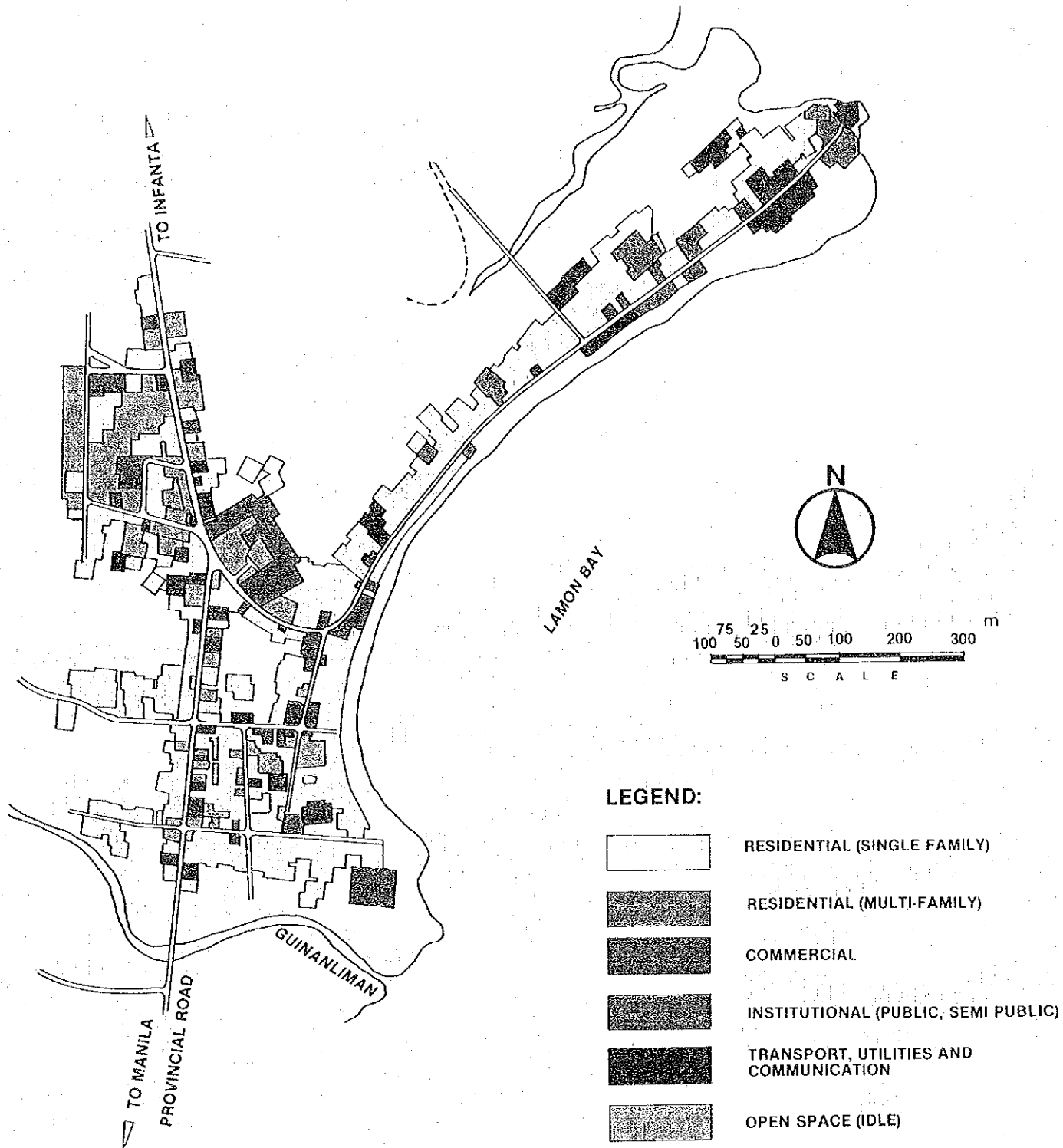
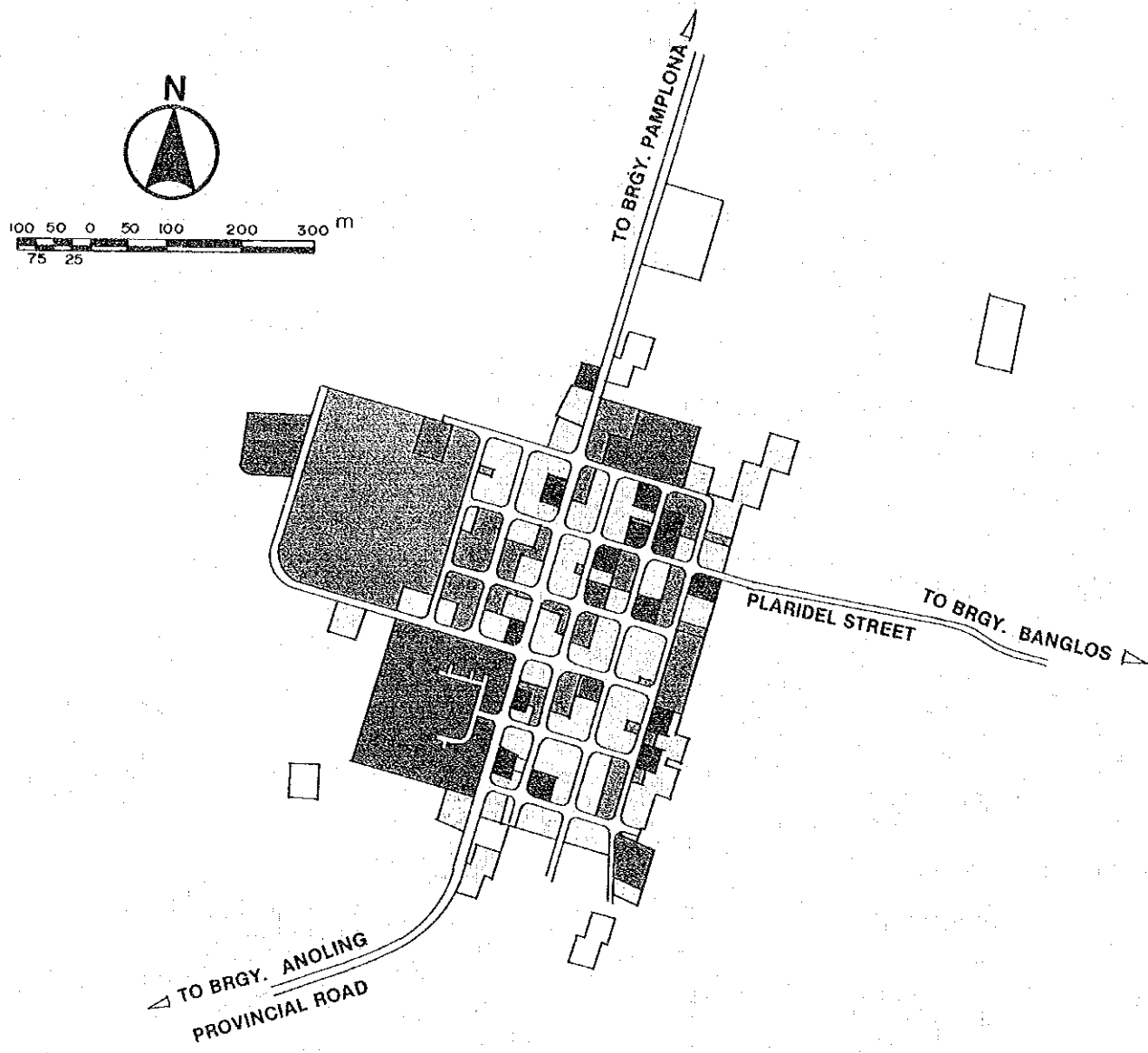


FIG. 2.1.37 EXISTING LAND USE OF BUILT-UP AREA (REAL)



LEGEND:

- | | | | |
|---|-----------------------------|--|-------------------------------------|
|  | RESIDENTIAL (SINGLE FAMILY) |  | INSTITUTIONAL (PUBLIC, SEMI-PUBLIC) |
|  | COMMERCIAL |  | OPEN SPACE (IDLE) |

FIG. 2.1.38 EXISTING LAND USE OF BUILT-UP AREA (GEN. NAKAR)

Table 2.1.14 LAND USE AREAS IN BUILT-UP AREA (IRM, 1983)

Land Use	ha (%)					
	General Nakar		Infanta		Real	
	Central District	All Built-Up	Central District	All Built-Up Area	Central District	All Built-Up Area
Residential	36.67 (31.0)	36.67 (31.0)	121.65 (39.5)	198.28 (42.4)	115.82 (49.0)	184.53 (53.2)
Single Family	36.67 (31.0)	36.67 (31.0)	113.28 (36.8)	186.63 (39.9)	113.60 (48.1)	184.52 (51.8)
Multi Family	0 (0)	0 (0)	8.37 (2.7)	11.65 (2.5)	2.22 (0.9)	5.01 (1.4)
Commercial	5.49 (4.6)	5.49 (4.6)	48.16 (15.7)	59.58 (12.7)	17.42 (7.4)	21.23 (6.0)
Institutional	23.67 (20.0)	23.67 (20.0)	63.88 (20.8)	74.04 (15.8)	17.83 (7.5)	29.76 (8.4)
Transport Utilities	0 (0)	0 (0)	3.27 (1.1)	3.27 (0.7)	2.29 (1.0)	19.96 (5.3)
Manufacturing	0 (0)	0 (0)	2.45 (0.8)	4.37 (0.9)	0 (0)	0 (0)
Open Space	12.39 (10.5)	12.39 (10.5)	19.80 (8.7)	32.57 (7.0)	54.00 (22.9)	54.76 (15.4)
Func. Open Space	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Vacant Lot	12.39 (10.5)	12.39 (10.5)	19.80 (8.7)	32.57 (7.0)	54.00 (22.9)	54.76 (15.4)
Forestry	19.71 (16.7)	19.71 (16.7)	0.31 (0.1)	0.31 (0.1)	0 (0)	0 (0)
Road	20.32 (17.2)	20.32 (17.2)	41.13 (12.4)	50.95 (10.9)	28.80 (0.2)	41.76 (11.7)
Total	118.25 (100.0)	118.25 (100.0)	307.68 (100.0)	467.59 (100.0)	236.16 (100.0)	356.00 (100.0)

Source: JICA Study Team

2.1.5 Transport Facilities

Traffic Flow Characteristics

1) Long Distance Traffic Flow

The position of IRM in a greater area shall be defined through the discussion of traffic flow characteristics between IRM and other areas, as well as among the three (3) municipalities of IRM.

(a) Passenger Flow

Passengers move between IRM and other areas by bus and ferry. The bus OD survey reveals (Fig. 2.1.39) that the major (64%) origin/destination of trips to and from IRM is Manila, and indicates a heavy direct communication between the two. After Manila, IRM is strongly connected with Rizal and Laguna Provinces. It is Infanta that has strong ties with these outside areas while General Nakar has little communication with them.

The results of the OD trip survey of ferry passengers between Infanta and Polillo Island indicates that the island has a strong and direct communication with Manila. Ferry passengers merely pass through Real and go to and from Infanta indicating that Infanta has more active communication with the island.

Single major purpose of travel except travel between IRM and Manila is shopping which accounts for 22.8% of total trips, but the shopping trip makers are mostly retail store owners in IRM rather than consumers. This is also true with trips between Polillo Island and Manila or Infanta. Thus,

long distance trips to and from IRM are purposely for acquisition of daily necessities (Fig. 2.1.40).

(b) Goods Flow

Goods flowing to and from IRM can be classified into the following: (1) primary and industrial products; and (2) commercial merchandises (see Fig. 2.1.41). Their flow can be characterized as follows:

(i) Most of the goods carried out of IRM fall under category (1) above, while most of goods carried into IRM fall under category (2) above. Major items are the following:

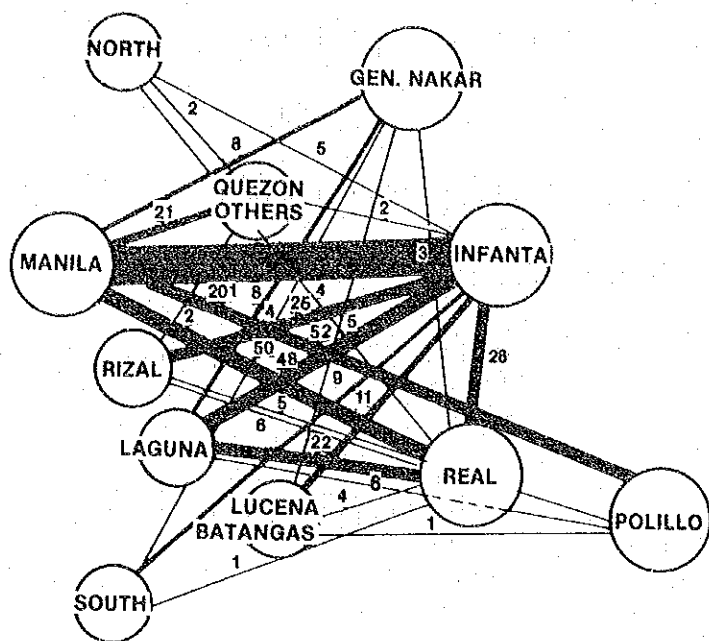
Inbound: Clothings, canned goods, grains, petroleum, ice, automobile parts, sundry daily goods.

Outbound: Wood carving and craft work items, furniture, charcoal, fish, and alcoholic beverages

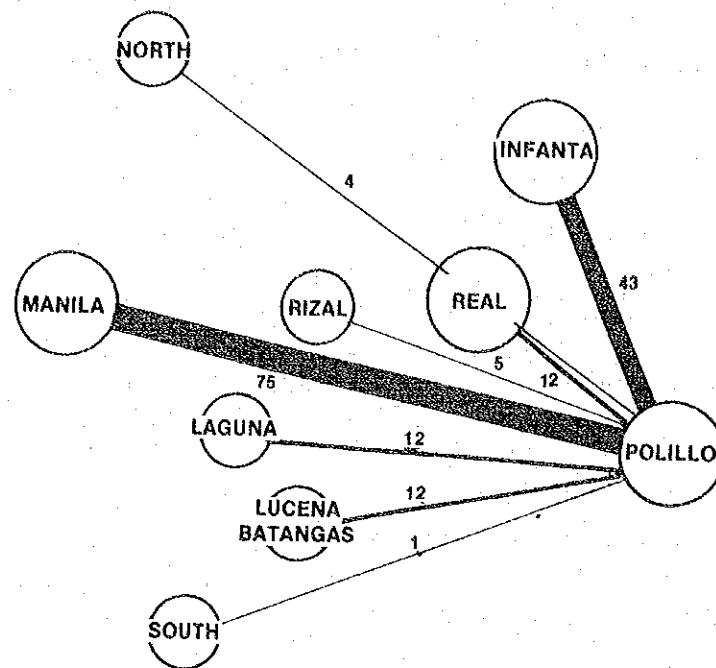
(ii) Goods in category (1) are shipped mostly (over 80%) to Manila, the remainder being shipped to Canlubang (Laguna Province) Baler (Aurora Province), and Atimonan (Quezon Province). Goods from Polillo Island, except for fish, are shipped to Manila markets via Real or Infanta.

Goods in category (2) above mostly (80%) come from Manila. Demands for such goods in Polillo Island and General Nakar are met with shipments from Real or Infanta. IRM is self-sufficient in rice, bread, and beverages.

Trucks and buses share goods transport 50-50. Operators, outside IRM are responsible for 70% of the trucks. One of three trips are made per month on the average for the transport of industrial raw materials and products from Manila while those for the transport of food and other daily necessities are made once a week (Fig. 2.1.42).



BUS O.D. TRIPS (FROM I.R.M., PERSONS/DAY)



FERRY O.D. TRIPS (TO POLILLO, PERSONS/DAY)

FIG. 2.1.39 O.D. TRIPS OF IRM

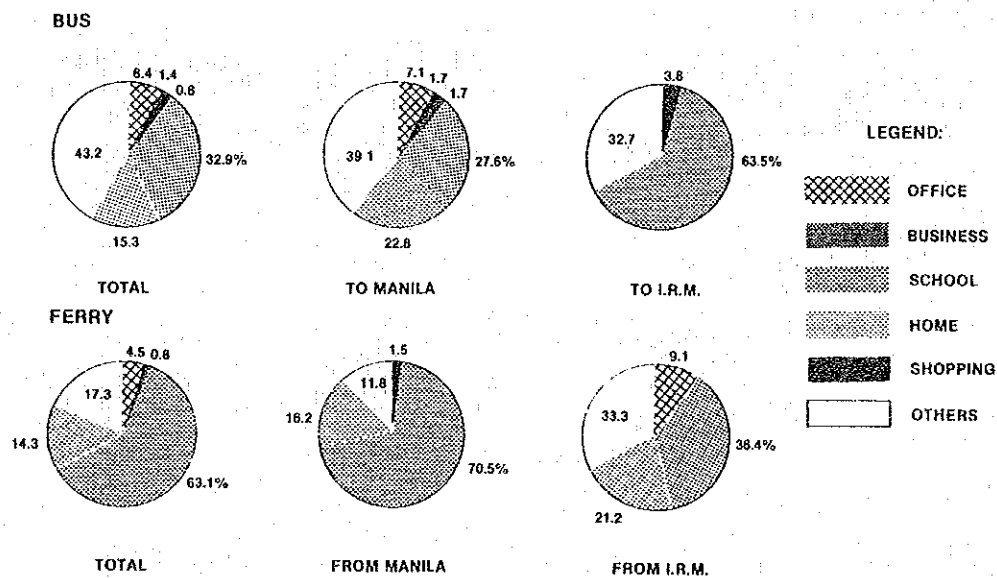


FIG. 2.1.40 PASSENGER TRIP PURPOSE

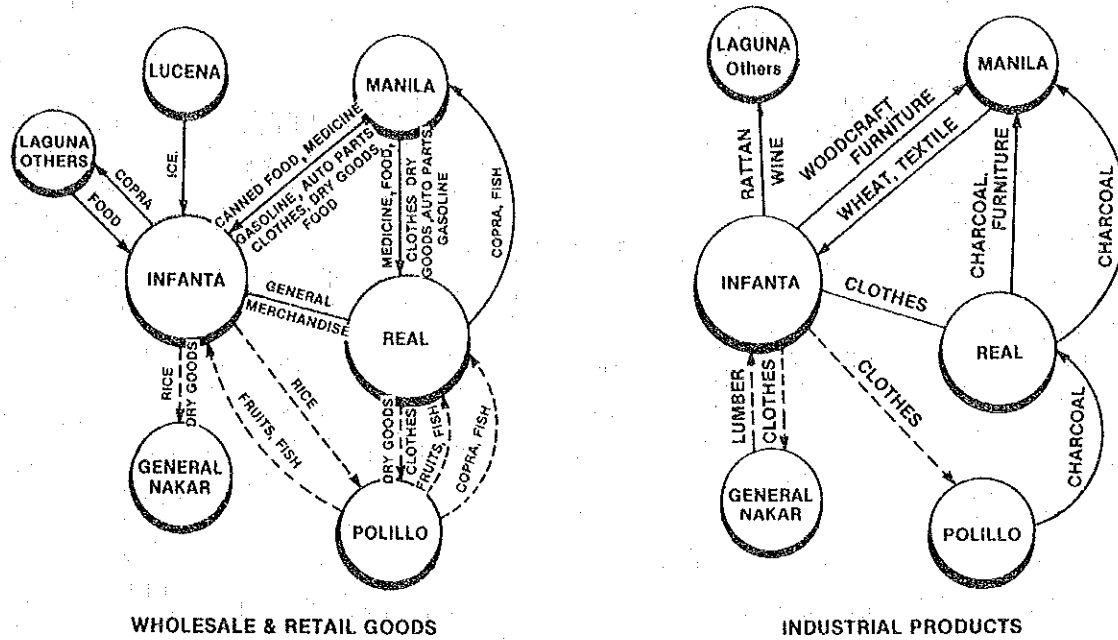


FIG. 2.1.41 DISTRIBUTION OF GOODS

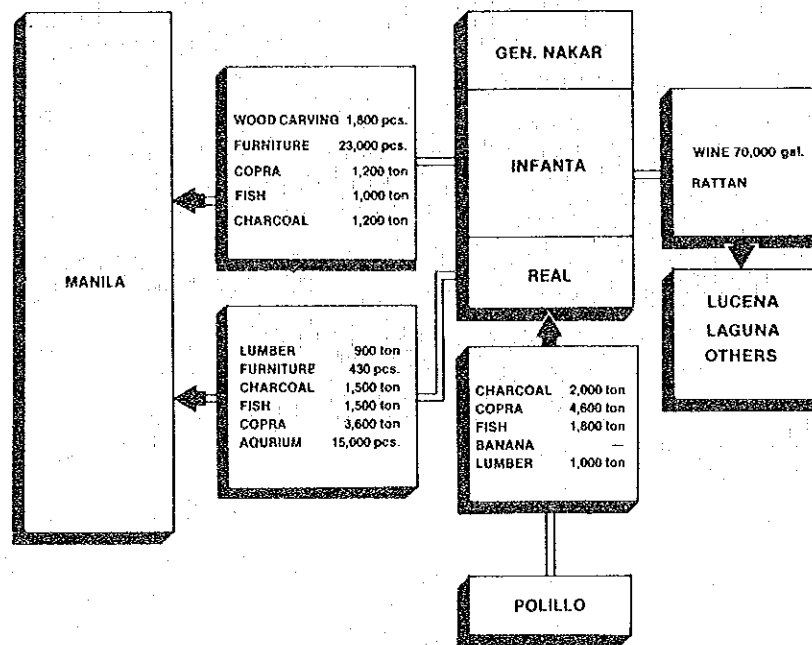


FIG. 2.1.42 DISTRIBUTION OF ANNUAL FREIGHT SHIPMENT

In summary, Infanta and Real are on a par with each other with regard to industry and service, while Real belongs to Infanta's consumption sphere with regard, particularly, to rice and other food supplies. General Nakar is totally reliant upon Infanta; and Polillo Island relies on Infanta and Real (Fig. 2.1.43).

2). Intra-IRM Traffic Flow

The flow of traffic to, from, and in IRM can be understood by the pattern shown in Fig. 2.1.44 summarized as follows:

(i) A marine transport axis between IRM and the eastern waters exists connecting Real Port and Polillo Island. This is both in terms of passenger flow and goods flow. At nodal points on the coastal line or in the swamp area, fish is landed from bancas and passengers from Polillo go ashore to reach the final destination of population and commodity conversion dispersion centers in Infanta, thus, achieving a shorter time distance than that between Polillo Island and Real Port.

(ii) Infanta Road, which connects the urban areas of Infanta and Real with each other is the land transport axis. Converged to and dispersed from it are the flows of passengers and goods from areas outside IRM, and passengers and goods moving between Infanta and Real, as well as other intra-IRM flows, including those landed at said nodal points.

(iii) General Nakar is directly under the influence of Infanta but because no direct motor access to General Nakar is available, all of the passengers and goods moving to and from it are carried via ferry across the Agos River.

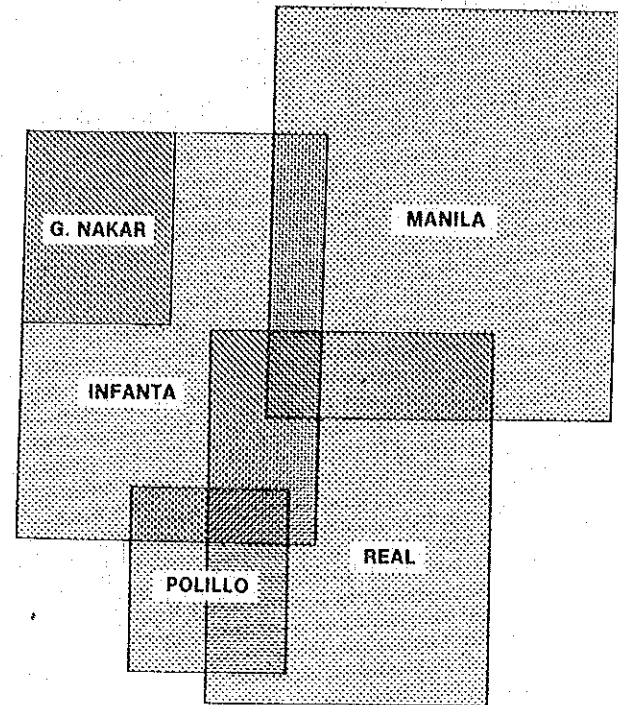


FIG. 2.1.43 ORIENTATION OF THE THREE MUNICIPALITIES

Modal Transport Characteristics

Major modes of transport available in IRM are characterized as follows:

(i) Tricycles, which account for 71% of total vehicles registered (see Table 2.1.15 for the 1983 registration), are the major means of transport in IRM. Other types of vehicles in Infanta include 21 trucks, 11 jeepneys, and 6 jeeps. Thus, passengers depend on public utility modes of transport, i.e., bus, jeepney, and tricycle.

Table 2.1.15 NUMBER OF REGISTERED VEHICLES (IRM, 1983)

	Tricycle	Others	Total	No. of Vehicles/ 1,000 pop.
Infanta	175 (82.2)	38 (17.8)	213 (100.0)	6.97
Real	24 (33.8)	47 (66.2)	71 (100.0)	4.47
Gen Nakar	10 (100.0)	0	10 (100.0)	0.76
Total	209 (71.1)	85 (28.9)	294 (100.0)	4.94
Lucena City*	322 (10.8)	2,666 (89.2)	2,988 (100.0)	27.74
Quezon**	—	—	8,079	7.15

* Year of 1980

Note: Figures in parentheses are share to total (%).

Source: MPWH

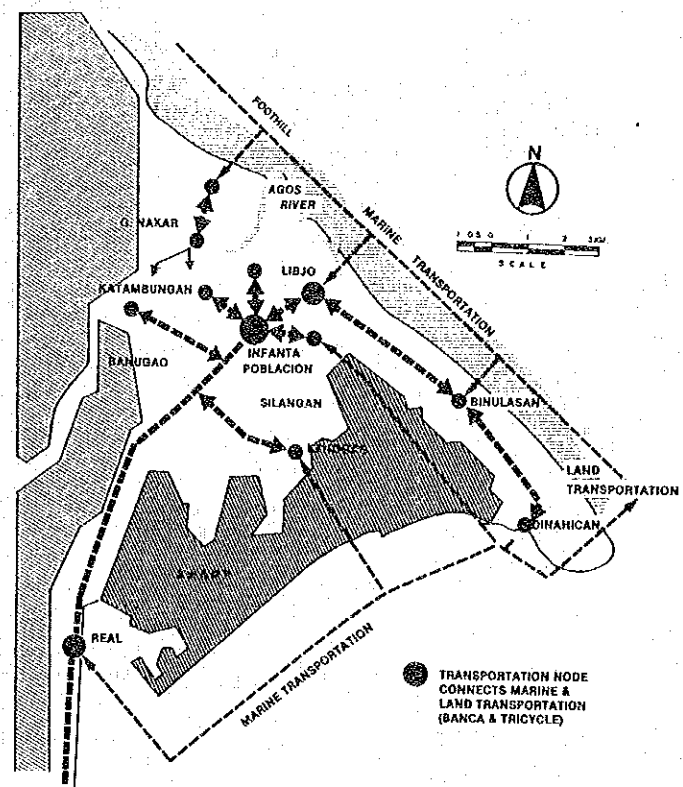


FIG. 2.1.44 LOCATION OF TRANSPORTATION NODE

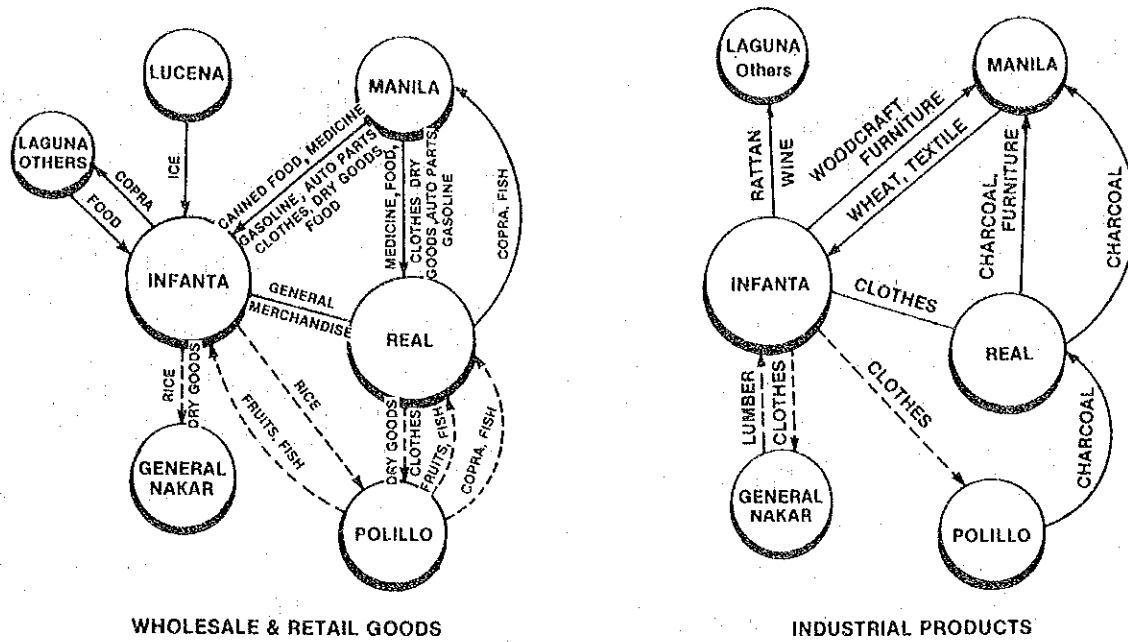


FIG. 2.1.41 DISTRIBUTION OF GOODS

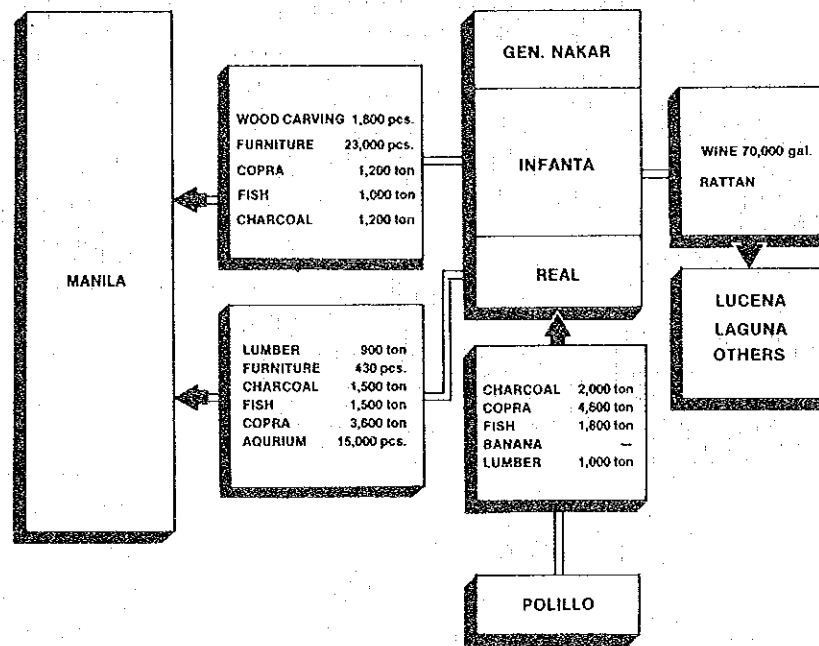


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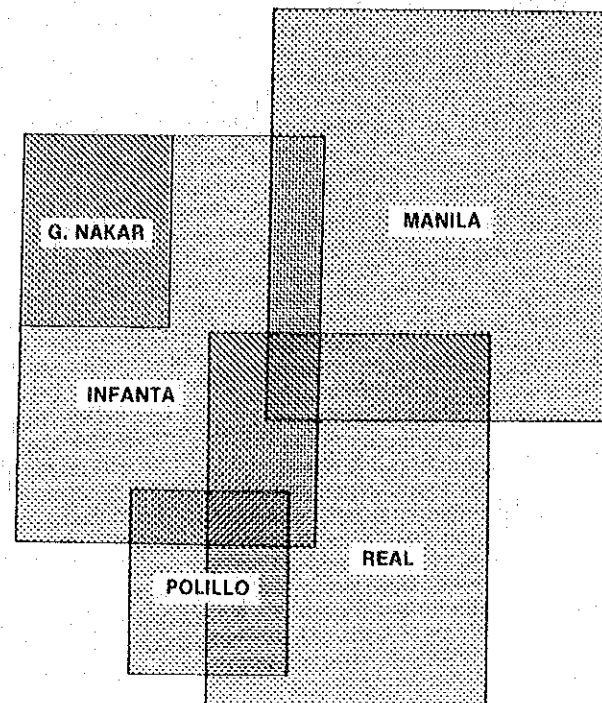


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* Year of 1980

Note: Figures in parentheses are share to total (%).

Source: MPWH

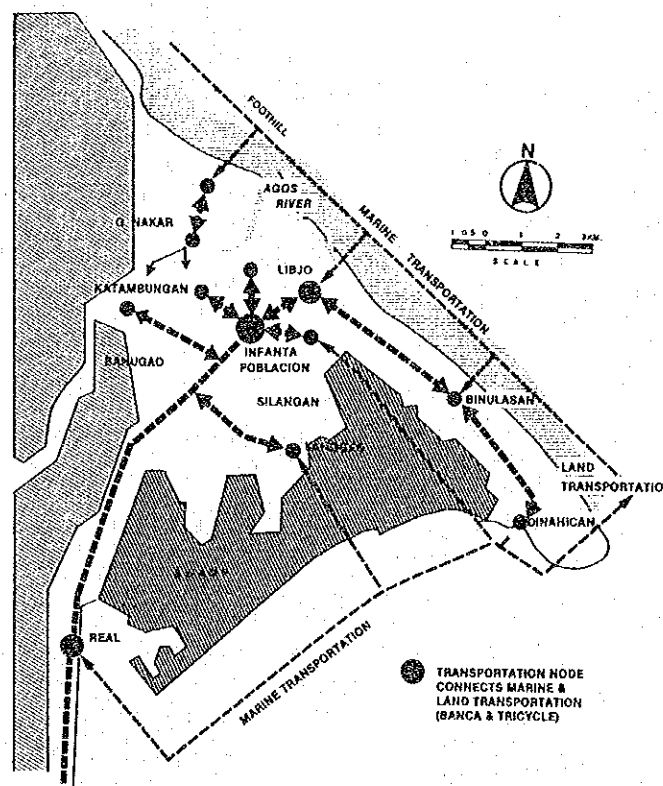


FIG. 2.1.44 LOCATION OF TRANSPORTATION NODE

(ii) In view of the total dependence on public mode of transport (and the absence of private cars), the level of motorization indicated by the average number of vehicles per population of 1,000 has an entirely different significance from that in advanced cities, such as Lucena.

(iii) These public modes of transport are playing an important role in the economy and industry of IRM, inasmuch as they are used for the transport not only of passengers but also of goods.

(iv) These public modes of transport have service areas in terms of distance, thus, tricycles accommodate trips within IRM, jeepneys meet trip demands between IRM and neighboring cities, and long trips to and from Manila are made by buses (Fig. 2.1.45).

(v) Furthermore, the pattern of transport modes utilization in IRM is such that tricycles are used for passenger and goods flow between the urban center and the aforementioned small transport nodes located along the coastal line, swamps, and the Agos River, while jeepneys serve on the route to which Infanta-Real traffic converge.

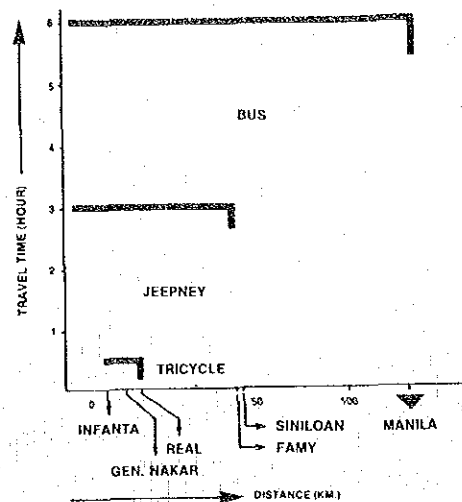
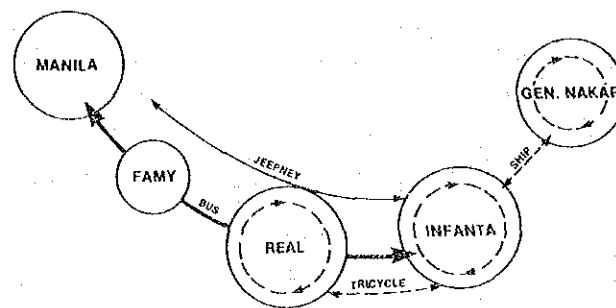


FIG. 2.1.45 MODAL SPLIT OF PUBLIC TRANSPORTATION

Transport Facilities

1) Roads

(a) Regional Road Network

Manila East Road and Infanta Road together connect Metro Manila, Rizal Province, and IRM. Metro Manila-Famy Road, which leads from Manila, runs on the north and east coast of Laguna de Bay and reaches Santa Cruz, the capital of Laguna Province. Manila East Road connects population/industrial centers of Laguna Province, which are located on Laguna de Bay, with Manila while it supports socio-economic interactions between such centers (Fig. 2.1.46).

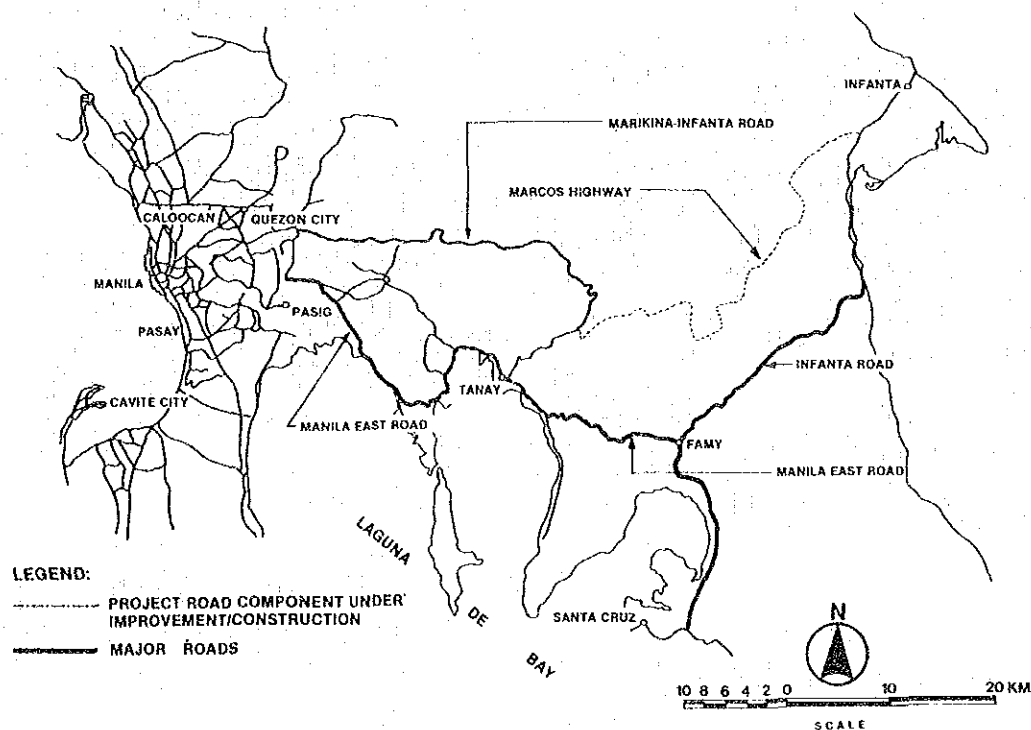


FIG. 2.1.46 REGIONAL ROAD NETWORK (M.M.A. — INFANTA)

Manila East Road and Infanta Road together constitute the life line of IRM accommodating long distance flows of passengers and goods between IRM and Manila. The route consisting of these two (2) roads shall hereinafter be referred to as "Eastern Growth Corridor (East Highway)".

East Highway is a concrete paved 2-lane road between Manila and Famy (Manila East Road), but it has a yet-to-be-developed gravel road with a road width of about seven meters between Famy and Infanta (Infanta Road). Thus, travel time between EDSA in Manila and Famy is only two (2) hours, while it is from 4 or 4.5 hours between Famy and Infanta (Fig. 2.1.47).

The volume of traffic on the East Highway is about 8,000 vehicles per day between Cainta and Angono, which is in Marikina plain, about 3,000 vehicles per day between Angono and Polillo, 700 vehicles per day between Polillo and Famy, and about 500 vehicles per day between Famy and Infanta (Figs. 2.1.48 and 2.1.49).

A part of Marikina-Infanta Road is completed, whose construction was planned as a by-pass for Manila East Road and to directly connect the northern part of Rizal Province with Manila in order to support the development of the hilly part of said Province, as discussed in 1.4.2 above.

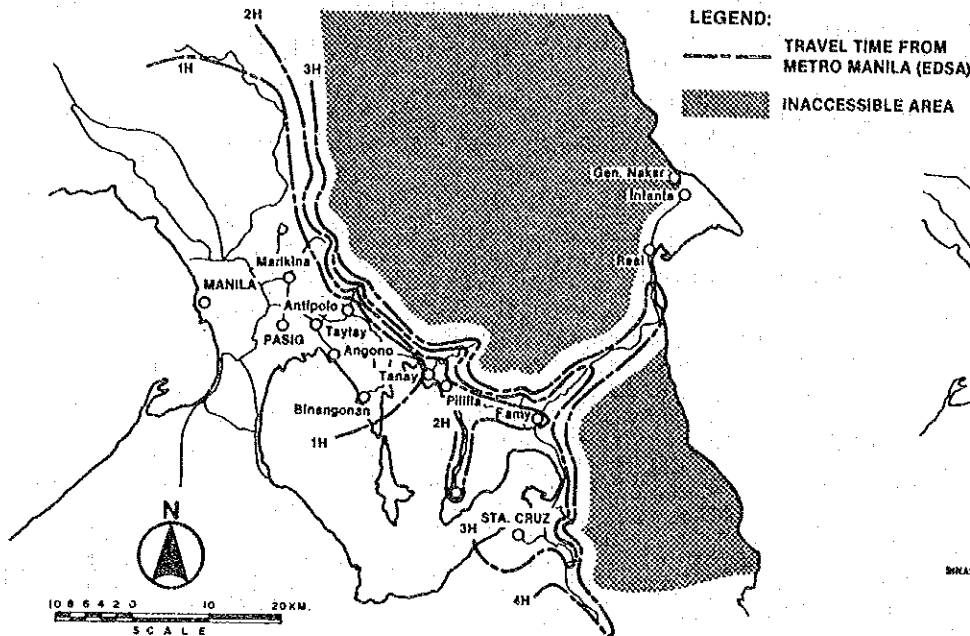


FIG. 2.1.47 TIME DISTANCE OF EASTERN CORRIDOR AREA

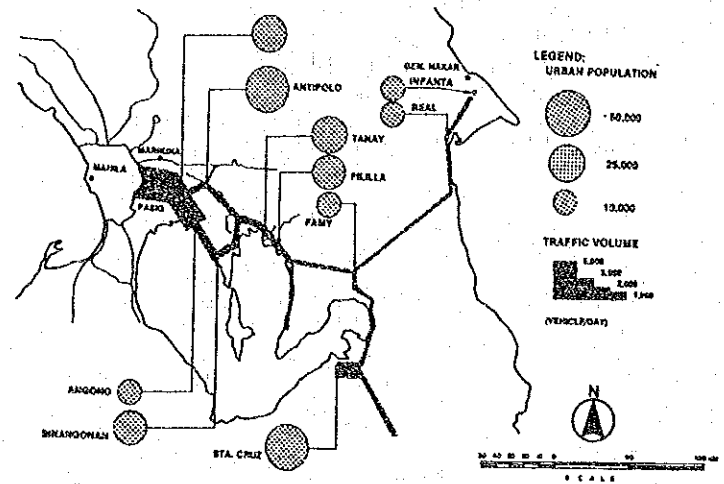


FIG. 2.1.48 TRAFFIC VOLUME OF MANILA EAST ROAD & INFANTA ROAD

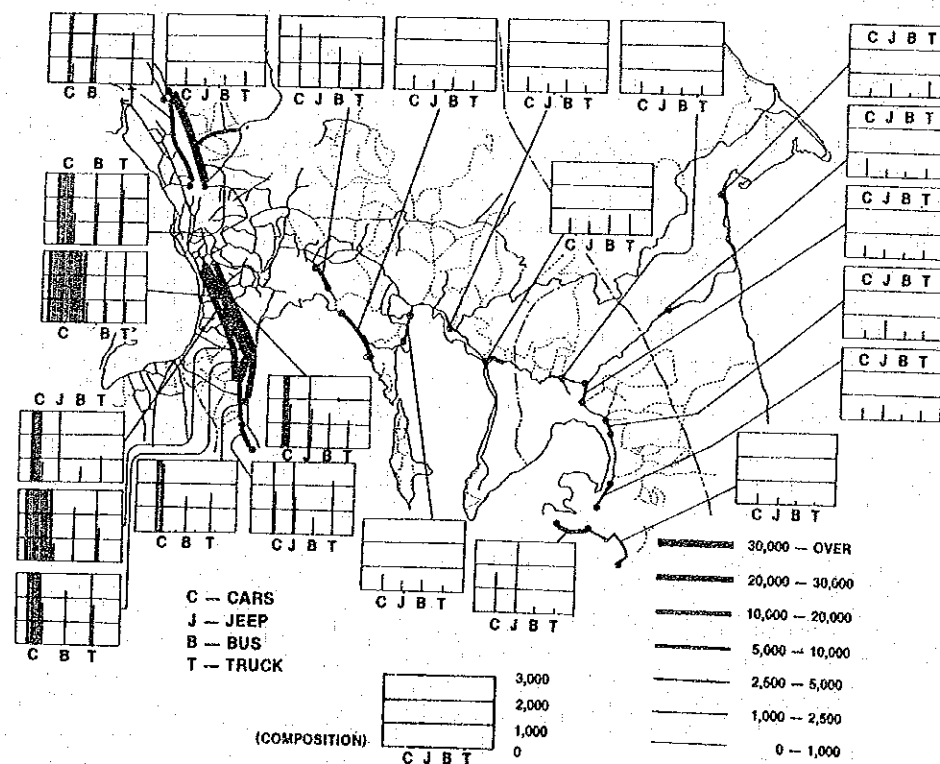


FIG. 2.1.49 ESTIMATED TRAFFIC VOLUME (AADT)

(b) Urban Road Network

IRM urban road network is structured with Infanta Road and feeder roads connecting thereto (Fig. 2.1.50). Infanta Road approaches IRM from the south, enters IRM through Real urban area, traverses IRM towards the north to reach the Infanta urban areas and constitutes the socio-economic axis of IRM and the spine of the urban road network. The feeder roads emanate from this spine toward the swamp area, the coast line, or the Agos River and terminate at nodal points connected to marine transport. General Nakar is isolated from this road network, and wholly depends upon tricycles for travel within the municipality.

The volume of motor traffic is 560 vehicles per day, mostly jeepneys and trucks, between Real and Infanta and is 250 vehicles per day between Real and Famy (Table 2.1.16).

Total road extension in the three (3) municipalities is 226 kilometers, of which 32 kilometers or 14% is national roads and 64% is barangay roads. Provincial and national roads have a relatively large width of at least 5.0 meters. The percentage of paved roads is only about 3%, and roads other than those in urban areas are yet to be paved (Table 2.1.17).

There is a total of twenty-five bridges in the three municipalities, 13 of which are located in Real. Of the 25 only 8 can withstand heavy weights, and the remainder are all wooden bridges (Table 2.1.18).

The central urban areas of the three (3) municipalities are systematically developed with a grid of streets. These streets mostly have a width of only about 4.0 meters, which is adequate for accommodating the present tricycle traffic but will become inadequate to avoid traffic congestion when Infanta Road has been developed and motorization advanced.

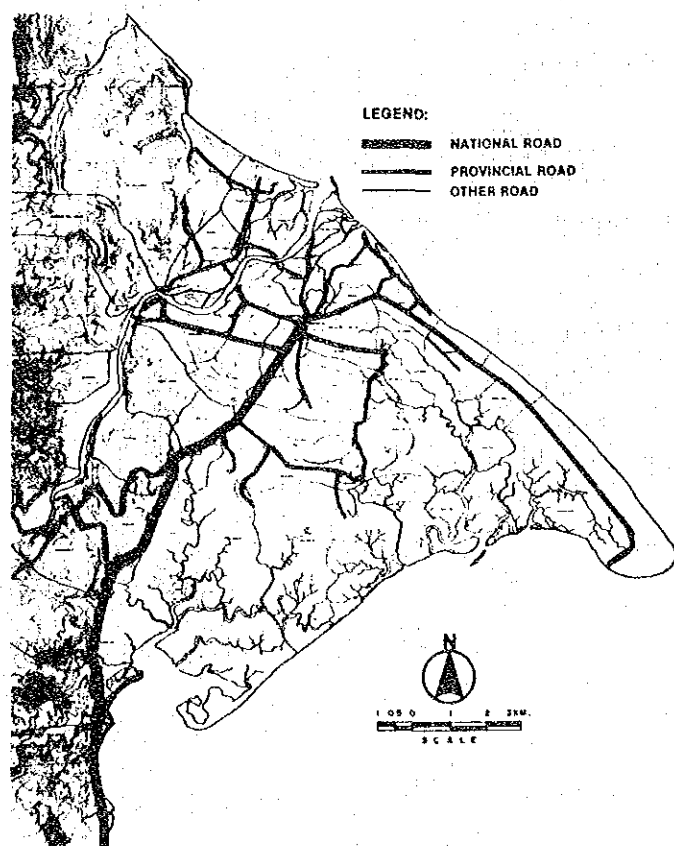


FIG. 2.1.50 ROAD NETWORK OF I.R.M.

2) Public Transport

(a) Bus

As the only means of passenger conveyance between Infanta and Manila, buses operated by three (3) bus companies located in Infanta make six round trip runs per day carrying an average of 570 passengers.

Bus passenger flow pattern has already been discussed. Interviewed passengers indicated that they make an average of 2.5 trips per month, while those engaged in sales business utilize bus transport at a higher frequency of twice or thrice a week.

In the central part of Infanta are two (2) bus terminals, one (1) with parking space for ten (10) buses and the other, two (2). Both are without any passenger service facility.

Neither bus terminals nor bus stops exist in Real, where buses stop to pick up or discharge passengers wherever necessary. To connect with the ferry service, the bus stops on a feeder road to the port.

(b) Jeepney and Tricycle

There are 11 jeepney operators in Infanta and 12 in Real, a comparable situation. However, the number of tricycle operators in Real is only about one-third as much as the number in Infanta (Table 2.1.19) for the following presumable reasons:

(i) In Real Port, a relatively large number of passengers and bulk commodities are for transit to and from Polillo Islands. Therefore, it is necessary to use jeepneys which could accommodate a relatively large transportation load.

(ii) In Real, the areas of flatland are few and most of its parts are accessible by walking. Therefore, the demand for tricycle is limited.

(iii) Real has little influence on transportation due to their way of life.

(iv) In Infanta, however, both passengers and cargo load/unload at various parts of its long shoreline, swamps, and creeks. These passengers and commodities are loaded/unloaded directly on the beaches and creeks by banca or other means of transportation. As a result, the quantities to be transported by tricycles are small.

(v) The settlements (rural and fishery villages) scattered at the urban center are at a distance not accessible by walking but the demand for transportation is not sufficiently large to require the use of jeepneys. Therefore, jeepneys are used principally in the Infanta-Real route where transportation demand is relatively high.

Table 2.1.16 DAILY TRAFFIC VOLUME

Station	Cars	Jeepneys	Buses	Trucks		Total
				Truck	Trail	
Real-Infanta	160	169	27	202	2	560
Famy-Real	102	64	26	55	3	250

Source: MPWH, 1982

Table 2.1.17 INVENTORY OF ROADS (RM, 1980)

	Type of Road	Total Length (kms)	Surface Type by Length (kms)				Percentage of Paved Roads	Surface Width (m)
			Concrete	Asphalt	Gravel	Unsurfaced		
Infanta	National	18.20	0.27		17.93		1.48	6.0-7.0
	Provincial	39.54			35.31	4.23	0	5.0
	Municipal	3.27	2.06		1.21		63.00	—
	Barangay	21.95	0.12		21.83		0.55	—
	Total	82.96	2.45		76.28	4.23	2.95	—
Real	National	13.50	0.64	0.22	12.64		6.37	5.0-7.0
	Provincial							
	Municipal	2.80	0.33		2.36	0.11	11.79	—
	Barangay	61.00	0.26	1.00	48.74	11.00	2.07	—
	Total	77.30	1.23	1.22	63.74	11.11	3.17	—
Gen. Nakar	National	7.72			1.00	6.72	0	5.0
	Provincial							
	Municipal	2.54	1.25		1.20	0.09	49.21	—
	Barangay	55.70			41.60	14.10	0	—
	Total	65.96	1.25		43.80	20.91	1.90	—
I.R.M.	National	31.70	0.91	0.22	30.57		3.56	—
	Provincial	47.26			36.31	10.95	0	—
	Municipal	8.61	3.64		4.77	0.20	42.28	—
	Barangay	138.65	0.38	1.00	112.17	25.10	1.00	—
	Total	226.22	4.93	1.22	183.82	36.25	2.72	—

Source: "Socio-economic Profile" Province of Quezon

Table 2.1.18 INVENTORY OF BRIGES (IRM, 1980)

Type of Road											m		
	*Concrete		Steel		Bailey		Timber		Others		Total		
	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	
Infanta	National	1	20.0					2	28.8	1	15.0	4	63.0
	Provincial							5	78.0			5	78.0
	Municipal							1	14.0			1	14.0
	Barangay												
	Total	1	20.0					8	120.0	1	15.0	10	155.0
Real	National	7	188.0	1	59.0	3	51.0	2	17.7			13	315.7
G. Nakar	Barangay									2	57.8	2	57.8
I.R.M.	National	8	208.0	1	59.0	3	51.0	4	45.7	1	15.0	17	378.7
	Provincial							5	78.0			5	78.0
	Municipal							1	14.0			1	14.0
	Barangay									2	57.8	2	57.8
	Total	8	208.0	1	59.0	3	51.0	10	137.7	3	72.8	25	528.5

* Concrete includes RCDG

Source: "Socio-Economic Profile" Province of Quezon

Table 2.1.19 NUMBER OF ESTABLISHMENTS OF TRANSPORTATION SERVICE

	Gen. Nakar	Infanta	Real	Total
Bus	0	1 (7)	0	1 (7)
Jeepney	0	11 (23)	12 (26)	23 (49)
Tricycle	15 (19)	102 (117)	30 (34)	147 (170)
Total	15 (19)	114 (147)	42 (60)	171 (226)

Note: No. of Workers are shown in parentheses

Source: JICA Study Team, 1983

3) Marine Transport

(a) Means of Marine Transport

Bancas, ferries, and cargo carriers are the means of marine transport for IRM. The bancas count 591 in total, 467 of which are motorized and 124 hand rowed. Most of these bancas are also used for fishing purposes. Ferries shuttling between Port Real and Polillo Island are of the 50-ton class and operated by two (2) companies. Cargo carriers of the 100-ton class are engaged in the transportation of timber. Both the ferry and cargo companies in Polillo Island, IRM have no vessel of the 50-ton class or larger.

(b) Marine Transport Quantity

Polillo Island is the major origin/destination of both passengers and goods carried by vessels. The quantities of these passengers and goods are estimated (Table 2.1.20) as follows:

(i) About 168,000 passengers/year are carried by ferries and about 182,000 passengers/year by bancas.

(ii) About 4,500 tons/year of cargo (copra, rice) is carried by ferries, 5,000 tons (charcoal, copra, fish) by bancas, and 1,000 tons/year of timber by cargo carriers.

Table 2.1.20 THE VOLUME OF TRAFFIC AND CARGO LOADINGS BETWEEN IRM AND POLILLO

	Items	Volume per Annum
Ferry	*Passenger	168,000 persons
	**Cargo	Copra, Fruits 3,600 tons Rice, Commodities 900 tons
	*Passenger	182,000 persons
Banca	**Cargo	Charcoal 2,000 tons Copra 1,200 tons Fish 1,800 tons Others
	**Cargo	Woods 1,000 tons

Source: *BFAR (1980)
**JICA Study Team (1983)

Table 2.1.21 MAIN PORTS IN IRM

	INFANTA				REAL	GEN. NAKAR
	Dinahican	Langgas	Silangan	Libjo	Real	Pinaglapatan
Mooring Quay	Causeway 5m	none	Quay 10m	none	Quay 27m	none
Location	Exposed to the sea	Inner Water	Inner Water	Exposed to the sea	Exposed to the sea	Inner Water
Natural Cond.	Front water depth 0m Troubles in storm					Unusable during ebbitide
Passengers (person/day)	Regular 15-20 boats 80-100 psns.	Irregular 8-10 boats 30-40 psns.	Irregular 15-20 boats 60-80 psns.		Regular 6-10 boats 250 persons	
Handling goods (per year)	15-20 boats fish 2,300 tons copra 500 tons	charcoal fish	30-40 boats charcoal 500 tons fish 350 tons wine		15-20 boats timber 3,500 tons banana, fish rice, others 900 tons	fish
Handling Place	Burdeos Infanta	Panukalan Polillo Infanta	Burdeos Polillo Infanta		Polillo Real	Gen. Nakar
Landing	Few houses Car park for 2 or 3 cars No open air store	Almost no car parking space, No open air store place	Open Air store space Car park for one car	No facility as a port	Little space for open air store Car park for 3 or 4 cars	No facility as a port
Area behind port	Furthermost from Infanta built-up area	Paddy field Comparatively far from built-up area, narrow road	Paddy field Comparatively close to built-up area	Sand bar	Timber yard and shops close to Real built-up area Bus stop	Coconut field

Source: JICA Study Team, 1983

(c) Port Facilities

IRM has six ports, one in Real, four in Infanta, and one in General Nakar (Table 2.1.21). Port Real is equipped with berths, but their total extension is only about 27 meters, and they are dilapidated. Of the four ports in Infanta, Dinahican and Libjo are on the sea, but Silangan and Langgas are on a creek and, therefore, cannot be navigated at low tide. Of the four, a berth is available only at Dinahican and Silangan, while at Libjo, cargo is unloaded directly on to the sand beach and, therefore, cargo operation cannot be carried out under bad weather.

2.1.6 Public Utilities

Water Supply

1) Development Level

As can be seen from Table 2.1.22 which gives data on water supplied IRM household by water source, 50% of households in Real are served by spring-fed water supply systems. General Nakar relies heavily on springs (for the communal pump type water supply system), and Infanta heavily

Table 2.1.22 SOURCE OF WATER SUPPLY (SHARE, 1983)

Kind of Water	%			
	Gen. Nakar	Infanta	Real	Planning Area
Piped Water	5.0	7.0	50.9	15.8
Artesian Well	0.6	16.5	11.9	13.9
Pump	25.8	29.0	9.1	24.6
Open Well	20.3	37.7	14.9	31.2
Spring	40.4	5.8	4.8	9.3
Rain Water	0.0	1.0	0.0	0.7
Lake, River, Stream	7.9	3.0	8.4	4.5
All Sources	100.0	100.0	100.0	100.0

Source: JICA Study Team

relies for water supply on pumped ground water and fountains. Only a few households located close to the water source in Infanta enjoy the water supply system since 1982 when the operation of water system was discontinued due to high pumping facility maintenance and operation costs.

2) Water Source

Despite the availability of abundant surface water from the Agos and other sources, most of the water systems operating in IRM depend on ground water sources, as shown above (the surface water is being used for irrigation). As a result, there are a large number of wells in IRM, nine shallow wells and 14 deep wells in General Nakar, 345 pumped wells and 620 springs in Infanta, and 24 shallow wells and 14 artesian wells in Real. (Of these, the deep wells in General Nakar are for irrigation. In Infanta and Real, there are no deep wells.) (Fig. 2.1.51)

According to NWRC's survey, the depth of the wells range from 4 to 15 meters, average ground water level is 2.54 meters and average water pumped is 0.44 liters per second. NWRC has estimated the pump capacities of the shallow and deep wells (Table 2.1.23).

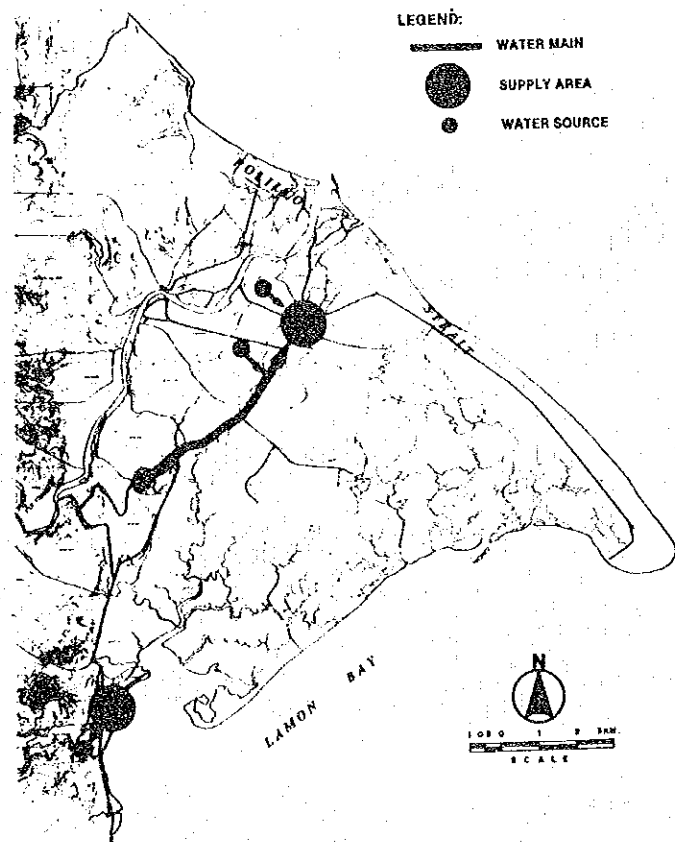


FIG. 2.1.51 WATER SOURCES OF EXISTING WATER SUPPLY SYSTEM

Table 2.1.23 ESTIMATION OF AVERAGE CAPACITY OF WELL (1983)

Municipality	Ave. Capacity of Well (x10 ³ lts/day)		Inflow (x10 ² lts/day)	
	S W	D W	SW Area	DW Area
Gen. Nakar	37.2	671.0	18,401	331,225
Infanta	37.2	671.0	78,363	3,688
Real	—	432.0	—	115,850

Source: NWRC

Electric Power

1) Power Source, Transmission and Distribution Systems

Luzon Grid is the source of power supplied to IRM through a 69 KV transmission cable from Caliraya substation to a 3,750 KW substation in Barangay Comon (Fig. 2.1.52) from which power is distributed through the network consisting of 13.2 KV primary line and 7.62 KV feeder lines extending to various locations of IRM (Fig. 2.1.53).

2) Electrification and Energy Sources

After the construction of said transmission facility, the electrification rate in IRM has rapidly increased to 43.8% in 1983 (47.1% in Infanta, 46.3% in Real, and 21.9% in General Nakar). The distribution network has been developed to cover nearly all of the flat parts of IRM leaving only the swamp areas and the remote General Nakar.

The ratio of households using kerosene for lighting purposes shrunk during the five-year period from 1978 to 1983 from an overall 90 to 100% to 39.0% (with 47.1% using power) in Infanta, to 49.3% (46.3% using power) in Real, and to 61.6% (21.9% using power) in General Nakar.

However, electric power still accounts for an insignificant 0.3% of total energy used for cooking in IRM along with kerosene's 1.1%, LPG's 2.9%, and 1.5% by husks and the like, an overwhelming majority of 94.3% uses fire wood and charcoal.

It should be pointed out that the reliability of power supply is not so high in IRM with blackouts at an average frequency of once a week. Power charge for domestic use is lower in IRM than in the Manila area but the charge for large users is conversely higher.

Communication

1) Telephone Facilities

There is only one SSB-type radio-telephone equipment being operated by A.Z. Communication in the Poblacion of Infanta. This equipment provides communication service with the exchange of the same company located in Quezon City (it is possible to communicate with the telephone network of the Manila Area). However, the quality of service provided by this equipment is very poor in terms of immediate communication and quality of communication. Approximately 2 minutes are required from the appli-

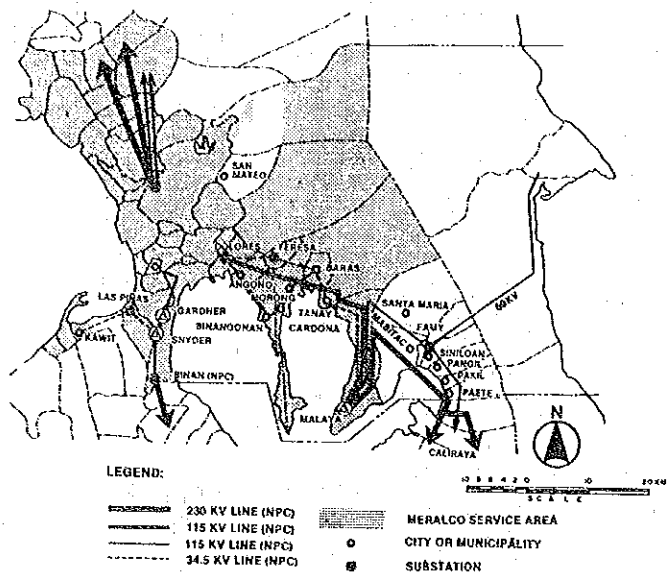


FIG. 2.1.52 POWER TRANSMISSION & DISTRIBUTION NETWORK

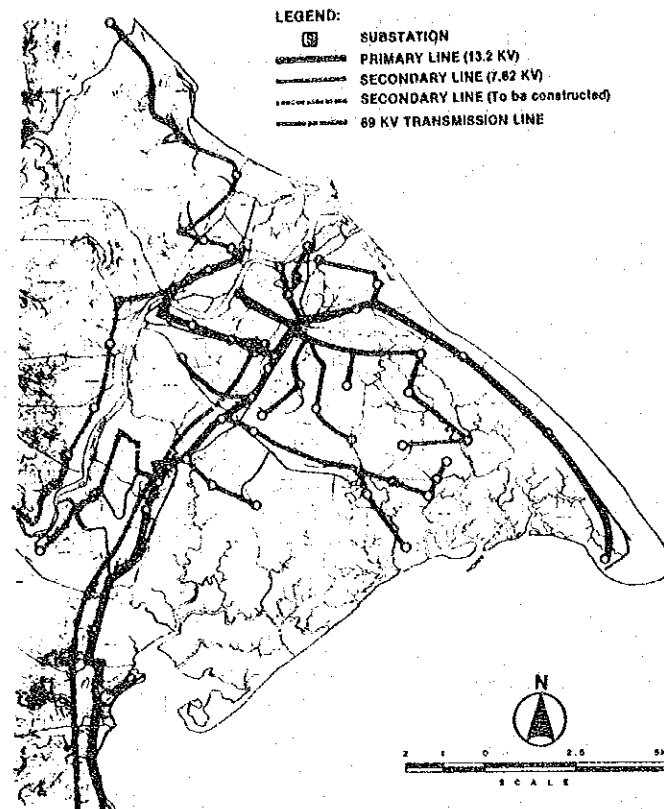


FIG. 2.1.53 EXISTING POWER DISTRIBUTION NETWORK (I.R.M.)

cation to the start of the telephone call under normal circumstances, and depending on the conditions, the communication with Manila becomes impossible. In reality, interruption of communication is very frequent. Nevertheless, this equipment handles a traffic consisting of an average of 20 daily calls (outgoing 60%, incoming 40%). The charge is P6.00 during the first 2 minutes and P3.00 for each successive minute (1983).

2) Telegraph and Mail

Post offices and telegraph offices are located in poblacions (Fig. 2.1.54, Table 2.1.24). With the exception of RCPI in Infanta, both post offices and telegraph offices have their service counters in municipal offices or their annexes. Incoming and outgoing mails totalled 2,580 in 1983, while a total of 55 telegrams were sent or received. The national average of telegrams sent or received is 1.0 telegram/person per year, while such average in Infanta is 0.5 telegram/person per year.

Telegraph service is available from BUTEL and RCPI, but BUTEL, which sends telegrams by morse signal via Lucena City, requiring three (3) days for the telegrams to reach Manila, is less frequently utilized by IRM residents than RCPI which requires only one day for the telegrams to reach Manila.

Mails are carried by Kapalaran bus to Sinoloan wherein they are transferred to a mail truck for further conveyance to Manila via San Pablo, and vice-versa.

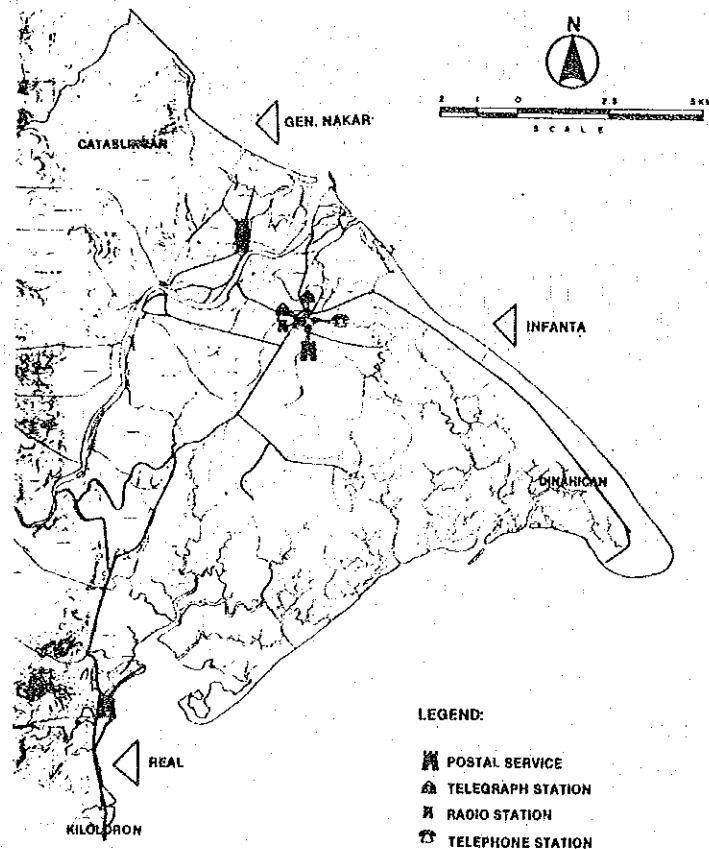


FIG. 2.1.54 COMMUNICATION FACILITIES

Table 2.1.24 NUMBER OF COMMUNICATION FACILITIES (IRM, 1983)

Facility		Gen. Nakar		Infanta		Real	
		No	Remarks	No.	Remarks	No.	Remarks
Telegraph Office	Private	—		1	RCPI (7487.5khz army type)	—	
	Government	1	BUTEL (Morse type)	1	BUTEL (Morse Type)	—	
	Total	1		2		—	
Post Office	Private	—		—		—	
	Government	1		1		1	
	Total	1		1		1	
Mail Carrier	Private	—		—		—	
	Government	1		2		2	
	Total	1		2		2	
Radio Station	Private	—		1	720khz (5w)	—	
	Government	—		—		—	
	Total	—		1		—	

Source: Municipal governments

3) Radio and Television

The owner rates of radio and television sets in IRM are estimated at one per 14 households and one per 8.7 households, respectively. Radio reception in IRM covers all local and Manila stations, while television reception covers three stations in Manila.

Solid Waste Disposal Facilities

Trash collection service is available only in Infanta poblacion (by truck), and in Real market area. The trash is disposed at a dump site near the poblacion, but trash collected from Infanta poblacion is partly thrown into the Bantilan River causing water contamination. In all other parts of IRM, trash is either incinerated/buried within the premises of each house or thrown into a nearby creeks.

No human waste collection service is available in IRM. Water sealed depository and closed pit are the two (2) major types of toilet facilities. About 65% of total households (most of them in Real and General Nakar) have no family toilet.

2.1.7 Social Service Facilities

Education Facilities

In IRM there are two nurseries, 22 public primary schools, nine highschools, (of which 3 are private), and one public college. The total

number of students are 146, 8,068, 4,329 (of which 1,630 are from private schools), and 125, respectively. The number of teachers is 2, 243, 145 (39 with private highschools), and 28, respectively. (As of 1983).

In five barangays of Infanta, two barangays of Real, and one barangay of General Nakar, primary school service level is lower and the number of children per teacher is larger than the Ministry of Education's standard of 40.

As for highschool, the Pacific Shore Institute located in General Nakar and Real has an average of 50 students per teacher as against the Ministry of Education's standard of 25 students per teacher.

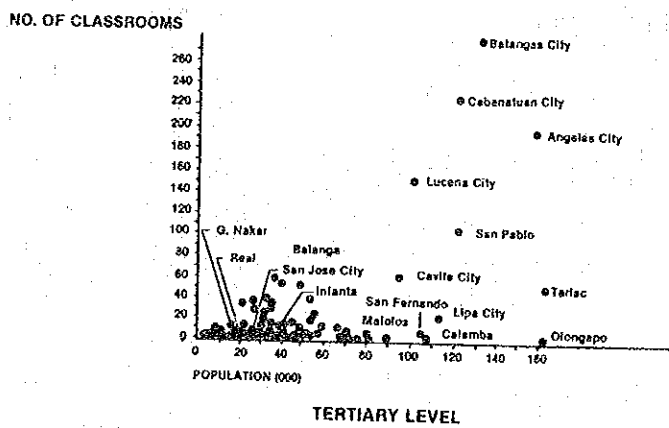
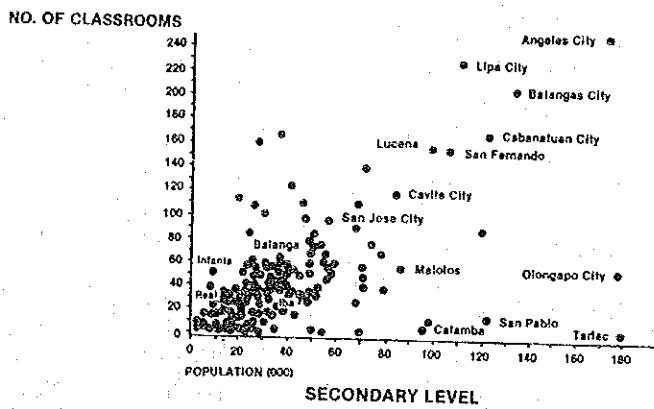
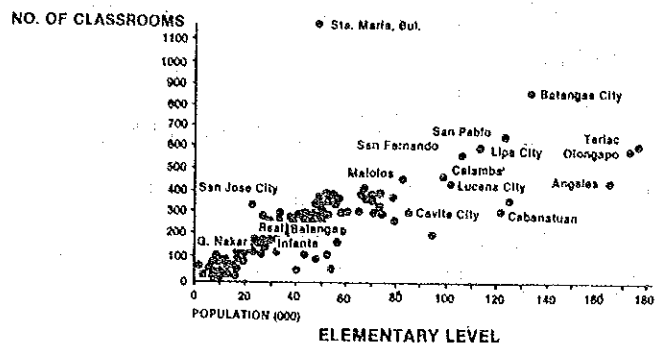
The Infanta Community College, the only tertiary highschool in IRM, has 125 students in all including those in night courses.

In comparison with the average number of classrooms on the three levels of education per average population of cities and towns in GCLA (Fig. 2.1.55):

- (i) The number of primary schools in the three municipalities of IRM are more than the GCLA average.
- (ii) The number of highschools is much higher in Infanta, Real and General Nakar the number is comparable to the GCLA average.
- (iii) Many cities and towns in GCLA with a population comparable to that of Infanta, have no colleges.

With the generally high levels of educational facilities, literacy rate of IRM is about 95%, which is much higher than that of the national average of 90%. Yet, many IRM youths (one out of every 4.5) seek the opportunity of higher education in Manila, suggesting that the quality of the college which exist in IRM is inadequate to some ambitious youths.

As for the geographical distribution of schools (Fig. 2.1.56), primary schools are evenly distributed, the territory of each school usually covering two or three barangays (Fig. 2.1.57). While no territory is defined for highschools, each has a tacitly demarcated territory.



**FIG. 2.1.55 NO. OF CLASSROOMS
(ELEMENTARY, SECONDARY & TERTIARY)**

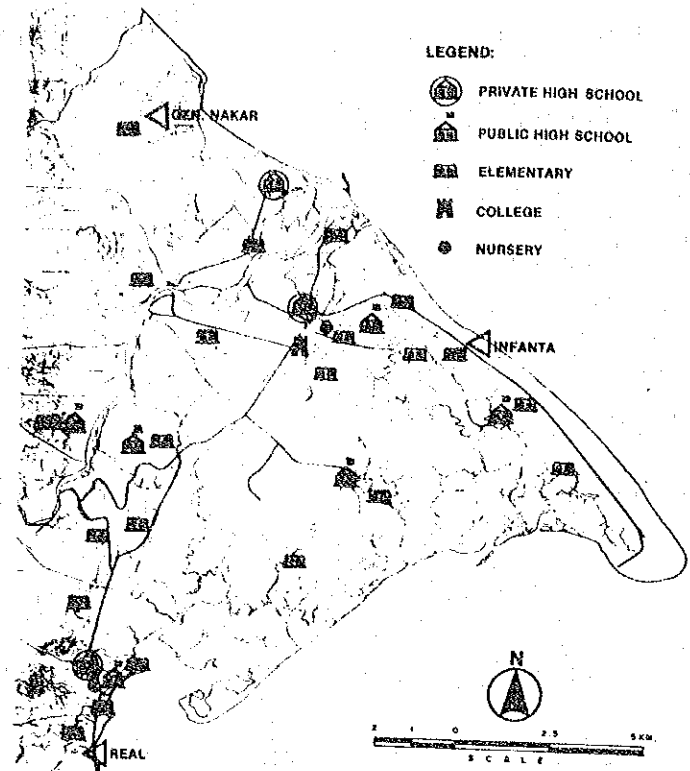


FIG. 2.1.56 EDUCATIONAL FACILITIES

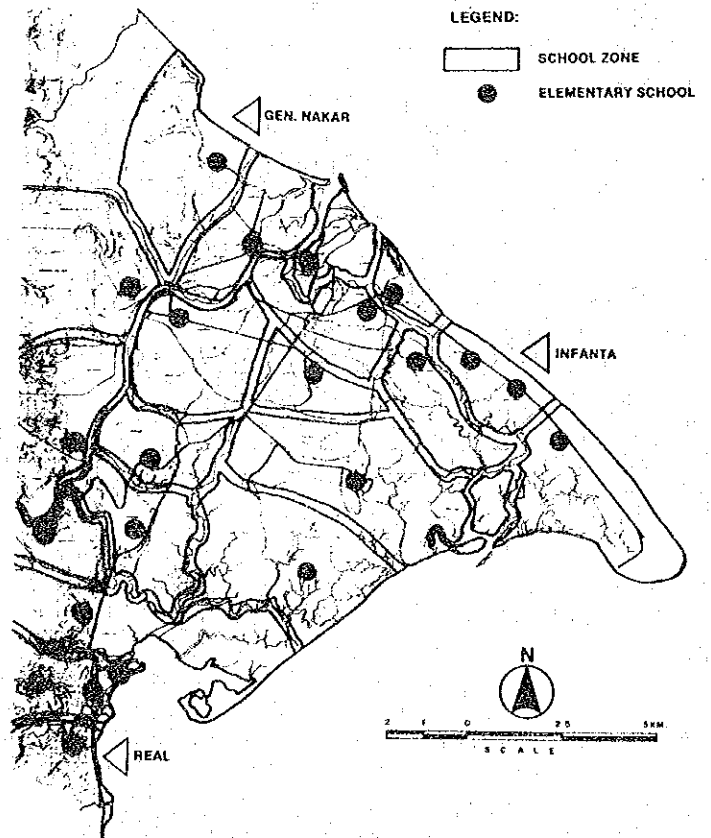


FIG. 2.1.57 ELEMENTARY SCHOOL ZONES

Medical and Health Facilities

Medical and health facilities located in IRM consists of one hospital, rural health units (RHU), barangay health stations (BHS), clinics, and nutrition centers (Fig. 2.1.58). A total of 41 beds are available (Table 2.1.25).

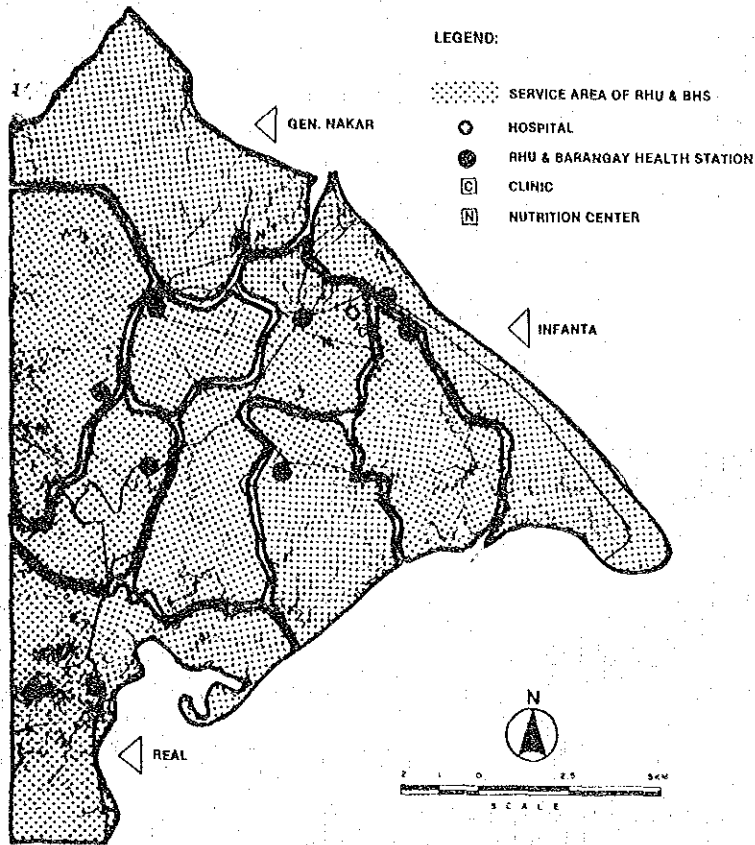


FIG. 2.1.58 DISTRIBUTION OF MEDICAL FACILITIES & ITS SERVICE AREA

Table 2.1.25 MEDICAL FACILITIES AND BED CAPACITIES

Municipality	Gen. Nakar	Infanta	Real
Facility			
Hospital			
Private / No. of Beds ()	—	—	—
Public / No. of Beds ()	—	1 (25)	—
Rural Health Unit	1	1 (4)	1 (4)
Barangay Health Station	1	5	—
Medical Clinic			
Private / No. of Beds ()	—	1 (8)	—
Public / No. of Beds ()	—	—	—
Nutrition Centers	1	1	1

Source: JICA Study Team

Claro M. Recto Hospital is the only hospital in IRM and is given the position of a district hospital, covering Infanta, Real, and General Nakar, as well as Polillo Island under its service. An interview survey indicated that from five to ten patients are hospitalized, making the 25 beds inadequate, and 150 outpatients are treated each day.

In IRM, the obligatory rural health unit is located in each of the three municipalities. Barangay health stations supplement RHU by offering daily routine medical care.

Most diseases in IRM are as follows: (i) bronchitis; (ii) anemia; (iii) ascariasis; (iv) diarrhea; and (v) dermatitis while the major fatal diseases are (i) pneumonia; (ii) cardiac diseases; (iii) lung tuberculosis; (iv) gastroenteritis; and (v) malnutrition.

In IRM, there are a total of 16 physicians, all living in Infanta. No physician lives in Real or General Nakar, and a physician from Infanta RHU makes weekly scheduled visits to Real RHU and General Nakar RHU.

Administrative and Communal Facilities

Municipal administrative facilities and national government agencies are located in the poblacions of the three (3) municipalities (Fig. 2.1.59 and Table 2.1.26). The municipal office of General Nakar has 18 personnel, Infanta has 27, and Real, 20.

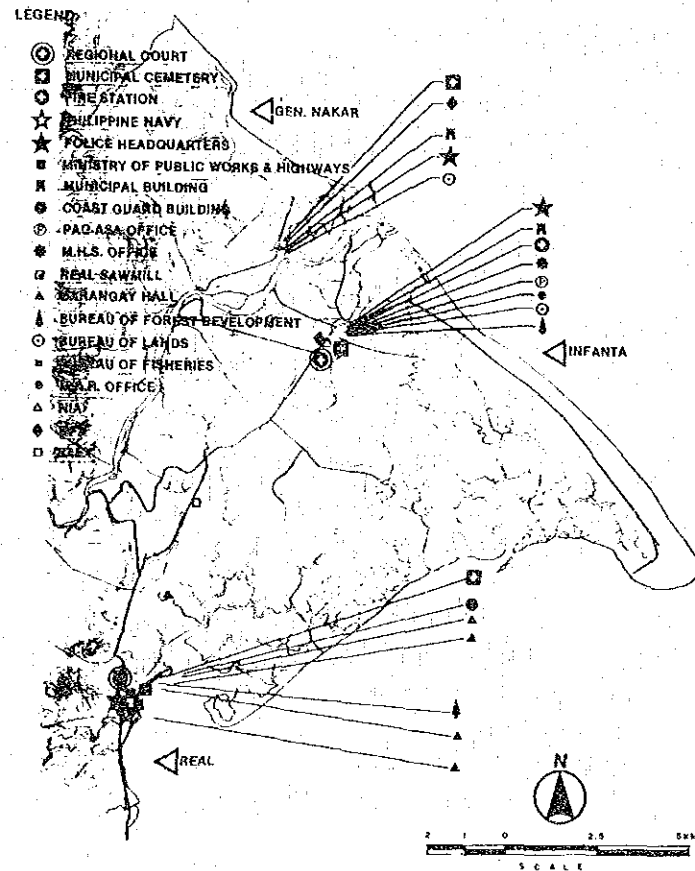


FIG. 2.1.59 PUBLIC & OTHER COMMUNITY FACILITIES

Table 2.1.26 PUBLIC SERVICE FACILITIES

Municipality	Gen. Nakar	Infanta	Real
Facility			
Municipal Government			
Municipal Hall	1	1	1
Police Headquarters	1	1	1
Fire Station	—	1	—
Trial Court	—	1	1
Library	1	—	—
Cemetery	1	1	1
Provincial			
National Government			
MPWH	—	—	—
NIA	—	1	—
BAEX	1	1	1
BFD	—	1	1
BFAR	—	—	1
MHS	1	1	1
PN	—	—	1
Phil. Coast Guard	—	—	1
Bureau of Lands	1	1	—
NFA	—	1	—
PAGASA	—	1	—
MLG	1	1	—
MSSD	1	1	—
NCSO	—	1	—
Parks			
Park	1	1	—
Playground	4	14	4*

*1 at each elementary school.
Source: Municipal Governments, 1983

As for parks, the municipal plazas offer an open space in front of each municipal office, and grounds of individual primary schools are utilized for sports and athletic events.

Social Welfare

In IRM, there are family planning units at each RHU and day care centers operated by both RHU staff and local volunteers (Table 2.1.27).

Other social facilities include churches of various denominations (Table 2.1.28 and Fig. 2.1.60).

Table 2.1.27 SOCIAL WELFARE FACILITIES (IRM, 1983)

Facility / Municipality	Gen. Nakar	Infanta	Real
Family Planning Unit	1 RHU	1 RHU	1 RHU
Day Care Center	4 Poblacion Anoling Maigang Batangan	2 Poblacion Gumian	1 Poblacion

Source: Municipal Government

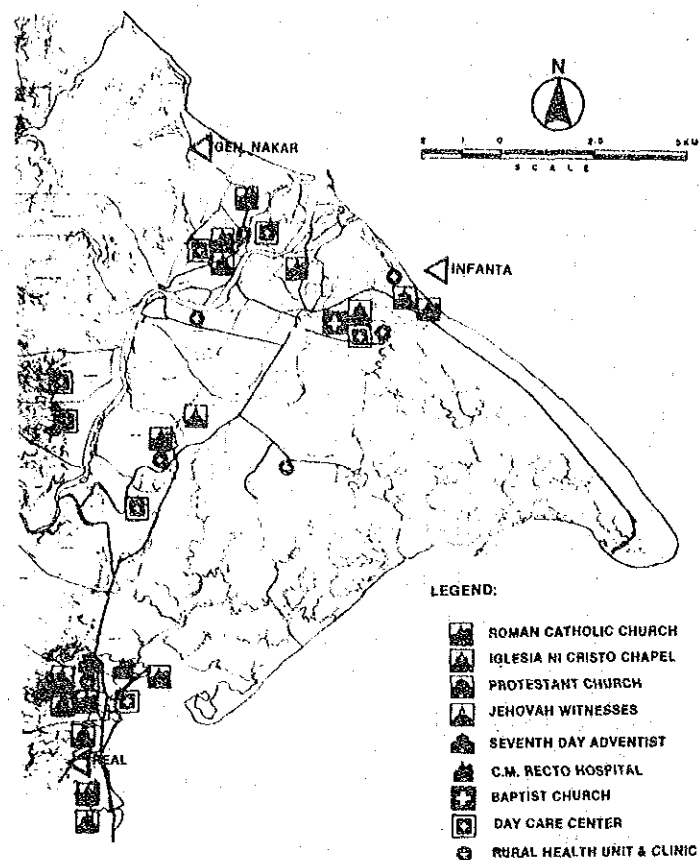


FIG. 2.1.60 DISTRIBUTION OF CHURCHES

Table 2.1.28 CHURCHES (IRM, 1983)

Church / Municipality	Gen. Nakar	Infanta	Real
Catholic	2	3	3
Iglesia ni Cristo	1	2	4
Protestant (Mistica)	—	1	1
Seventh-day Adventists	—	1	1
Jehova's Witnesses	—	1	1
Baptist	—	2	—
Total	3	10	10

Source: Municipal Governments

2.2 Development Potential

2.2.1 Sectoral Development Potential

Agricultural Development

As seen in the land use characteristics in the last chapter, 43% of the IRM land except swamp zone is already developed as agricultural land where mainly rice and coconuts are cultivated. Further, various kinds of crops such as vegetables and bananas are also produced on a small scale.

The rice is cultivated by double cropping, single cropping and rainwater cropping. Irrigation system by NIA made Infanta Plain a major rice-producing area. The rehabilitation of the system is now under way with the help of the World Bank's fund. In spite of the buguey soil suitable for agriculture, the production per unit area is 2,375 kg/ha, not so high compared with 4,950 kg/ha (Masagana 99 Plan), target rice failure in introducing the farming machinery as well as insufficient agricultural fertilizers and chemicals.

On the other hand, although the coconut cultivating area has increased in both Project Area and Polillo Area, the production per unit shows a sharp decrease. This phenomenon is common to all the coconut plantations operated by small holders. This production decrease is directly caused by aged coconut trees with lower fruit bearing capacities and the spread of a plaque, Cadang-Cadang and harmful insects, blackbeetles.

The Philippine Coconut Authority (PCA) is performing experiments on the different varieties of coconuts to cope with such adverse conditions mentioned above in IRM and Polillo Island (5 Pilot Project Areas). One experiment deals with the hybrid coconut called "Mama" which produces twice as much fruit.

These achievements in agriculture give rise to the following development potentials. The large expansion of the agricultural area cannot be expected in terms of rice cropping. However, if the following reforms are made, the target of the Masagana 99 Program at 4,950 kg/ha shall be easily achieved and even 10,000 kg/ha becomes attainable.

(i) By improving the irrigation facilities such as the Agos River irrigation system and employment of efficiency of agricultural technologies such as multi-cropping, planning methods, crop rotation, crop season variations, etc., a production increase can be expected.

(ii) The productivity per unit area is expected to be ameliorated by actively using agro technologies such as intensive farming, fertilizing, and chemicals/herbicides application, as endorsed in the Masagana 99 Program.

The PCA is performing research and information-dissemination activities on different varieties of coconuts to improve productivity. If the results of experiments and researches are successfully disseminated and applied by farmers, a 5% annual increase of production per unit area is expected.

Furthermore, based on this productivity increase, the copra production of 63,754 tons in 1992, and 93,312 tons in 2000 in the three (3) municipalities and Polillo Island have been estimated.

Fishery Development

The Fishery Sector in IRM consists of municipal fishing, commercial fishing, and aquaculture. The estimated catch by commercial fishing is 1900 tons/year and the production of aquaculture, 300 tons to 400 tons/year.

In most cases, the municipal fishing performed on a very small scale by using 2 to 4 men "bancas" less than 32 feet long. Even smaller 7 feet motorless "bancas" are used in some cases. On the other hand, in the aqua culture industry, there are 89 fishponds with registered area of 978 ha. (measured area 742.4 ha). The fishponds are mostly of plankton feeder, and sabahi in very extensive conditions.

Taking these into consideration, the development potential for the fishing industry is expressed in the following three (3) fields:

1) Municipal Fishing

Development potential intended for the fishermen in the IRM and Polillo Island and its surrounding areas. In municipal fishing, the above mentioned small bancas are used and the conventional methods such as gill net, stick-held dip net, pole and line fishing are applied. Its main fishing ground is the Polillo Strait, especially the northern waters of the Agos River mouth.

Various kinds of fish resources such as tuna, white fin caballa (horse mackerel), golden thread fin bream, and sardines are found in this fishing ground. If the following improvements in the fishing methods and operation is made, there is a fair chance of productively developing this fishing ground.

In view of the resources and fishing area, three to five Fiber-Reinforced Plastic (FRP) boats shall be introduced for replacing bancas. As another fishing method longlining for tuna which is promising can be added to the conventional ones.

Even in conventional fishing, the catch may be increased through the following reforms:

- (i) Expansion of operating area with an increase in mobility;
- (ii) Increase of the number of operating days;
- (iii) Improvement in operation efficiency; and
- (iv) Freshness conservation and continuous operation by installing fish holds.

2) Fishing Base: Fishing Development in the Pacific Waters

At present, there are only average 8-ton boats at Real and its catches are 130 to 150 tons/year. In the fishing ground, the waters along the northern coast of the Pacific Ocean, the catches of the drift fish such as bonito, tuna, sardine, horse mackerel, mackerel, etc. are promising. If a round haul net not using "Payaus" is introduced, its rapid development is expected. Catches of bonito and tuna are estimated at 60,000 tons and those of sardine, horse mackerel and mackerel at 100,000 tons. Fishing in these waters has not been fully developed because no adequate fishing base was established. This area adjacent to Manila has a high potential as a fishing base or a landing port of catches. In this case, at least 30% of the total catches is expected to be landed here, 20,000 tons of bonito and tuna and 30,000 tons of sardines, horse mackerel, and mackerel totalling 60,000 tons with 10,000 tons from the municipal fishing.

3) Activation of Aquaculture: Aquaculture Development in Swamp Zone

The present fish farms consisting of pools separated by berms operate in a primitive way, where fingerlings are naturally swept in by the tide and mainly fed with zooplankton. In Sabahi, the production per unit is estimated at 50 to 70% of the national average at 600 kg/ha and prawn being a part of the fish farming at about 30 kg/ha. The following are possible improvements for the present aquaculture industry:

(a) The Change of Fish Species for Better Productivity - In view of the natural conditions of swamp zone (salt density, tide level, tidal current, etc.), a change species to black tiger prawn, available in commercial quantities, offers good prospects. This way, a large increase in productivity is expected (Considering the future technical improvements, 600 to 800 kg/ha in 1992 and 1,000 to 2,000 kg/ha in the year 2000 shall be attainable).

(b) Expansion of Fish Pond - The total area less than 1 m above sea level intended for fish farms is 3,723 ha and the actually developed fish farm area occupies only 20% of it. This flooded area is mainly used for growing mangrove and nipa. In the view of preserving the natural environment of the fish fingerlings and the forestry resources, the development of the mangrove swamp must be limited to one third of its total area. At present, mangrove swamp is 1996 ha. If one third of this 600 ha shall be developed, a total area of approximately 1500 ha including the present fish farms shall be usable for production.

As shown above, if the change to the intensive prawn farm is completed through the reforms of existing farm facilities as well as new developments, 5000 tons/year (in year 2000) is expected. About 3,000 employees shall be needed.

Industrial Development

Although at present this area has almost no important industry, there are some potentials as follows:

1) First Possibility

If the necessary preparations like infrastructure are realized, the civil investment shall be induced.

The following are the criteria for preferred industries in this location:

- (i) Existence of industrial accumulation (possibilities of parts supply from related enterprises and maintenance services).
- (ii) Large fare-bearing capacity (Transportation-cost bearing capacity) to Quezon Province or the MMA.
- (iii) Large scale of market area (export market, all the Philippines, GCLA and the MMA, IRM and Quezon Province).
- (iv) Amenable to natural conditions (high humidity in IRM, wide range of the tide, typhoon, seaside characteristics).

With the above mentioned items as criteria, the following three (3) types of industries were selected to meet the conditions of the first possibility.

- (i) Population corresponding type (butchery, meat products, dairy products, rice polishing and flour milling, bread, alcohol, soft drinks, porcelain and pottery).
- (ii) Footloose type (apparel, other fiber products, leatherworks, shoes).
- (iii) Resource based type (fish, fish products, coconut oil, livestock feed, lumbering and plywood, furniture and fittings).

For the "population corresponding type", there is possibility of location on the scale corresponding to the population planned in IRM. Presently, almost all the industries in IRM belong to the population corresponding type. Employment rate per population is 6.3 persons/1000 population. Therefore, assuming the future population of IRM is 150,000, the employees engaged in this type shall be about 950 persons.

In terms of footloose type, there is no possibility of its location in IRM considering its competition with the Export Processing Zone (EPZ's) (still vacant lots in Bataan and Cavite EPZ's, 94 ha and 268 ha respectively in 1982, and also proposed Pampanga EPZ) which are now existing or in the planning stage

In terms of resource-based type, there is a possibility of location based on the following resource development potentials:

(a) Forestry Potential and Industry Types to be Located - The annual cutting volume in the three Pacific coastal provinces of Luzon amounts to $1,626 \times 10^3 \text{ m}^3$. In Quezon, it is possible to cut 100 to $300 \times 10^3 \text{ m}^3$, provided the presidential decree prohibiting the cut is lifted. (The maximum cutting volume is possible only when the reforestation is performed.)

If there is wood supply from Isabela Province at $200 \times 10^3 \text{ m}^3/\text{year}$ and Quezon Province at $100 \times 10^3 \text{ m}^3/\text{year}$, along with the above mentioned resources, there is a possibility of attracting a lumber processing industry in the area (plywood factory $160\text{-}300 \text{ m}^3/\text{day}$ and veneer factory 100 tons/day and particle board factory 100 tons/day).

(b) Fishing Potential and Industry Types to be Located - As indicated before, cultured prawn which is estimated at 5,000 tons/year, tuna and sardine 60,000 tons/year are the fishing resource potential. There is a possibility of locating the fish processing industry (frozen prawn 3,000 tons/year, frozen tuna 6,000 tons/year, canned tuna 12,000 tons/year).

(c) Resource Potential for Vegetable Oil From Coconut (Copra) and Industry Types to be Located - In the three municipalities and Polillo Island, coconut production is estimated at 63,754 tons (1992) and at 93,312 ton (2000). Assuming 65% of its production is used to extract coconut oil, it is possible to locate there the coconut oil extraction industry which produced 41,400 coconut oil per year (in 1992) and 60,700 ton per year (in 2000). Furthermore, as its related industry the activated charcoal industry is feasible.

2) Second Possibility

Location of industries highly necessary for the national economy is possible. With the following items as criteria, the industry types to be located were selected:

(i) Promote the development of eastern coastal area of Luzon Island through IRM development;

(ii) Substitute the import, and foster the industries of basic products which make, at present, the gap between demand and supply from the national economic viewpoint; and

(iii) Establish a large employment power and potential for core industry in IRM.

First of all, the characteristics of IRM are:

(i) The main products in eastern area are from forestry;

(ii) The harbor is usable; and

(iii) Agos River may assure a large amount of water available for industries. With regard to the above mentioned IRM characteristics, water dependent types of forest products processing industries are feasible. Pulp and paper milling industry, meeting the second and third conditions was selected as possible industry type.

In view of the supply-demand balance, even if the Paper Industries Corporation of the Philippines (PICOP) built-up program is realized, the demand and supply gap will be made in terms of material supplies for newspaper, 60 x 10 tons/year, printing paper 156 x 10 tons/year and industrial paper 254 x 10 tons/year (in 2000). Therefore, as described above, the importance of import substitute industries shall be stressed.

Judging from the volume of existing resource as well as supply-demand balance, it is possible to locate an integrated factory of paper and pulp which produces mainly slick paper, 80 x 10 TPA (in the First phase), and 90 x 10 TPA (in the Second phase).

Tourism Development

With regard to tourism, as international competition in the future shall become more severe, its relative position shall suffer the decline unless a considerable preparation shall be made. In domestic tourism, it is premature to expect a sudden change in the general leisure spending of Filipinos from time oriented to oriented propensity to spend. In spite of the negative facts mentioned above, together with other expected difficulties, the potential for tourism is still considered quite large and rewarding taking into account the following:

(i) Constant tendency of visitors coming to the Philippines even up to the present;

(ii) Enormous latent demand of MMA (It can be expected that the opportunity for beach recreation of the MMA population shall increase); and

(iii) Abundant natural attractions such as scenic sports and sandy beaches.

The tourism resources of IRM can be appraised as follows:

(i) The sandy beach is composed of black sand and is not as beautiful as white sand and because it stretches linearly, the usual perception is static and drab. The beach averages about 30 m in width and beyond some portions of its length, grass lands abound.

(ii) The temperature is generally 1 to 2 degrees lower than that of Manila, and the rainy season is reversed. The relative humidity exceeds 80% averagely and, therefore, is not relatively comfortable.

(iii) Its biggest advantage is its proximity to Manila.

The following measures shall be taken in exploiting the existing advantageous characteristics and compensating its weak points:

(i) Promote the establishment of an Interregional Transport Axis connecting with the cities in the southern area of Laguna and MMA and fill-up the shortage of human and social accumulation in the area. Establish the required connection with Polillo Island.

(ii) The resort is dependent on facilities to draw domestic and international tourists which cannot be attracted only by the natural resource dependent resort. Thus, higher level facilities shall have to be introduced.

(iii) Attach importance to the ties with marine and fishing industries. To utilize to the fullest the characteristics of that region and give priority in the development of facilities which are closely connected with the marine and fishing industries.

(iv) Use of swamps and hills to advantage. The effective use of the swamps and hills for nature expeditions and sight-seeing trips.

If the resolute investments shall be made in accordance with the above measures, the approach of tourism development to the beach resort recreation center for international and domestic visitors shall be realizable.

On the basis of such measures to be taken, an annual demand of 37,000 foreign and 109,000 domestic tourists divided into 53,000 overnight visitors and 93,000 day visitors can be expected. This corresponds to approximately a 40% increase over current figures for Puerto Azul which is a two-hour drive from Manila.

Industry Development

The rate of employment in the tertiary industries per resident which is the index showing the developing stage of tertiary industry is 0.170 in Lucena, 0.133 in Batangas, and 0.085 in IRM. The rate in IRM is at a fairly low level. Tertiary industries develop corresponding to the increase of the following:

(i) Production activities in respective municipalities;

(ii) Population size (and its aggregate purchasing power); and

(iii) Function as a regional node (in relation to goods and people).

Each of the above two (2) cities of Lucena and Batangas has a population of over 100,000. The tertiary industries in both cities developed from their inherent activity-generating bases which are commercial-oriented in the case of Lucena, and coastal manufacturing industry-related in Batangas. With regard to IRM, envisioned to become the growth center in the east coast area (at 250,000 population) without prejudice to its bountiful natural environment, the tertiary industry shall be developed based on its bounties in the agro-fishery industry. The medium of the rate of employment in tertiary industries between the two cities is 0.140. When the figure is applied for IRM's projected population, it reveals that for a population of 100,000 and 150,000, the employment size for the tertiary industry shall be 14,000 to 21,000 respectively. It is, therefore, obvious that tertiary industries have an important role in IRM.

The core of the development of tertiary industries in IRM is likely to compose of the following two points:

(i) Tertiary industry related to the distribution business. This means the total function of distribution in relation to the circulation of people, information and money, and related services which comes together with the bulk of physical development during the start of operations of the fishing and commercial port which is to be constructed in Real. The complete exploitation of the function of Real Port cannot be achieved unless such distribution related industries are constantly developed.

(ii) Commercial and service industry corresponding to the rise of needs level. Considering the general increase of the living standard in IRM, and the concentration of 150,000 people and immigration from the surrounding area, these should be supported by specialized commercial and service industries. These would be in the form of high class shops of expensive and specialized goods, supermarkets, and leisure and recreation establishments. These establishments shall be concentrated in a conducive location which emanates the festive atmosphere of a shopping center.

The rate of employment in the commercial and service industries such as commerce, (retailers and whole sellers), money and credit, insurance, etc., is 0.053 in Lucena, 0.046 in Batangas and 0.036 in Region IV. The difference of 0.010 to 0.017 between these cities and the 0.036 average of Region IV are based on the individual characteristics of point of these cities.

This concludes that the location of commercial establishments having 1,500 to 2,500 employees can be satisfied also in IRM where the population shall reach 150,000.

2.2.2 Potential and Restrictions of Infrastructure Improvement

The industrial development potential described in the last section in all cases assumes the necessary improvement of the local infrastructure. The potential and the restrictions for development of this infrastructure is as described below. This potential depends on the possibility of using existing local resources such as water, electricity, etc., the technical and cost related difficulties for the construction of infrastructure due to topography, natural conditions, etc. and the perspective of demand for industrial development which may cover the costs incidental to the infrastructure improvement.

Roads

The most serious hindrance for the development of IRM, in spite of its short distance from Capital Manila (80 km straight-line distance), and as the geographical center of the eastern coasts, is the Sierra Madre mountains which is a physical barrier for land transportation facilities. The overcoming of this restriction is the single most important precondition for the IRM development. Otherwise said, it is the decisive factor for what can be realized in IRM, the trip attractions as a result of development, and the improvement potentials of IRM.

If IRM could be developed as a city catering to national and international interest as in Manila, first class roads such as Manila North and South Roads shall definitely be constructed. However, the industrial development potential described in the last section recognizes the potential of IRM only as the developing base for the East Coast Region.

The principal road to the East from Manila is, as described in the last section, the Manila Eastern Road. The improvement of the section of existing Infanta Road between Infanta and Famy which branches off the above Road would enable round-trip passenger travel to Manila in one day, and round trip truck transport to Manila in half a day. Therefore, this improvement satisfies completely the necessary condition to realize the industrial development potential described above, in other words, the condition for making IRM the developing base for the East Coast Region.

If the above mentioned industrial development potential is realized and IRM is developed as the growth center in the East Coast Region, the traffic toward Manila is estimated at 9,600/day. To cope with this traffic, the most practical solution is to improve the existing road by first class paving throughout its full two-lane width (according to the Road Improvement Regulation provided for the Manila East Road connected with this road). This is the necessary minimum condition for realizing the above mentioned industrial development potentials.

Ports

Four (4) roles can be considered as the objective of IRM port development: an alternative port to the Manila Port, a commercial port, a production port, and a tourism port.

1) Alternative Port

The conception of the alternative port for part of the functions of Manila Port is to relieve congestion of Manila Port by sharing its international freight operations between the east side (IRM) and west side (Manila) of Luzon Island. However, in terms of cargo handling and distribution, there are no adequate transport facilities along the East Coast of Luzon. Furthermore, the international shipping lines lie on the western waters of Luzon Island, placing IRM at a disadvantage. Moreover, when the improvement project of Manila Port is implemented, it shall increase its cargo handling capacity.

By taking into account the above conditions, there is no possibility of a substitute port in the present project period of city development. However, there still remains a certain possibility of this conception in the case a special bulk transportation with the Pacific countries shall be necessary which depends on the sort of resource development in IRM.

2) Commercial Port

Owing to topographical restrictions, a land traffic facilities in the East Coast Region is at present undeveloped. The interregional traffic must therefore rely on the marine transport. By taking into account the above matters and the marine transport condition along the coastal water of IRM as described in Section 4 of Chapter 1, it has a development potential as the base for the inland traffic of the east coast region.

3) Production Port

The potential for the production port relies on the possibility of introducing industries highly dependent to marine transport and industries favored by the coastal location such as marine products processing industry. As described in the section of industrial development potentials, in case of the fishing port, IRM has a big potential to be a fishing center with complete storage and processing facilities.

4) Tourism Port

As for the tourism port, it can provide the role of landing place and marina for of sight-seeing activities.

From the above factors, the port development potential of IRM can be summarized below:

From the geographical condition of IRM adjacent to Manila and the center position of the east coast region, there is a potential for port development as the center of marine transport provided that road improvement is executed. This port shall play the main roles of a fishing port for the East Coast and a distribution port to the West Coast.

In accordance with the above described industrial development potential, the landing of 65,000 tons of catch as fishing port and the freight of 27,000 tons/year agricultural products mainly coconuts, 50,000 tons/year industrial products mainly wood, and 30,000 tons/year distributing freight, daily necessities and miscellaneous goods for Polillo Islands and East Coast Region, totalling 107,000 tons/year as distribution port, are estimated.

Water Supply

Since there are water systems rich in water resource as Agos River, and other rivers and creeks in the Sierra Madre Mountains adjacent to IRM, there is a high potential for the use of surface water. In fact, the dam construction projects in Kaliwa River attributing Agos River, and utilizing the water resources of the East Coast is planned by MWSS to resolve the shortage of water in MMA.

Having a basin of 879.0 km², mean flow of 116.6 m³/sec and yearly volume of 3.68 x 10⁹m³, Agos is considered a medium sized river. Even in dry periods, (10 year probability), it has a flow of 20.2 m³/sec, and considering that approximately 70% of that flow is usable, a flow of 14 m³/sec is still attainable without having to depend in storage facilities such as dams.

Since future water demand shall be approximately 8 m³/s for agriculture (Agos Irrigation Project) and 1 to 2 m³/s for urban water, the above potential shall be enough even in dry periods. Furthermore, when the water shortage facilities shall be constructed, it shall be able to meet the demand of a larger population. According to the calculation made by NWRC, the total underground water flow of the three municipalities is estimated at 1.72 m³/s.

Since the urban water demand is dispersed in different areas of IRM, water supply from the Agos River is not always economic, and in such cases, underground water can be used as source for urban usage. In any case, the water development potential in IRM can be based on both the underground and surface waters.

Power Supply

The electricity development potential in IRM was examined from the four (4) following viewpoints:

- (i) Reliance on the actual power supply from Luzon Grid;
- (ii) Construction of hydroelectric power plant (depending on abundant water of rivers on the east coast);
- (iii) Coal thermoelectric power plant (using coal of Polillo Island); and
- (iv) Dendro thermal power plant (depending on forestry on east coast).

Since the quality of coal from Polillo Island is rather low and it can be used only by mixing with other coal, and power supply shall very much exceed the power demand in IRM, it is not practical to implement the coal power plant. With regard to Dendro thermal plant, although it supports the shift to non-conventional energy sources which appeals to the public, it could not generate enough power to supply IRM in as much as it could be relied upon only as an auxiliary power source.

The hydroelectricity generation from Agos River can be conceived, but it may not be profitable due to costs incurred from the demand of IRM, and requires a large initial investment for such development. On the other hand, a small scale hydroelectric power plant could produce cheap power. However, its limited capacity makes it fit only to serve as an auxiliary power source.

Therefore, it is practical to purchase power from the Luzon Grid and using local power as auxiliary power sources. When relying on the Luzon Grid, up to 25 MW is available and by adding the power from small hydroelectric plants at 5 MW, there shall be no problem of power supply for the moment.

Furthermore, in the future, the improvement of transmission and distribution facilities corresponding to the integrated plan of the Luzon Grid (hydro-power from North, Geothermal-power from South and nuclear-power from Central Luzon connected with extra high voltage transmission lines) may cope with the increase in IRM power demand.

2.2.3 Basic Prerequisites of IRM Urban Development

In the last section, we examined the improvement potential of each sector of infrastructure. When taking them in relation with the industrial development potential of 2.2.1, it is evident that the construction of roads connecting IRM directly with Manila is the most important factor for the city development.

The reason IRM remains still undeveloped in spite of the existence of various industrial development potential as described before is due to the lack of an adequate road connecting IRM directly with Manila. If this transport condition is improved, the local economy and industries are likely to start developing.

According to such situation, the IRM urban development plan has, from the start, been conceived together with the construction of a highly developed road connecting IRM with Manila as the prerequisite. This was the Marikina-Infanta Road (Marcos Highway).

This road runs through the settlements (Module) 1 to 3 to be developed

on the hills in Rizal Province as the axis of the Lungsod Silangan and leads to IRM.

This road was designed by MPWH. Its extension totals 130 km in spite of the straight-line distance of 80 km due to the geographical conditions of the area. Moreover, the road standards are much lower than expected by the above IRM development project which can hardly be considered as a sufficient and direct access to MMA. It is also known that enormous investments shall be required if it is redesigned to a higher level of standard. The Marikina-Infanta Road was designed to be the principal road connecting Manila with the settlements 1 to 3 and joining the existing Manila East Road, but this route which runs through the Sierra Madre Mountains has been deferred for the moment.

On the other hand, as the industrial development potential of IRM becomes clear, and the Manila East Road is used and the existing Infanta Road is improved, it shall be able to function sufficiently as the extensive principal road directly connecting Manila with IRM for the future industrial development of the area.

As described above, the initial plan for Marcos Highway has been deferred. However, it is necessary to stress that the construction of a high standard road (or considerable improvement of existing road) connecting both areas in some other form is, as stated above, an absolute premise for the industrial development potential described in this section.