

**THE COMPREHENSIVE  
URBAN TRANSPORT STUDY  
IN BARRANQUILLA  
METROPOLITAN REGION  
OF THE REPUBLIC  
OF COLOMBIA**

***PROGRESS REPORT (2)***  
**MARCH 1984**

**JAPAN INTERNATIONAL  
COOPERATION AGENCY**

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## PROGRESS REPORT (II)

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## 1. INTRODUCTION

### 1-1. General.

In response to the request by the Government of Colombia for Technical cooperation in conducting a Comprehensive Urban Transport Study in the Barranquilla Metropolitan Region (here in after referred to as the "Study"), the Government of Japan, through the Japan International Cooperation Agency (JICA), sent a study team to carry out the Study jointly with the Government of Colombia.

The Study commenced in the middle of July, 1983, when the Inception Report for the Study was accepted by the Coordinating Committee.

Based on the schedule as presented in the Inception Report, the first progress report, which compiled the progress of the Study in the first stage was prepared and submitted to the Coordinating Committee in December, 1983.

This Progress Report (II) contains the progress to date since the Progress Report (I), and the major findings during the study period.

The results presented in this report are still at a preliminary stage, therefore amenable to revision in the course of further studies.

### 1-2. Objectives.

The objectives of the Study is to formulate a transport master plan comprising of transport policies and a development plan and program in the long term as well as short term, including the planning of Urban Renewal for the Central District, that will effectively serve the present and future transport needs and contribute to the orderly urban development in the Barranquilla Metropolitan Region.

### 1-3 Study Area

The Study Area, as is stipulated in the Inception Report, covers the present and future urbanized area of cities of Barranquilla, Soledad, Malambo, Galapa, and Puerto Colombia as shown in Fig. 1-3-1.

Although the Study Area covers these cities, the actual study is focussed on the urbanized area in Barranquilla and Soledad, based on the following viewpoints.

- (1) The main objective is to formulate a comprehensive urban transport plan which will cope with the major transport problems at the present as well as in the future.
- (2) The urban transport problems in Barranquilla are most serious in the Study Area at present and are anticipated to be further aggravated in the future.
- (3) A considerable portion of residents in the other cities are commuting to Barranquilla; therefore, the intermunicipal transport has more importance than the intramunicipal transport for those cities.
- (4) The transport problems will expand to the surrounding cities of Barranquilla in accordance with the population and economic growth in those areas; however, they may be solved within the framework of intermunicipal transport.
- (5) Because Soledad, has already formulated a continuous urban area with Barranquilla, it cannot be studied separately.

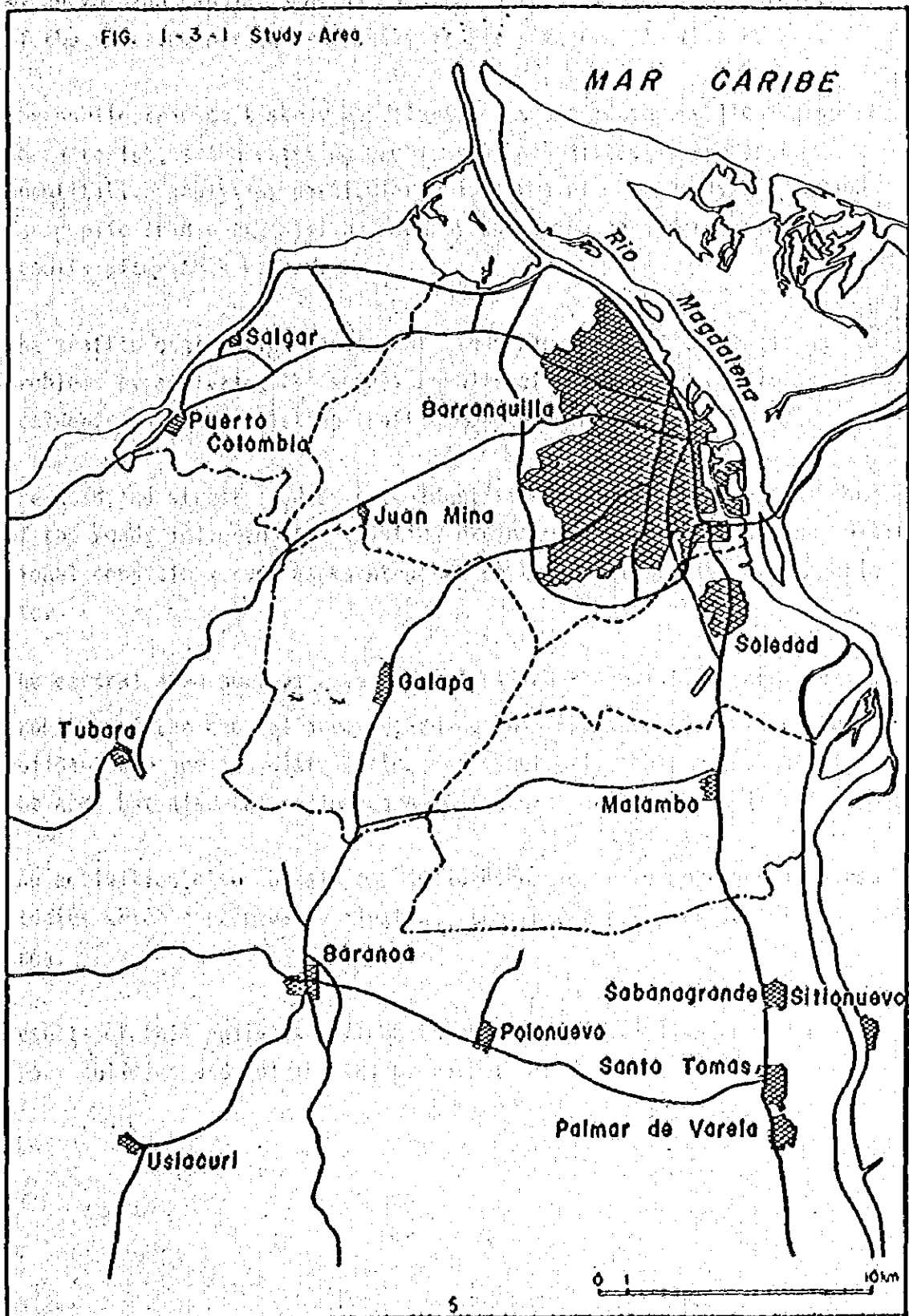
Accordingly, the other three cities, Malambo, Galapa, and Puerto Colombia will be studied from the aspect of intermunicipal transport problems in Barranquilla and Soledad.

### 1-4 Major Activities Conducted

The major activities conducted during the study period to the date in the second stage are shown in Fig. 1-4-1 and Fig. 1-4-2.

As recognized from the Study Flow Chart, the activities compiled in this report are primarily characterized as the analysis of existing urban transport condition and urban structure in the Barranquilla Metropolitan Region at present on the basis of the various surveys including the Person Trip Survey carried out in the first stage.

FIG. 1-3-1 Study Area



- (1) The survey results of the Person Trip Survey were processed, expanded, and tabulated by using a computer. The preliminary results of the existing person trip analysis are presented in this report.
- (2) The public transport study has clarified the existing public transport characteristics and existing problems by a qualitative approach. A quantitative analysis, particularly in terms of the supply and demand for public transport, will be made by using the person trip survey results after this report.
- (3) The traffic engineering management study has depicted the existing traffic problems by analyzing the survey results of the parking conditions, traffic accidents, and the existing traffic management system.
- (4) The Road and street studies have identified not only the physical condition of the roads including the existing drainage system but also the institutional conditions such as maintenance work, administrative organizations, etc.
- (5) The central area surveys have also clarified the existing conditions and problems of the central area regarding the infrastructure, land use, building use and its distribution, etc. Not only the physical setting of the area but also the socio-economic features are included in this analysis.
- (6) The activities also contain the socio-economic frame work and land use studies which conceptually illustrate the future perspectives of the Study Area.

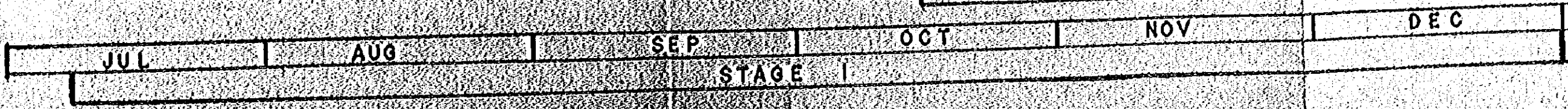
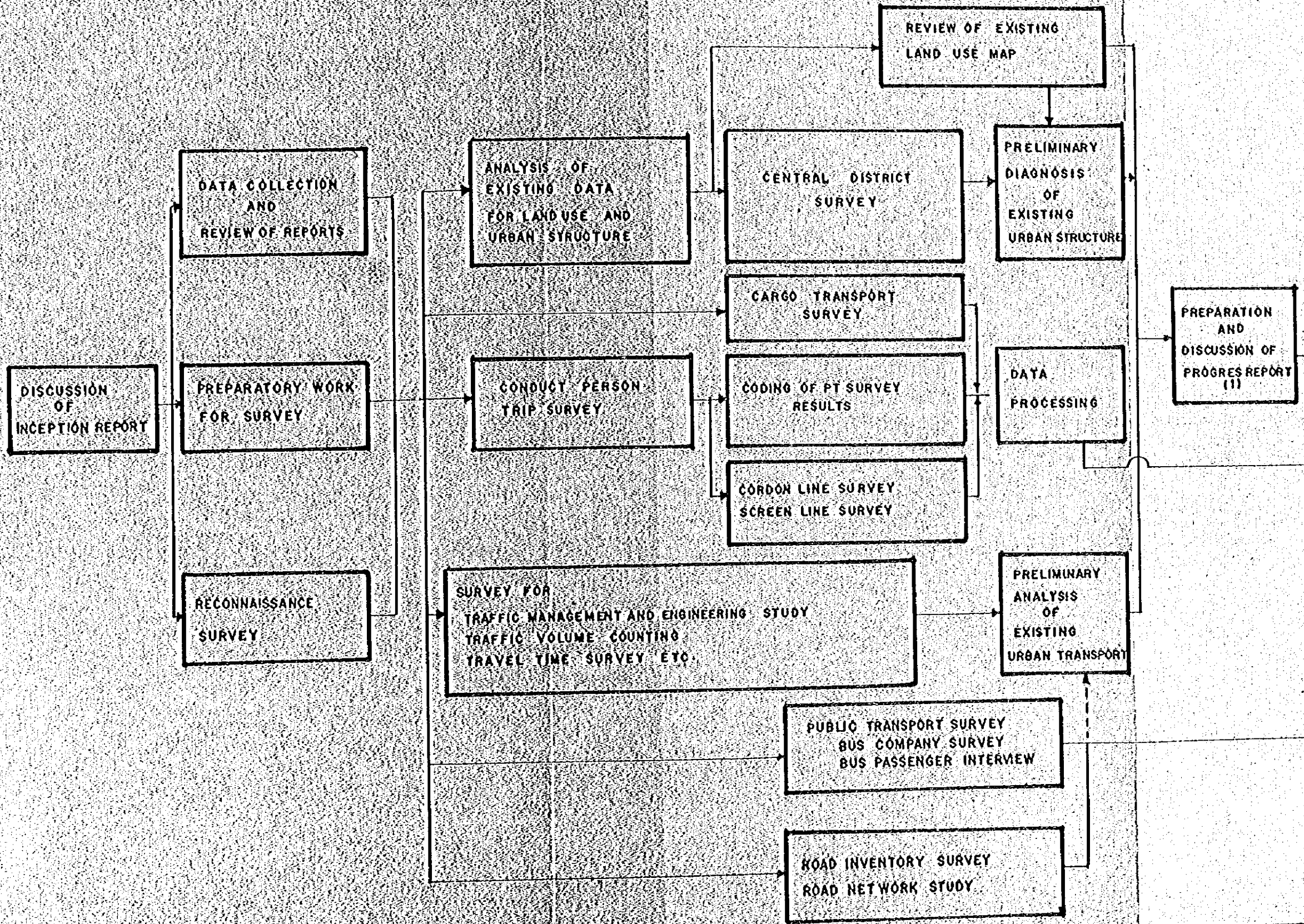
The results of this analysis will be the basis for establishing the future transport policies and solving the problems.

Fig 1-4-1 Major Activities Conducted

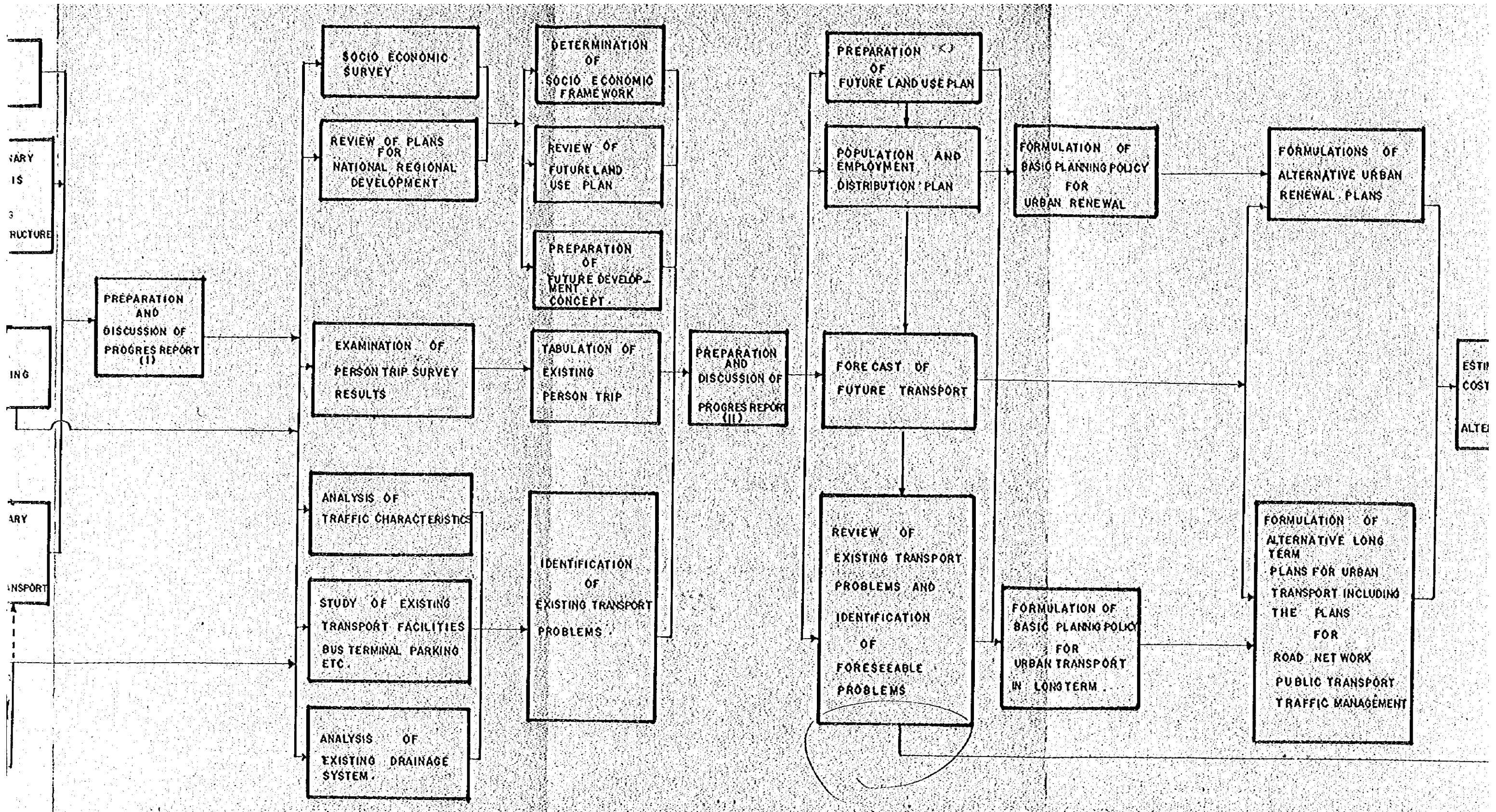
ITEMS	JAN	FEB	MAR
1. Socio-economic Study and Land Use Study			
1-1 Data Collection	██████████	██████████	
1-2 Analysis of Past Trend of Socio-economic Data	██████████	██████████	
1-3 Review of National and Regional Plans	██████████	██████████	██████████
1-4 Analysis of Existing Land Use and Review of Future Plans		██████████	██████████
1-5 Projection of Socio-economic Framework		██████████	██████████
2. Central District Study			
2-1 Supplementary Field Survey	██████████	██████████	
2-2 Analysis of Existing Land Use	██████████	██████████	██████████
2-3 Analysis of Existing Buildings	██████████	██████████	██████████
2-4 Survey of Infrastructure and Drainage System	██████████	██████████	
2-5 Identification of Existing Problems		██████████	██████████
3. Road Engineering, Traffic Engineering and Management			
3-1 Arrangement of Road Inventory Survey Results	██████████	██████████	██████████
3-2 Construction Cost Survey	██████████	██████████	██████████
3-3 Analysis of Design Standard	██████████	██████████	██████████
3-4 Analysis of Existing Storm Drainage System		██████████	██████████
3-5 Study on Parking Condition	██████████	██████████	██████████
3-6 Traffic Accident Analysis	██████████	██████████	██████████
3-7 Survey of Traffic Facilities	██████████	██████████	██████████
3-8 Analysis of Existing Traffic Management System		██████████	██████████
3-9 Identification of Existing Problem		██████████	██████████
4. Public Transport Study			
4-1 Analysis of Bus Operation and Management System	██████████	██████████	██████████
4-2 Supplementary Bus Company Survey	██████████	██████████	██████████
4-3 Survey and Arrangement of Terminal and Taxi Stand Inventory	██████████	██████████	██████████

ITEM	JAN	FEB	MAR
4-4 Financial Condition of Bus Companies	_____	_____	
4-5 Preliminary Identification of Existing Problems		_____	_____
5. Data Processing and Analysis of Person Trip Survey and Other Related Surveys			
5-1 Data Processing	_____		
5-2 Tabulation of Results		_____	
5-3 Analysis of Existing Person Trip		_____	_____
6. Reporting			
6-1 Prepare Progress Report		_____	_____









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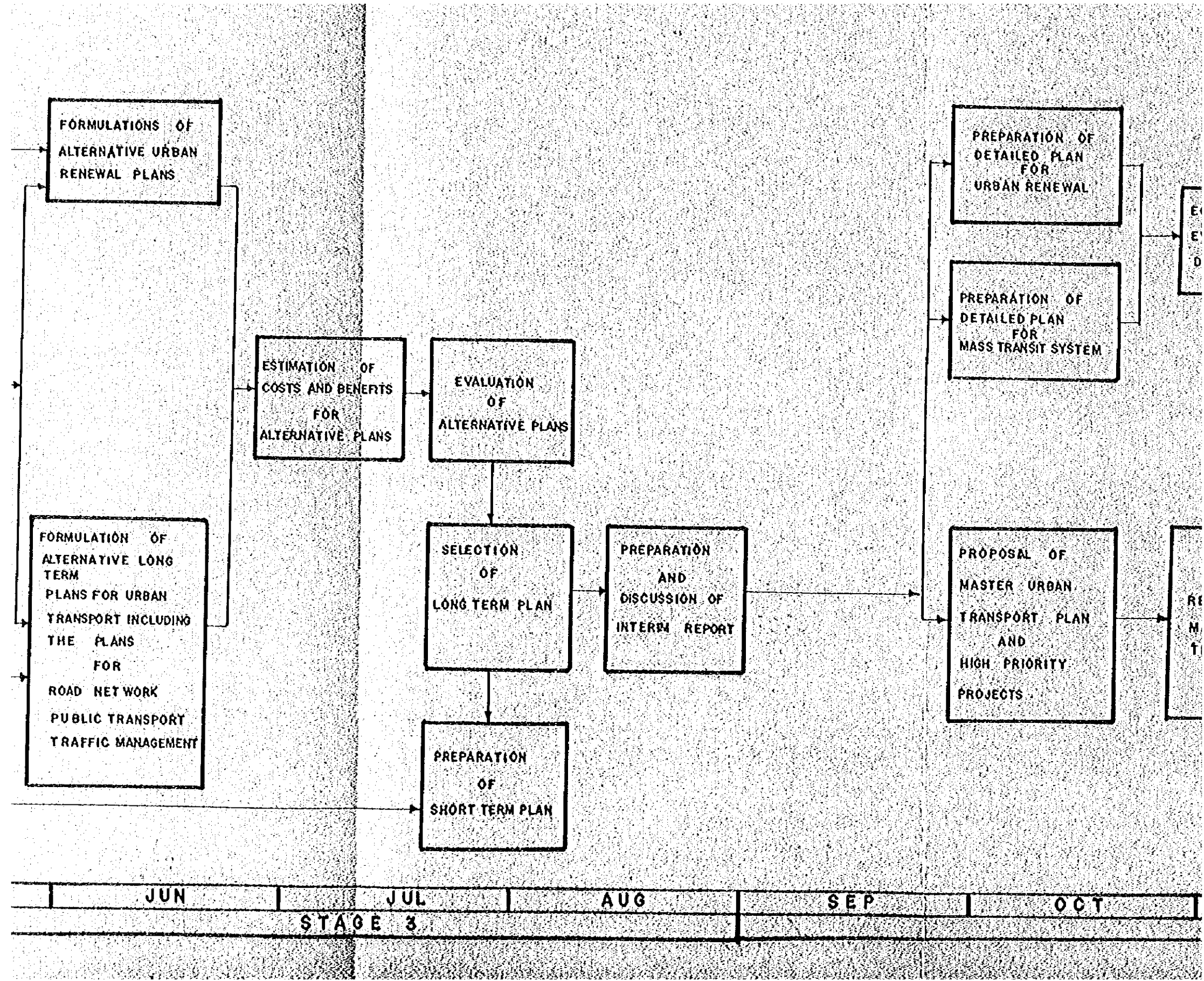
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STAGE 2

ESTIMATED COST ALTERNATIVES



FORMULATIONS OF ALTERNATIVE URBAN RENEWAL PLANS

FORMULATION OF ALTERNATIVE LONG TERM PLANS FOR URBAN TRANSPORT INCLUDING THE PLANS FOR ROAD NETWORK PUBLIC TRANSPORT TRAFFIC MANAGEMENT

ESTIMATION OF COSTS AND BENEFITS FOR ALTERNATIVE PLANS

EVALUATION OF ALTERNATIVE PLANS

SELECTION OF LONG TERM PLAN

PREPARATION OF SHORT TERM PLAN

PREPARATION AND DISCUSSION OF INTERM REPORT

PREPARATION OF DETAILED PLAN FOR URBAN RENEWAL

PREPARATION OF DETAILED PLAN FOR MASS TRANSIT SYSTEM

PROPOSAL OF MASTER URBAN TRANSPORT PLAN AND HIGH PRIORITY PROJECTS

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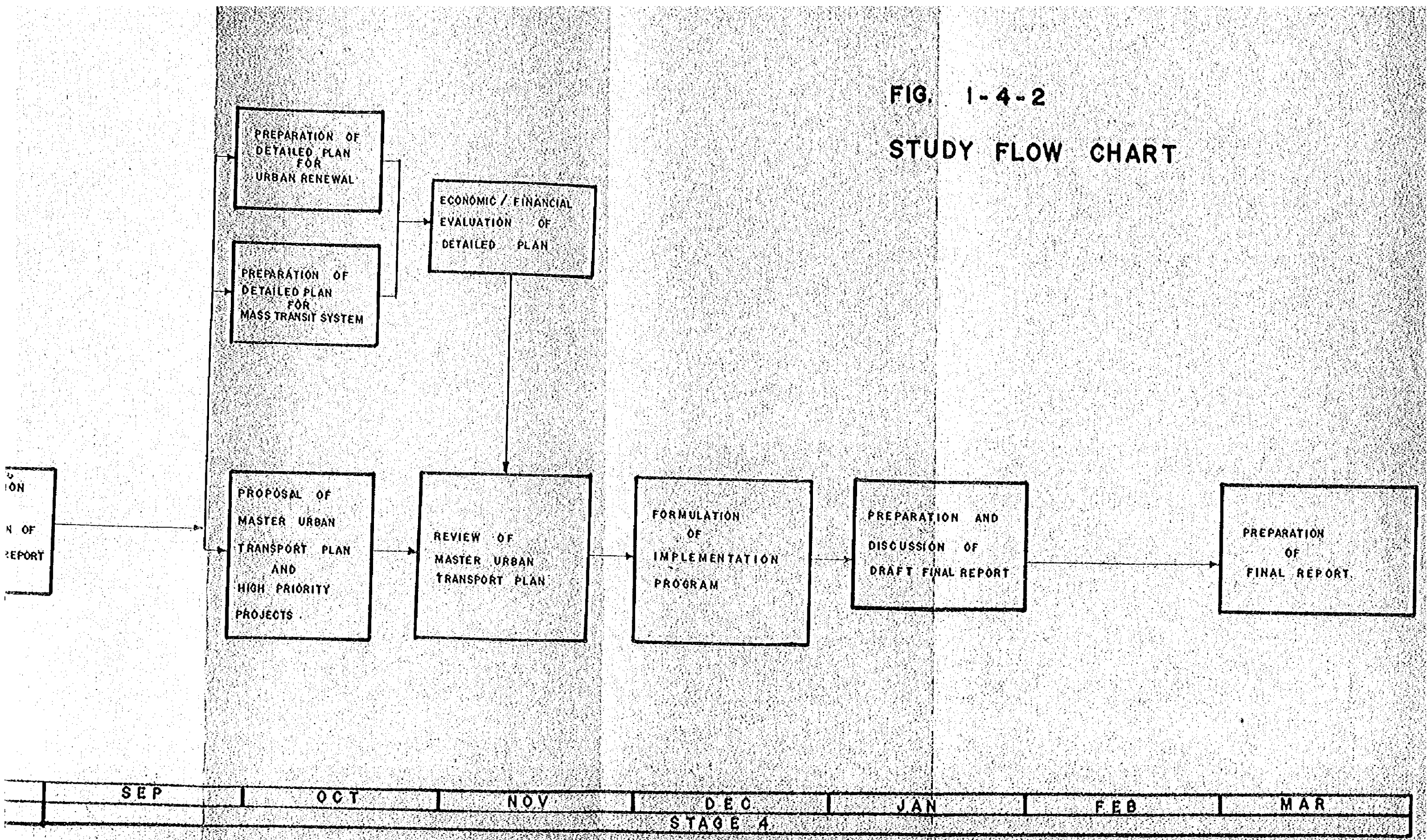
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STAGE 3



FIG. 1-4-2  
STUDY FLOW CHART



## CHAPTER 2. Socio-economic Background

### 2-1 Population

#### 2-1-1 Population Size

##### 1) Population Census

The population Census in 1973 is the most recent census in Colombia. As shown in Table 2-1-1, the population in the study area has increased with a higher growth rate than those of Departamento Atlántico and the national total. As a result, the percent share of the population in the Study Area to Atlántico has grown to nearly 80%.

It is noted that the annual growth rate on the Study Area has a declining tendency, though the population size itself is increasing.

Table 2-1-1 Past Population trend by Census

( in thousands )

	Population				Annual Growth Rate	
	1951 <sup>(1)</sup>	1964 <sup>(1)</sup>	1973 <sup>(1)</sup>	1973 <sup>(2)</sup>	'51-'64	'64-'73
Barranquilla	279.6	498.3	665.9	703.5	4.5%	3.9%
Soledad	20.9	38.5	65.1	68.6	4.8%	6.6%
Malambo	4.5	7.6	11.3	12.3	4.1%	5.5%
Galapa	4.5	6.2	9.2	9.9	2.5%	5.3%
Pto. Colombia	8.2	10.3	13.2	14.6	1.8%	4.0%
Total Study Area (% share to Atlántico)	317.7 (74.4%)	560.9 (78.2%)	764.7 (79.3%)	808.9 (78.6%)	4.5%	4.2%
Atlántico	427.3	717.4	964.1	1028.9	4.1%	4.1%
Colombia	11548.2	17484.5	22773.0	22915.2	3.2%	3.1%

Source : 1) Censo Población 1951, 1964, 1973, DANE  
2) Ajuste por cobertura de la población, DANE (Abril 1981)

## 2) Estimation of Present Population Size

As for Barranquilla and Soledad, their population sizes can be estimated by using the results of Person trip survey conducted in 1983. As shown in figure 2-1-1, the existing number of houses was identified by actual counting and updating of the existing information such as the survey results by DANE (Departamento Administrativo Nacional de Estadística) or the Malaria Eradication Service (SEM: Servicio de Erradicación de la Malaria).

The present population size is estimated by multiplying the number of houses by the number of persons per house, which is obtained from the Person Trip survey.

Consequently, the present population sizes in Barranquilla and Soledad are estimated as given in Table 2-1-2.

fig. 2-1-1 Estimation Procedure of Present Population Size.

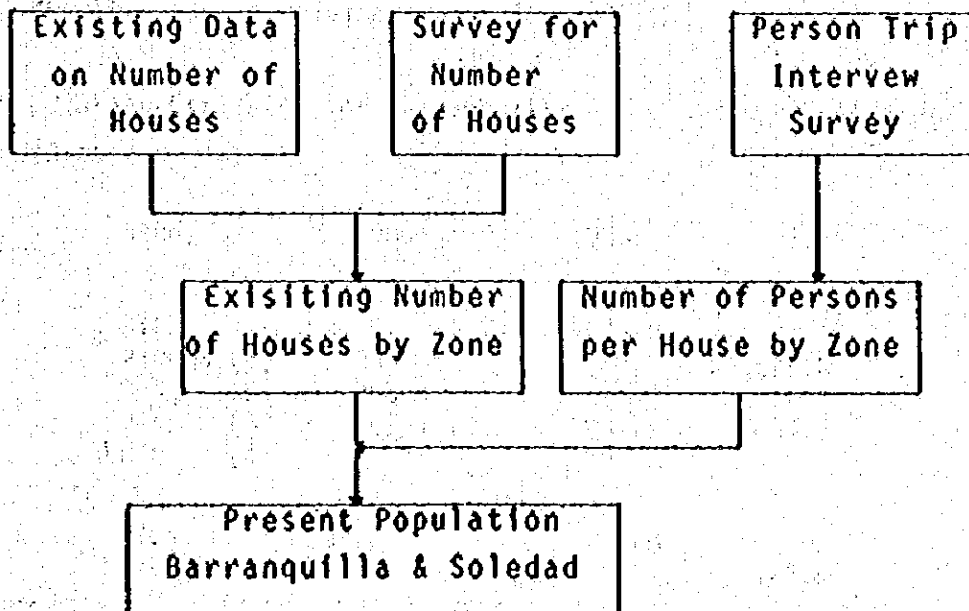


Table 2-1-2 Population in the Study Area in 1983

	Population		Ave. Annual Growth Rate
	1973	1983	
Barranquilla	703.5	973.2 <sup>(2)</sup>	3.3%
Soledad	68.6	134.8 <sup>(2)</sup>	7.0%
Malambo	12.3	58.7 <sup>(3)</sup>	16.9%
Galapa	9.9	12.8 <sup>(3)</sup>	2.6%
Puerto Colombia	14.6	20.7 <sup>(3)</sup>	3.6%
<b>Total</b>	<b>808.9</b>	<b>1,200.2</b>	<b>4.0%</b>

Source: 1) Censo Nacional de Población ajustado DANE

2) Person Trip Survey in 1983

3) Instituto Nacional de Fomento Municipal

( estimated on the basis of the sample survey in 1979 )

The population in the Study Area has increased from about 808.9 thousand in 1973 to about 1.2 million in 1983.

The population estimates for Barranquilla and Soledad in the above Table can be compared with other past studies as shown in Table 2-1-3.

Table 2-1-3 Population Estimates for Barranquilla and Soledad by different studies

Area	Study	1980	1983	1985
Barranquilla	JICA		973.2	
	PIDAMB (1)	906.0		1,079.8
	DANE (2)	886.8		
	DANE (3)	885.9	985.9	1,057.3
	PIN (4)		996.0	
Soledad	JICA		134.8	
	PIDAMB	97.7		125.8
Barranquilla & Soledad	JICA		1,108.0	
	PIDAMB ONP (5)	1,003.7	1,074.0	1,205.6

- Source:
- 1) Plan Integral al Desarrollo del Area Metropolitana de Barranquilla Agosto 1981.
  - 2) Encuesta de Hogares DANE 1980
  - 3) Colombia Estadística 1979 DANE
  - 4) Plan de Integración Nacional 1979-1982
  - 5) Dinámica Demográfica y Proyecciones de Población del País, los Territorios Nacionales, las 30 Principales Ciudades Sept. 1982 DNP

In the case of Barranquilla, the estimates by different studies do not differ very much from one another. As for Soledad, owing to the rapid housing development in the recent years, the estimate by the Study Team resulted to be somewhat higher than the other.

The population growth in Malambo is also remarkable. It has grown about 5 times as much as the population in 1973 during the last decade.

The rapid population growth in the satellite cities of Barranquilla may be attributed to the following reasons.

- 1) The urbanized area in Barranquilla, particularly inside of the Circunvalar Road, is already built up.
- 2) The housing cost in Barranquilla is relatively higher while the satellite cities are providing a lot of low-cost houses.
- 3) The satellite cities are located fairly close to Barranquilla (within about 10 Kms from the Centro), and a frequent bus service to the central district of Barranquilla is provided.
- 4) The family structure per living quarter is changing to more nuclear-type families from the extended type, i.e., the number of household per house is decreasing. Therefore, the effect of spill-out from Barranquilla may be one of the main reasons for the population expansion in the satellite cities.

This tendency is anticipated to continue at least 'till 1985, since a number of housing development programs are already prepared. However, it is also anticipated that the rapid population growth may lead to a shortage of public services such as electricity, gas and water supply, and a transportation problem as well.



## 2-1-2 Characteristics of Population Structure

### 1) Age Composition

Table 2-1-3 shows the Age Composition in Barranquilla and Soledad, obtained from the Person Trip Survey in 1983. Compared with the Age Composition in 1973, it is found that the age group of 15-64 has considerably increased, while the age group of less than 15 years old has substantially decreased. The changes in the age composition may be caused partly by the decreases in the fertility and birth rates and mortality rate and partly by the fact that a substantial proportion of the population which is made up of migrants, tends to be centered around the economically active group.

Table 2-1-4. Age Composition in Barranquilla and Soledad (in thousands)

Age Group	1973 (1)		1983 (2)	
	Population	%	Population	%
0 - 14	296.7	40.6	395.2	35.6
15 - 64	410.7	56.2	681.5	61.6
65 -	23.7	3.2	31.3	2.8
Total	731.1	100.0	1,108.0	100.0

Source 1) Censo Nacional de Población Oct. 1973, DANE

2) Person Trip Survey in 1983

### 2) Population by Natural Increase and Migration

The birth rate has decreased at a higher pace than the death rate during the years from 1964 to 1973 as shown in table 2-1-4. Hence, the natural increase rate has a declining tendency.

Table 2-1-5 Birth Rate and Death Rate in Colombia

	1951	1964	1973
Birth Rate	-	4.80%(1)	3.31%(2)
Death Rate	1.42%(3)	1.24%(4)	0.90%(4)
Natural Increase	-	3.56%	2.41%

Source : 1) Elkins H. "Cambio de Fecundidad" en la Fecundidad en Colombia, Encuesta Nacional de Fecundidad, Bogotá ASCOFAME, publicación No. 5 1973.

2) DANE "La Fecundidad en Colombia 1978" Boletín Mensual de Estadística No.325 Agosto 1978.

3) DANE Anuario General de Estadística 1966 - 1967.

4) DANE Population Census Adjusted.

On the other hand, the population in urban areas in Atlántico has a higher growth rate than that in rural area. This implies that a population concentration to urban areas has been occurred during the period.

Table 2-1-6 Population in Atlántico

	1951	1964	1973	Annual Growth Rate	
				'51-'64	'64-'73
Cabecera	376.4	652.4	954.9	4.3%	4.3%
Resto	52.0	65.0	74.0	1.7%	1.5%
Total	428.4	717.4	1028.9	4.0%	4.1%

Source: Censo Nacional de Población DANE

In the case of the Barranquilla Metropolitan Region, the population growth during the years '64-'73 is much higher than the natural growth: This implicitly indicates that the annual net in-migration into the Region has been about 1.0% of the population in average during the period.

## 2-2. Gross Regional Domestic Product (GRDP)

### 2-2-1. Movement of Gross Domestic Product (GDP).

#### 1) General

The GDP grew 5.8% annually during the period between 1970 and 1980, but since 1981, the growth curve has been showing a tendency to become flat. The growth rate came down 2.3%, 0.9% and 0.9%, in 1981, 1982 and 1983 respectively.

This fact can be explained fundamentally by the reduction in producing activity of leading sectors, such as agriculture-livestock, manufacturing industries, and private construction. These three sectors all together contribute more than 40% of GDP, and their movement has a strong influence on other sectors, such as commerce and transportation.

The reasons for the descending activity of the leading sectors are mainly as follows:

- (1) The insufficiency of total demand.
- (2) The increasing protectionism of industrialized countries.
- (3) The difficult economic situation of many Latin-American countries.

#### 2) Sectoral Characteristics of Leading Activities.

##### a. Agriculture-livestock.

The prices of agricultural products in the international markets were lowered in the world wide recession, with the exception of coffee and tobacco, that caused to decline the will of amplifying areas and increasing productions.

In 1982, the production of cotton and sesame showed a remarkable reduction

58% and 38% respectively, and the exportations of rice and sugar were affected seriously by the international prices.

The livestock subsector has registered 0.9% improvement in production, especially with the 5% increase of dairy production in 1982. On the other hand, the level of slaughtered numbers of cattle and swine for domestic consumption presented a considerable decrease.

#### b. Manufacturing Industries.

The gross value added in manufacturing industries showed a continuing downward curve of -2.6% and -2.2% on the same scale in 1981 and 1982.

The industries of capital goods and durable consumer goods marked an acute downward tendency. For example, the production of vehicles has been to the order of 35,000 units annually during the last two years. This figure is very much inferior to the annual average of 45,000 units during 1978-1980.

As for industries of intermediate goods, the construction materials have increased remarkably: cement, iron and steel, plastics, woods, etc.

The non-durable consumer goods, like textile industries, showed only little increase in the volume of production. In the case of apparels, the diminishing domestic demand was accompanied by little increase in international sales.

#### c. Construction.

The subsector of private construction was affected by the minor constructing activity of the Paz del Rio Steel Mill. In this project, the construction of pipe lines and urban development works in general are included.

On the other hand, the public construction has a positive effect of putting the brakes on the recessive tendencies of other sector of producing activity.

However, it is important to point out that because of the fiscal unbalance, it is necessary to adopt a policy to reduce public costs.

Table 2-2-1. Movement of GDP of Colombia by Three Sectors of Economic Activity at 1975 Constant Prices.

	(in million pesos)					
	1970	1973	1975	1980	1981	1982P
Primary	77,893	83,669	96,766	119,314	123,135	120,816
Secondary	86,875	112,275	118,365	147,175	145,841	145,164
Tertiary	142,728	175,454	189,977	259,276	268,760	276,777
Total	307,496	374,398	405,108	525,765	537,736	542,757

P: Provisional

Source: DANE

#### 2-2-2. GRDP of the Department of Atlántico.

##### 1) GRDP until 1975.

The departmental GRDP was estimated by INANDES for the years 1960-1975. According to this estimation, the economic activity for the Department of Atlántico can be summarized as follows:

- (1) Participation of Atlántico in Colombia was gradually increasing from 4.85% in 1960 to 5.59% in 1975.
- (2) Annual growth rate of the departmental GRDP was 6.6% between 1960 and 1975, while the GDP of Colombia marked a 5.6% increase. The elasticity was 1.17; that is the annual growth rate of Atlántico when the GDP increases 1.00%.
- (3) GRDP per capita was the level of 1.2 times of the GDP per-capita and came up from 6,287 pesos in 1960 to 9,118 pesos in 1975.

- (4) As for the sectoral composition of GRDP, Atlántico is characterized by the high percentage of secondary and tertiary sectors. The primary sector (agriculture and mining) occupied only 8.2% in 1975.
- (5) The primary sector of Atlántico is mainly located in the southern part of the department, where livestock and agricultural production are conducted for supplying the products to the Barranquilla metropolitan region. Local production does not reach the demand, so it is necessary to resort on the supply from the adjacent departments and some inner parts of the country.
- (6) As Atlántico is abundant in water areas, fishing activity occupies an important position, so its share in the primary sector was 15.2% in 1975.
- (7) The important agricultural crops in Atlántico are cotton, maize, and cassava. Coffee, which is the most important export product in Colombia, cannot be cropped here because of the climatic condition.
- (8) The secondary sector is concentrated in the Barranquilla metropolitan region. The manufacturing industries are located mainly at the following zones: Vá Cuarenta, Las Flores, Villa Nueva - Calle 17, Autopista al Aereopuerto.
- (9) The main manufacturing activities were chemicals, food and beverages, and non-metallic mineral products, occupying more than 50% of the total manufacturing value added in 1974.
- (10) Construction activity contributed 10% to the total secondary sector.
- (11) The tertiary sector occupied 62.3% of GRDP in 1975; it was a very high percentage in comparison with that of GDP of Colombia, 49.8%.
- (12) Commerce has a more important role in Atlántico than in the rest of Colombia. In the tertiary sector, commerce had 38.3% share; on the other hand, at the national level, the percentage was 33.6%.

## 2) Recent movement of the Economic Activity in Atlántico.

### a. Agriculture + Livestock.

In 1982, the agricultural activity presented an undiserable movement; that is, the planted area decreased 0.2%, and the production value suffered

damages in real terms. The total cultivated area diminished its extension. The land productivity on the whole came down, a consequence of a technical assistance program and irregular climatic conditions.

It is important to point out that the increase in physical production does not result in the increase of production value because of the low selling prices affected by an inadequate market system.

In the principal agricultural zone of the Department (South Zone), there are some limitations to producing activities. They are as follows:

- (1) Insufficient or inopportune provision of an irrigation system.
- (2) Many small farms under the minimum size which permit the rational utilization of available resources.
- (3) Absence of an institution which promotes the marketing of products and agricultural investment, facilitating the acquisition of reasonable prices for producers.

The livestock subsector registered a low dynamism in 1982. The number of livestock, the domestic consumption, and the promotion credit diminished significantly in relation to the previous year. At the beginning of the year, the exportation of livestock (unit of cattle) reduced 25.2%. But according to the improvement of the international price of meat, that is, the two important meat producing countries (Argentina and Australia) decreased their exportation, the value of meat exportation showed a considerable increase.

#### b. Manufacturing Industries.

In 1982, the territorial extension of the industrial zones amounted to 743 hectares, of which 69% are utilized. The industrial development of the region has suffered traditionally from the high prices of electric energy and the administrative centralization of the state as obstacles.

The price of electricity for industrial use in Barranquilla is 25%, 42% and



99% higher than those of Bogotá, Cali and Medellín respectively. This fact is in part, due to the thermal power generation.

In the middle of the second semester of 1982, a plan was started for eliminating the unbalance of the electric price between the Atlantic Coast and the inner part of the country, by means of a gradual increase of prices for the latter and maintaining constant prices for the former.

The excessive administrative centralization diminishes the decisive power, the authority, the functions, and the resources of the departmental and municipal government. These facts have caused new enterprises to locate preferably in the capital of the country.

The manufacturing groups which fell in to low increasing levels of production value in real terms were food, except beverages; textiles and apparels, except footwear; wood and cork, except furnitures; papaer and paper products; and non-ferrous metal basic industries.

The groups which marked good movement but not sufficient for modifying the producing structure in 1982 were berevages; furniture and fixtures; chemical industries and fabricated non-metal mineral products.

By starting to execute the National Development Plan 1983-1986, it is emphasized that the structure of manufacturing industries will be adjusted to produce relatively more capital goods and less consumer goods in the long term. Barranquilla has advantageous conditions as the site for establishment of the capital goods industries, for these types of industries are characterized by the following:

- (1) Possesing a high component of imported primary materials.
- (2) Requiring an easy access to the international markets, for the domestic market is not sufficient for the supply of products.

At present, the capital goods industries are concentrated in the inner area; however the time is coming when the country will have to decide to mobilize these said industries to the coastal area for more efficient

competition

c. Construction.

The building activity in Barranquilla increased 2.7% which is based on approved licenses in 1982.

The new construction of houses, stores and the like, which compose more than 58% of building activity, diminished 19% in 1982, but was compensated with many modifications and additions.

As for the public works, many charges have occurred in the field of road maintenance, water supply facilities, and others.

d. Commerce.

Recently the informal sector, which is composed of street vendors, small stalls or kiosks have increased as well as the smuggling. They are taking the market of legal commercial activities. On the other hand, these types of cooperatives contributed to improve the purchasing power of medium and low income classes.

3) GRDP in 1983.

Before estimating GRDP of Atlántico in 1983, the one in 1980 was estimated by the following method :

- 1) The primary sector: Using the same growth rate as the national level of the sector between 1975 and 1980.
- 2) The secondary sector: Using the ratio Atlántico to Colombia in the value added of manufacturing industries obtained from the 1980 "La Encuesta Anual Manufacturera".
- 3) The tertiary sector: Using the ratio of Atlántico to Colombia in the sectoral value added obtained from the INANDES projections for 1980 by

5.5% growth rate case.

Based on the decided GRDP in 1980, the following considerations were taken into account for estimation of 1983 GRDP.

- 1) Agricultural activity in Atlántico was also damaged by the low prices in international and domestic markets as was done in the whole country.
- 2) Manufacturing industries of Atlántico showed some increase in value added during the period 1980/1981, in spite of the national level decrease. But after that the tendency has been serious as described before.
- 3) The tertiary sector may have taken the same behavior as that of the national level.

Table 2-2-2 shows the result of estimation with those of preceding years.

GRDP of Atlántico occupies 5.69 % of GDP, and grew 4.1% annually during the past decade.

From the stand point of sectoral development, the primary sector shows the highest growth rate of 5.2%; but it is due to the significant increase of annual 15% during the period between 1973 - 1975.

The steady growing sector is the tertiary, maintaining the upward tendency in the ratio to the total GRDP.

The secondary sector is the important leading sector occupying the two thirds of GRDP, but has been suffering from low growth rate of annual 2.6% since 1979.

Table 2-2-2. GRDP of Atlántico at 1975 Constant Prices.

	(in million pesos)			
	1973	1975	1980	1983
Primary	1,260	1,600	2,050	2,100
Secondary	7,210	8,200	9,200	10,030
Tertiary	12,370	13,050	17,660	19,030
<b>Total</b>	<b>20,840</b>	<b>22,910</b>	<b>28,910</b>	<b>31,160</b>
Ratio to National Total	5.57	5.66	5.50	5.69

Source: Estimated by the Study Team.

### 2-3. Existing Industries.

#### 2-3-1. Manufacturing Industries.

According to 1981 "La Encuesta Anual Manufacturera" (DANE), in the Department of Atlántico located 500 establishments of manufacturing industries (with 10 and more persons engaged), producing 27,027 million pesos value added, and employing 37,650 persons. Comparing with the national total, the departmental share is 7.36%, 6.61% and 7.51% in number of establishments, value added and persons engaged, respectively.

The manufacturing industries of Atlántico is concentrated in the Barranquilla Metropolitan Region, especially in Barranquilla-Soledad area. Concentration ratios amount to the level of 98.6%, 99.0% and 99.2% in number of establishments, value added and persons engaged, respectively.

Table 2-3-1. Status of Manufacturing Industries in Barranquilla-Soledad compared with Atlántico and Colombia (1981).

	Barranquilla-Soledad(A)	Atlántico(B)	Colombia(C)	(A)/(B)	(B)/(C)
Number of establishments	493	500	6.792	0.986	0.0736
Value added (million pesos)	26.759	27.027	409.147	0.990	0.0661
Persons engaged	37.352	37.650	501.035	0.992	0.0751

Source : DANE

Of 26,759 million pesos value added in Barranquilla-Soledad, 75.8% (20.271 million pesos) is occupied by the following industries: chemicals, food, beverages, fabricated metal, wood, apparels, non-metallic minerals, paper and paper products, and textiles.

From the stand-point of employment, apparel industries contribute the most (5,845 persons, 15.6%) followed by food industries (5,424 persons, 14.5%).

When compared to 1980, the number of persons engaged decreased considerably in almost all of activities, especially textile industries. This phenomenon reflects the recent stagnation of economic situation.

Table 2-3-2. Manufacturing Industries by Activity in Barranquilla-Soledad (1980-1981).

	Persons engaged		Value added	
	1980	1981	1980	1981
311/312 Food	5906	5424	3113	3733
313 Beverages	2376	2203	2365	3052
314 Tobacco	245	223	315	297
321 Textiles	3117	1975	1062	1010
322 Apparels	5412	5845	1365	1419
323 Leather	810	770	283	399
334 Footwear	405	581	68	166
331 Wood	2048	1889	1506	1815
332 Furniture	482	420	99	103
341 Paper	994	1011	998	1058
342 Printing	1061	926	333	412
351 Chemicals	2153	2080	3134	4679
352 Chemical Products	1494	1348	898	750
353 Petroleum	-	-	-	-
354 Petroleum Products	79	66	25	29
355 Rubber	153	217	45	53
356 Plastics	1859	1651	509	880
361 Ceramics	13	-	3	-
362 Glass	501	420	348	447
369 Other Non-metallic	1415	1456	1060	1351
371 Iron and steel	219	275	45	142
372 Non-ferrous	681	643	500	592
381 Fabricated metal	3370	3254	905	2154
382 Machinery	771	747	228	252
383 Electric machinery	994	795	501	668
384 Transport	2219	2157	864	878
385 Professional	96	73	22	28
390 Miscellaneous	1156	903	410	392
<b>Total</b>	<b>40029</b>	<b>37352</b>	<b>21002</b>	<b>26759</b>

Source: DANE

According to the information from Cámara de Comercio, the total number of establishments in the Barranquilla Metropolitan Area is 1976 as of the year 1982.

Most of the large manufacturing industries are concentrated in the industrial area along the trunk roads in Barranquilla and Soledad such as Vía 40, Calle 30, Calle 17 and Barranquillita.

Table 2-3-3. Distribution of Large Manufacturing Industries.

Industrial Area	Number of Establishments		
	Heavy Industries	Light Industries	Total
Vía 40	58	27	85
Calle 30	35	55	90
Calle 17	6	35	41
Barranquillita	14	33	47

Source: Cámara de Comercio.

Among them, the industrial area along Vía 40 is characterized by heavy industries such as chemical products, metal products etc., while the area along Calle 17 and Barranquillita are dominated by light industries such as beverages, wooden products etc.

### 2-3-2. Other Activities.

#### 1) Construction.

According to Cámara de Comercio there exist 561 establishments in the Barranquilla Metropolitan Area. They are engaged in the construction works for the infrastructures such as bridges, highways or the private houses and the buildings for commercial and industrial uses.

## 2) Commerce and Finance.

This sector has more than 7000 establishments which are providing the largest portion of employment opportunities in Barranquilla Metropolitan Area. About 150 of them are large financial companies such as banks, insurance companies and cooperatives with regard to their locations, a considerable number of entities are concentrated in the Central District. Specifically in Barranquillita, lots of food businesses are food.

It is also prominent that a concentration to new commercial zone along Calle 72 is proceeding.

## 3) Services.

This sector also has a large number of establishments; about 1900 entities in the year 1982 according to Table 2-3-4.

Like as commercial sector, most of them are concentrated in Centro and the area along Calle 72.

Table 2-3-4. Number of Establishments in Barranquilla Metropolitan Region.

Activity	No. of Establishments
Agricultural	322
Mining	12
Manufacturing Industries	1976
Construction	561
Commerce & Finance	7191
Transport/Communications	418
Public Service	88
Private Service	1860
Total	12428

Source: Cámara de Comercio 1982. Study Team Estimation.



## 2-4 Employment.

### 2-4-1. Labor Force Supply.

In 1973, the participation and activity rates in Barranquilla were highest as compared to other cities in Atlántico as shown in Table 2-4-1. The total labor force in Barranquilla & Soledad in 1973 was about 228,5 thousand, while the other three municipalities of the Study Area had about 8,800 only.

In accordance with the population growth, the labor force in Barranquilla and Soledad has grown from 228,5 thousand in 1973 to 387,0 thousand in 1983 with a growth rate of 5.4% per annum as shown in Table 2-4-2.

This high growth rate is partly due to an increase in the percentage of the working age population and also due to an increase in labor participation ratio.

The census in 1973 revealed that the unemployment rate in the Study Area was considerably high. The unemployment rate in Barranquilla seemed to have been once eased in the late 1970's; however, due to recent world-wide economic recession and the introduction of new trade policy by the Government of Venezuela in 1982, the labor market has been aggravated again in the recent years. (See Fig. 2-4-1-). According to the Person Trip Survey, the unemployment in Barranquilla/Soledad in 1983 was found to be 14.9%, which was approximately coincident with the result of the DANE's survey in 1983. (Encuesta de Hogares by DANE shows that the unemployment rate in 1983 is 14.6% for Barranquilla/Soledad.)

Table 2-4-1. Labor Force in Study Area in 1973.

(in thousand)

	Atlántico	Barranquilla	Soledad	Sub- Total	Malambo	Galapa	Pto. Colombia	Sub- Total
Total Population	964.1	665.9	65.1	731.0	11.3	9.2	13.2	33.7
Working Age Population	638.4	453.7	40.9	494.6	6.9	5.6	8.4	20.9
Labor Force	289.5	210.6	17.9	228.5	2.9	2.4	3.5	8.8
Participation Rate	45.3%	46.4%	43.8%	46.2%	42.4%	42.4%	42.4%	42.4%
Activity Rate (Gross)	30.0%	31.6%	27.5%	31.3%	25.7%	26.1%	26.5%	26.1%
Unemployment Rate	17.3%	16.0%	21.8%	16.4%	24.1%	20.8%	28.6%	25.0%
Unemployment	50.0	33.6	3.9	37.5	0.7	0.5	1.0	2.2
Total Employment Persons	239.5	177.0	14.0	191.0	2.2	1.9	2.5	6.6

Source: Censo Nacional de Población '73 DANE (Sin ajustar)

Note: Working age population indicates the population over 12 years old.  
 Participation Rate: Labor Force/Working Age Population  
 Activity Rate: Labor Force/Total Population.

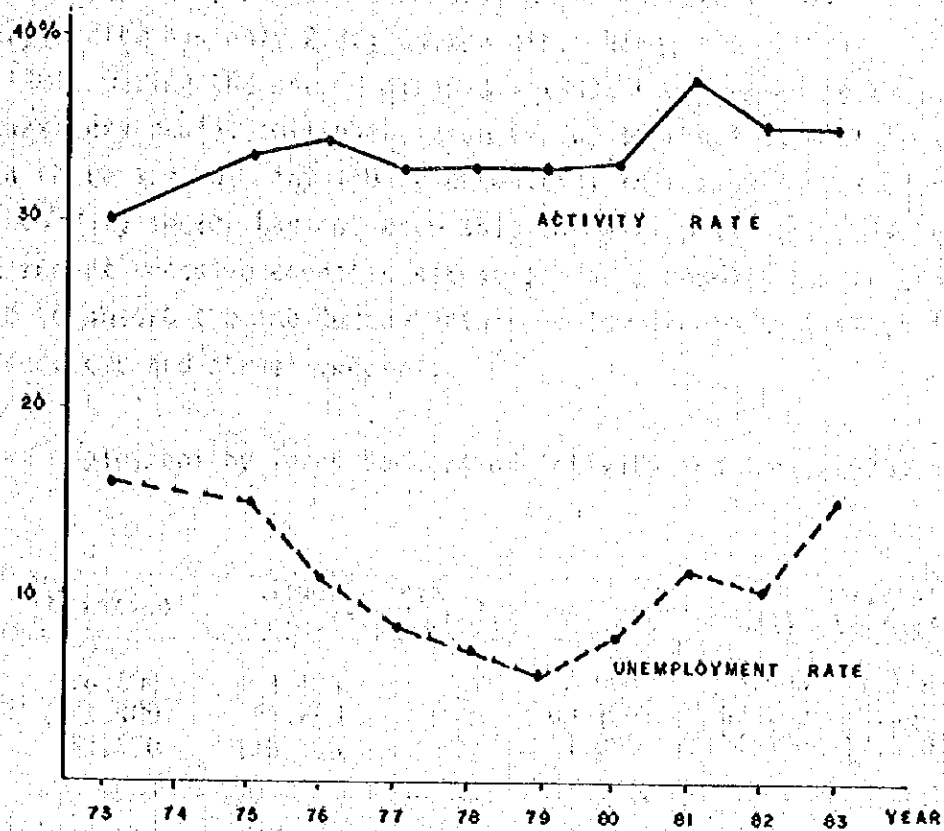
Table 2-4-2. Labor Force Trend in Barranquilla and Soledad.

(in thousand)

	1973	1982	1983	Ave. Annual Growth Rate (73 - 83)
Total Population	731.0	1.068.5	1.108.0	4.2%
Working Age Population	494.6	759.1	786.5	4.7%
Labor Force	228.5	369.7	371.6	5.0%
Participation Rate	46.2%	48.7%	47.3%	-
Activity Rate	31.2%	34.6%	33.6%	-
Unemployment Rate	16.4%	10.3%	14.9%	-
Unemployment	37.5	38.1	55.2	3.9%
Total Employment	191.0	331.6	316.4	5.2%

Source: 1 Censó Nacional de Población '73 DANE  
 2 Encuesta de hogares '82 DANE  
 3 Person Trip Survey '83. Study Team

**FIG. 2-4-1 ACTIVITY RATE AND UNEMPLOYMENT RATE  
IN BARRANQUILLA**



SOURCE: Censo Nacional de Población '73  
Encuesta de Hogares DANE  
Person Trips Survey 1983 by Study  
Team.

## 2-4-2. Employment by Sector.

The characteristic of employment composition of the Study Area is that the primary sector has only 2.3%; on the other hand, the tertiary has 73.9% in 1983. During the period of 1973 - 1983, the process of tertiarization was very rapid. This phenomenon is due to the fact that in the Study Area there are not many job opportunities in the primary sector, and the secondary sector has not been able to develop sufficiently because of the recent recessive economic situation. As a result, the tertiary sector had to absorb the job demand into some low income activities like personal services and street vendors.

Table 2-4-3 Employment by Three Sectors of Activity and Area (1973).

	Atlántico	Study Area		Total	Rest of Atlántico.
		9/quilla-Soledad	Others		
Primary	26.500	3.400	2.000	5.400	21.100
Secondary	71.400	61.200	63.100	63.100	8.300
Tertiary	152.600	130.800	4.000	134.800	17.800
<b>Total</b>	<b>250.500</b>	<b>195.400</b>	<b>7.900</b>	<b>203.300</b>	<b>47.200</b>

Source: Based the 1973 Census, the Study Team estimated.

Table 2-4-4 Employment by Three Sectors of Activity and Area (1983).

	Atlántico	Study Area		Total	Rest of Atlántico.
		8/quilla-Soledad	Others		
Primary	37.360	4.600	3.400	8.000	29.300
Secondary	92.200	76.100	4.700	80.800	11.400
Tertiary	275.300	236.100	14.600	250.700	24.600
<b>Total</b>	<b>404.800</b>	<b>316.800</b>	<b>22.700</b>	<b>339.500</b>	<b>65.300</b>

Source: Based on the P.T. Survey, the Study Team estimated.

## 2-5 Vehicle Ownership

According to INTRA, the total number of vehicles registered in Barranquilla in 1982 is 55.7 thousand including disused cars. Among them, the number of private cars is about 40 thousand.

Although, this figure includes not only the vehicles in Barranquilla but also those in other cities in Atlántico, the most portion of them are envisaged to be used in Barranquilla and Soledad.

Accordingly, the vehicle ownership in Barranquilla and Soledad is calculated to be about 35 vehicles/1000 person.

On the other hand, the vehicle ownership can be roughly estimated from the Person Trip Survey in 1983. According to the results, the vehicle owner house accounts about 15% of total houses in Barranquilla and Soledad.

Figure 2-5-1 shows that the number of vehicle registration in Barranquilla has steadily grown during the last 10 years.

The growth rates during the recent year are relatively low ranging 5.2-8.4% per annum in comparison to that in the early 70's, however the vehicle growth rate is much higher than the population growth. This implies that the vehicle ownership in Barranquilla is substantially increasing year by year.

Table 2-5-1. Vehicle Registration in Barranquilla.

	1981				1982			
	Official	Public	Private	Total	Official	Public	Private	Total
Car	207	6.594	18.413	25.214	212	6.783	19.209	26.204
Jeep	463	918	5.782	7.163	492	929	6.436	7.857
Pick-up	412	971	7.121	8.504	419	971	7.711	9.101
Sub Total	1.082	8.483	31.316	40.881	1.123	8.683	33.356	43.162
Bus	74	2.898	338	3.310	75	2.987	346	3.408
Small Bus	12	319	96	427	13	365	101	479
Microbus	5	186	47	238	5	186	47	238
Sub Total	91	3.403	481	3.975	93	3.538	494	4.125
Truck	188	1.842	3.389	5.419	190	1.865	3.511	5.566
Lorry Truck	1	128	65	194	1	142	73	216
Special Truck	82	104	308	494	82	104	340	526
Sub Total	271	2.074	3.762	6.107	273	2.111	3.924	6.308
Motorcycle			1.712	1.712			1.855	1.855
OTHERS	47	8	173	228	47	8	228	283
TOTAL	1.491	13.968	37.444	52.903	1.536	14.340	39.857	55.733

Note: The figures include disused cars.

Source: Statistic Department INTRA

Table 2-5-2. Vehicle Ownership in Barranquilla and Soledad

	Vehicle owner House	Non-Vehicle House
Barranquilla	16.2 %	83.8 %
Soledad	5.2 %	94.8 %
Total	15.0 %	85.0 %

Source: Person Trip Survey in 1983.



FIG. 2-5-1 NUMBER OF VEHICLE REGISTRATION  
IN BARRANQUILLA

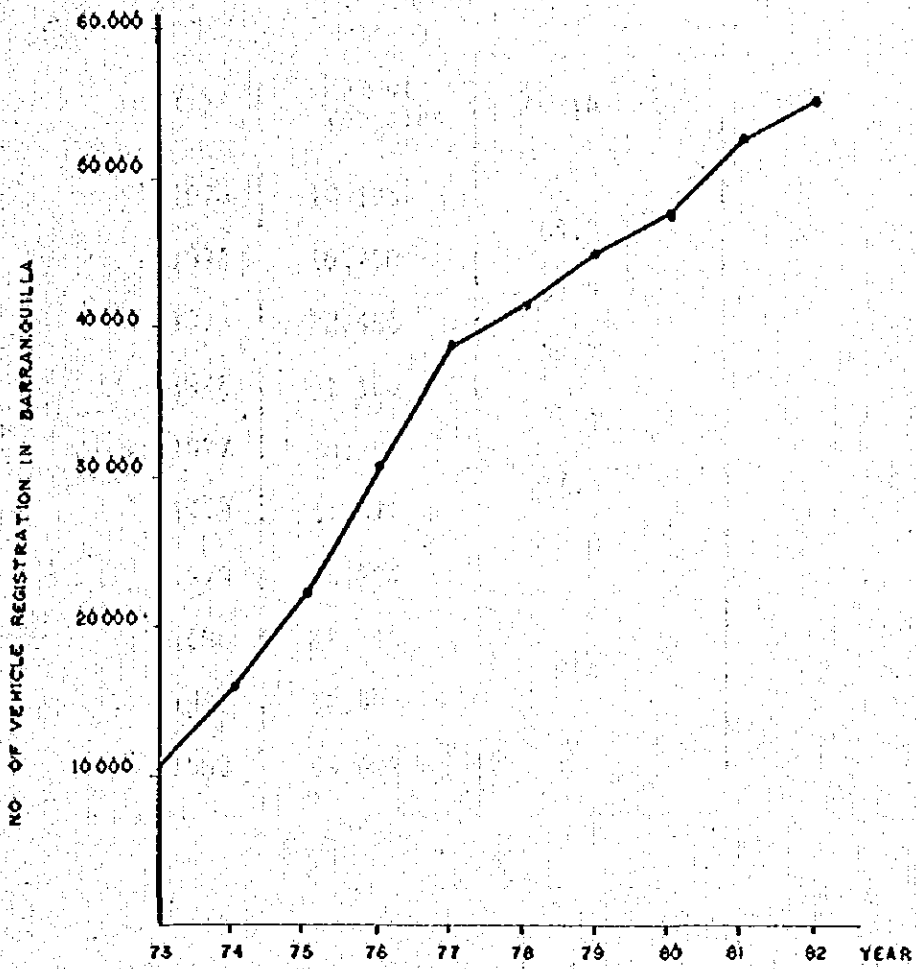


Table 2-5-3. Past Trend of Vehicle Registration in Barranquilla.

Year	No. of Vehicles	Growth Rate %
1973	10,195	64.3
1974	16,760	33.9
1975	22,450	38.7
1976	31,150	25.1
1977	38,991	7.3
1978	41,873	8.0
1979	45,234	7.8
1980	48,793	8.4
1981	52,903	5.2
1982	55,692	

## CHAPTER 3. EXISTING LAND USE AND URBAN ESTRICTURE

### 3-1 Barranquilla Metropolitan Region

#### 3-1-1 General Land Use

The Barranquilla Metropolitan Region covers an area of 51,400 hectares, of which 12,000 hectares are urbanized. From the large built up area surrounded by the Circunvalación, urbanization extends southward to Malambo on one hand and northwestward to Puerto Colombia on the other hand. The west part of Barranquilla outside the Circunvalación has not been confronted with urbanization pressure, but recently some spotting developments are gradually progressing. The on-urbanized area stretching in the southwestern part of the region is classified as follows;

Forest	20%
Stubbles	40%
Pasture	30%
Cultivated land	
Sand	10%
Dunes and beaches	

The land use for agricultural crops is very small because the climatic condition presents serious restrictions for developing an efficient and profitable agricultural activity.

#### 3-1-2 Topography and Hydrographic Characteristics

There are no high mountains in the region, but several low hills form three hydrographical basins with many arroyos (streams) and the Magdalena River. The widest basin of the Magdalena River is located at the eastern part of the region, including the Barranquilla-Soledad-Malambo urbanized areas. In this basin, there are many swamps along the Magdalena River in the municipalities of Soledad and Malambo.

During the rainy season, rain water rushes down the streets of Barranquilla from the uptown residential area to the "Centro" beside the river.

The central basins of the Arroyo Grande cover the municipalities of Galapa, the western part of Barranquilla, and the eastern part of Puerto Colombia. New residential developments and squatter areas extend westward from Barranquilla's hilly section. If these urbanizations continue without some appropriate water management, this area will suffer from the same problems as the built-up area of Barranquilla.

The west basin is formed within the municipality of Puerto Colombia separated by Loma Pan de Azucar from the central basin, and surrounded by other hills.

The main part of Puerto Colombia is situated at the foot of Loma La Risota.

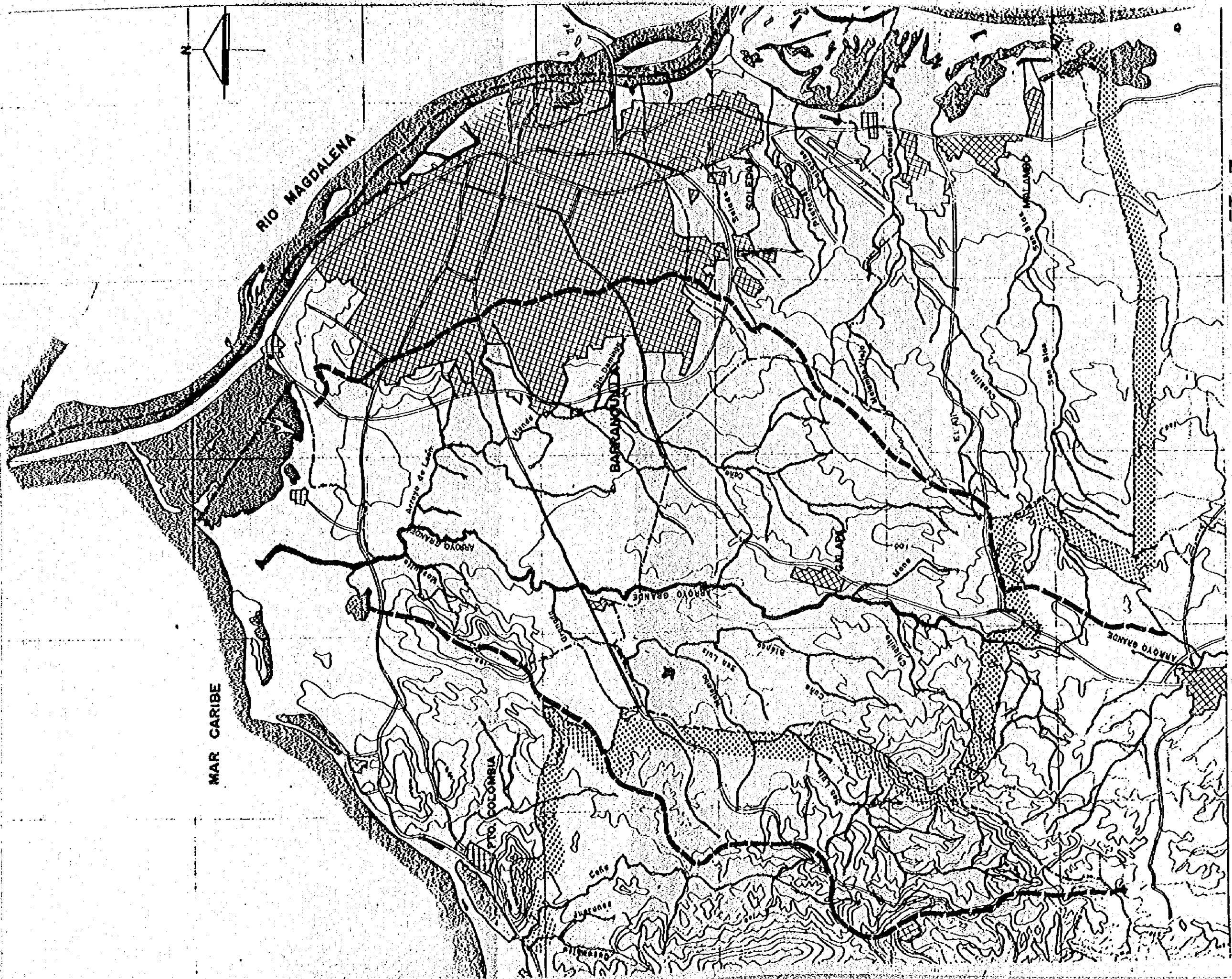


FIG. 3-1-1  
 HYDROGRAPHIC CHARACTERISTICS  
 IN STUDY AREA.

## 3-2. CENTRAL AREA.

### 3-2-1. GENERAL FEATURES OF CENTRAL AREA.

#### 1) Study Area.

The area of the central area study of Barranquilla covers 499.5 ha. This area is settled taking into account the study area by PIDAMP (PLAN INTEGRAL DE DESARROLLO DEL AREA METROPOLITANA DE BARRANQUILLA) as well as the recent development tendency of the central area.

Although the area studied in PIDAMB includes the LOMA No. 1 area, our study excludes it simply because of its present land use: mostly vacant land with exceptional use by the recent establishment of a veterinary unit of ICA (INSTITUTO COLOMBIANO DE AGROPECUARIA).

On the other hand, the development of the central area has extend of late to the west, and this seems to justify a wider demarcation of the study boundary in the west part.

This study area is divided into 5 zones, and each zone in turn further into some sub-divisions as illustrated in Fig. 2-3-1. The division in accordance with main streets which characteristically divide the study area.

The actual study area is composed of blocks (MANZANAS), and each block of lots (PREDIOS). Table 3-2-1. shows the enumeration of the area, the number of blocks and the number of lots for each zone and sub-division. In Zone 2 and 4 the average area for block is larger and is smaller in Zone 1, which may reflect the historical development of the area.

#### 2) Topography.

The topographic features of the central area can be summarized as follows and are shown in Fig. 3-2-2:

- a. The east half of the area is almost flat with the height of below 5m above sea level. This part faces the Rio Magdalena and its branch or a canal goes through the area. This area almost conforms to the Zones 1 A, 2A, 2B, 3A and 5A; notably most of the Barranquilla area is below 2 m above the sea level.
- b. The west half of the area is characterized by upward gentle slopes to the west. The average grade is about 2 to 3% and this hardly gives an impression that Barranquilla is hilly topographic formation.

### 3) Historical Brief.

The history of Barranquilla is believed to start in around 1620 to 1629 by the settlement in the present central area. The configuration of this settlement was similar to the pattern introduced by Spaniards at that time: a central plaza with a church surrounded by buildings and houses. This primary settlement has developed as the center of commodity flow and trade between foreign and domestic territories. The extension pattern of the settlement had been rather irregular in terms of the shape of blocks and the width of streets.

The epochmaking event for the economic, political and social evolution of Barranquilla was the construction of railroad between the Sabanilla seaport and the existing customhouse. Thus, at the end of the last century, Barranquilla had seen remarkable demographic and economic development, and various commercial, financial, industrial and administrative activities had concentrated to the central area; the Aduana (customhouse) Plaza as the terminal of the railroad (Montoya Section), St. Nicolás Plaza as a landmark of the city and the center of the catholic community with surrounding commercial activities and seasonal religious events, and the market Plaza as the center of commodities interchange with the river transport terminal on it.

The Barranquillita district had to wait for its development until 1950's because of its chronic inundation in the winter (rainy) season. Since then



factories warehouses, and bus terminals have been constructed and the importance of the district has increased in terms of the land use in the city.

Apparently the recent development and expansion of the city has been changing the placement of the central area; relative decline of commercial activities, concentrated traffic congestion, decrease of the number of households (population), and some environmental deterioration along the canal. These might be the points which necessitate the idea of urban renewal after a century since the actual city development started.

### 3-2-2 Land Use

#### 1) General

The land use studies in the central area are based on the two sources. One is the field survey conducted by the survey team, in which each building in the study area has been checked in terms of its use, heights and age. The other is the land and building cadaster by IGAC (INSTITUTO GEOGRAFICO "AGUSTIN CODAZZI", MINISTERIO DE HACIENDA Y CREDITO PUBLICO).

Extensive coordination work between those two sources has been carried out to figure the actual land use situation converting building use information into land use of each lot.

Quantitative data of buildings and land made it possible to calculate the building area ratio and the floor area ratio for each lot in the study area. At the same time a vacancy ratio of each building and also a vacancy ratio of land for each block could be worked out on the basis of these data.

The existing urban ordinance code for the central area has been compiled. This is the modification of the code established in 1957, and the modified version was made in 1968 by the City Planning Board of Barranquilla.

### 3-2-3. LAND TENURE AND LAND VALUE.

#### 1) General.

The cadastral information on land and building by IGAC made it possible to work out the land tenure and assessed value of land which is the basis of taxation.

The land tenure has been also checked by the information obtained through governmental offices, and, as a result, the location of public land has been identified and plotted in the study area.

As for the land value of each lot, IGAC renews the value every year by increasing 10% of the previous value. Thus, it seems that the relative value will not change yearly, so the actual assesment of land value should be conducted through examples of real commercial transactions. Taking into account of the difficulties to obtain

these data, however, the comparison between the assessed value and the commercial price would be done on the basis of real estate advertisement.

It was also possible to work out the unit building value according to IGAC data for all the buildings in the study area. In this study a unit investment value has been calculated for each lot by adding its land value and building value and dividing the added value by the land area. This unit investment value gives some criteria whether the investment is proportional or not compared with the unit land value of the lot. The investment intensity index (I.I.I.) was given to each lot according to the following formula:

$$\text{I.I.I.} = \frac{\text{UNIT INVESTMENT for each lot}}{\text{average of UNIT INVESTMENT for the block}} \\ - \frac{\text{UNIT LAND VALUE for each lot}}{\text{average of UNIT LAND VALUE for the block}}$$

#### 3-2-4. ECONOMIC ACTIVITIES.

##### 1) General.

Economic activities in the central area can be characterized by the concentration of commercial and financial establishments. The average ratio of concentration of all kinds of establishments in the central area can be estimated around 40%. However, the concentration ratio of commerces, hotels, restaurants, and financial establishments seems to be almost 50%, and most of these are located in Zone 1.

In spite of this high concentration, the recent tendency of the location of commercial and financial establishments is to the west part of the central area or up the hill to the Calle 72 area. This tendency can be identified by the fact that the Barranquilla branch of the national bank (EL BANCO DE LA REPUBLICA) has already decided to move from the very center of the central area (Paseo Bolívar) to Calle 45.

Another outstanding feature of commercial activities in the central area is the existence of an enormous number of street vendors. This is not only a problem of space in the central area but a profound problem rooted deeply in the issue of employment of the informal sector of the city. In connection with the proposed removal of warehouses from the Barranquillita area to GRAN-ABASTOS in the south part of the city, a careful study should be conducted about the present situation of street vendors.

### 3-2-5. INFRASTRUCTURES.

#### 1) General.

The water supply system in the central area is complete in terms of the piping networks and the area enjoys 24-hours supply. However, the quality of water should be improved together with the superannuated piping which seem to cause the problem of high ratio of water leakage.

The sewer system is also completed in the central area, and quite recently the outlet of sewage was changed from the canal directly down to the Rio. The problem is, however, the sewage never go through any treatment and the system apparently suffers from the superannuation.

The problem of storm water is identified in the central area. One is the influx of storm water down to the lower central area, and the streets where the storm water flows have transport problems together with some sanitary issues such as garbage dumping in the stream. Another point is the low ground level of the east half of the central area, which causes a chronical inundation in some districts.

The Canal Ahuyama which was once an important route of river transport to the market seems to be environmentally deteriorated and with the construction of bridges the river transport has become almost impossible. The dredging of the canal is now under study by the Municipality, and a careful attention should be payed to the effective involment of the canal into the renewal program of the central area.

Table 3-2-1 ZONAL FEATURES

Zone	Area (HA)	No. of Blocks	No. of Lots	No. of Households	
				DANE ('81)	JICA Survey
A	24.83 ( 5.0)	40 (10.3)	263 ( 5.3)	122	68
B	23.14 ( 4.6)	30 ( 7.7)	342 ( 6.4)	368	208
C	55.36 (11.1)	49 (12.6)	713 (13.4)	995	716
Subtotal	103.33 (20.7)	119 (30.6)	1338 (25.1)	1485	992
A	82.51 (16.5)	57 (14.6)	398 ( 7.5)	222	122
B	91.62 (18.3)	31 ( 8.0)	95 ( 1.8)	134	207
Subtotal	174.13 (34.8)	88 (22.6)	493 ( 9.3)	356	329
A	11.30 ( 2.3)	11 ( 2.8)	190 ( 3.6)	346	340
B	15.20 ( 3.0)	16 ( 4.1)	293 ( 5.5)	319	215
C	21.97 ( 4.4)	14 ( 3.6)	372 ( 7.0)	558	442
Subtotal	48.47 ( 9.7)	41 (10.5)	855 (16.1)	1223	997
A	28.41 ( 5.7)	22 ( 5.7)	421 ( 7.9)	594	528
B	36.21 ( 7.3)	19 ( 4.9)	297 ( 5.6)	428	387
Subtotal	64.62 (13.0)	41 (10.6)	718 (13.5)	1022	915
A	29.61 ( 5.9)	23 ( 5.9)	406 ( 7.7)	401	368
B	37.68 ( 7.5)	37 ( 9.5)	613 (11.5)	808	665
C	41.69 ( 8.4)	40 (10.3)	890 (16.8)	1349	1136
Subtotal	108.98 (21.8)	100 (25.7)	1909 (36.0)	2558	2169
Total	499.53 (100.0)	389 (100.0)	5313(100.0)	6644	5402

Table 3-2-2 Number of Entities by Zone

	Agriculture	Mining	Manufacturing	Electricity		Commerce		Transport	Finance	Services	Total	Composition Ratio
				Gas	Construction	Hotel	Restaurant					
1	1		50		3	729	24	49	59	915	14.6%	
1			69	1	10	935	48	312	225	1600	25.6%	
			97	7	8	603	16	335	661	1727	27.6%	
Subtotal	1		216	8	21	2267	88	695	945	4242	62.8%	
A			90	3	1	412	51	1	14	526	8.4%	
2	1		14	1	1	13	11	1	3	44	0.7%	
Subtotal			104	4	2	425	16	2	17	570	9.1%	
A		1	7			22			4	34	0.5%	
3			30		3	147	21		25	226	3.6%	
			22		1	85	15	4	36	163	2.6%	
Subtotal		1	59		4	254	36	4	65	423	6.7%	
A			22			86	4	4	61	177	2.8%	
4			22		3	132	10	9	57	233	3.7%	
Subtotal			44		3	218	14	13	118	410	6.5%	
A			27	1	2	132	6	6	12	186	3.0%	
5			71	3	2	121	7	12	39	255	4.1%	
			23	1	1	85	5	16	39	170	2.7%	
Subtotal			121	5	5	338	18	34	90	611	9.8%	
Central Area	1	1	544	17	35	3502	172	749	1235	6256	390 %	
City	80	18	3104	37	236	6733	372	1543	3918	16041		
Total												

TABLE 3-2-3 URBAN ZONING ORDINANCE.

ZONE	MINIMUM LOT AREA, M <sup>2</sup>		MINIMUM FRONTAGE MEASUREMENT L.M.		MINIMUM SETBACK L.M.			RATIO %		PERMITTED LAND USE	HEIGHT	
	DETACHED DWELLING	HIGH RISE BUILDING	DETACHED DWELLING	HIGH RISE BUILDING	FRONT YARD	SIDE YARD	REAR YARD	OCCUPATION	FLOOR AREA		MAXIMUM	MINIMUM
R-2	450.00	600.00	15.00	20.00	ACCORDING TO ROAD CHARACTERISTICS	1.50	3.00 IS NOT PERMITTED TO ATTACH	70	200	RESIDENTIAL	FOUR STORY	
R-2B	470.00	800.00	18.00	25.00	10EM	3.00	3.00 IS NOT PERMITTED TO ATTACH	70	200	RESIDENTIAL	FOUR STORY	
R-3	250.00	350.00	8.00	15.00	10EM	1.00 OR TO ATTACH	3.00	70	200	RESIDENTIAL	FOUR STORY	
R-4	200.00	250.00	8.00	12.00	10EM	1.00 OR TO ATTACH	3.00	80	250	RESIDENTIAL	FOUR STORY	
R-5	150.00	800.00	7.00	14.00	10EM	3.00 OR TO ATTACH	3.00 IS NOT PERMITTED TO ATTACH	P.P. 100 D.P. 80	300	COMMERCE RESIDENTIAL	UNLIMITED	
R-6		250.00		10.00	10EM	3.00 OR TO ATTACH	3.00 IS NOT PERMITTED TO ATTACH	P.P. 100 D.P. 80		COMMERCE RESIDENTIAL	UNLIMITED	
C-3		250.00	7.00		10EM	3.00 OR TO ATTACH	3.00	P.P. 100 D.P. 80		CENTRAL COMMERCE	UNLIMITED	
C-4		250.00	7.00		10EM	3.00 OR TO ATTACH	3.00	P.P. 100		COMMERCE INDUSTRY	UNLIMITED	
I-L						4.00 IS NOT PERMITTED TO ATTACH	4.00 IS NOT PERMITTED TO ATTACH	65	150	LIGHT INDUSTRY		
I-P						5.00	5.00 IS NOT PERMITTED TO ATTACH	60	200	HEAVY INDUSTRY		
E-E												

P.P. = First Floor

D.P. = Other Floor



### 3-3. Existing Problems

#### 3-3-1. Problems Concerning to the Total Structure

As mentioned in the preceding sections, the Study Area and Barranquilla-Soledad area have various structural problems. These problems have been gradually developed along with the historical growth of this metropolis to become a one-million city. And it can easily be foreseen that they will be more serious in the process of rapid urbanization to double its size at the end of this century.

The following are the problems and corresponding matters of consideration, especially related to the urban transport planning.

- 1) Employment is concentrated in the central part of Barranquilla. Many workers commute every day from mainly the south and southwest parts of the city and, recently, all the way from the satellite municipalities into "Centro" by bus. This is the cause of traffic congestion of the place and, for long distance commuters, they are forced to waste time and energy.
- 2) Historical residential urbanization by private developers and; recently, by squatters have formed a labyrinthian road network, except for some radial trunk roads. Present trend of urban growth will extend such kind of built up areas outside of the Circunvalación. In order to cope with the new traffic demand of crossing the city from south to north and vice versa generated by the growth of North Commercial Center along Calle 72, it is necessary to improve the roads of this direction, but it is rather difficult to implement this work because of the irregular form of narrow roads. And in future the same problems will occur outside of the Circunvalación. The countermeasure for the last would be an advance preparations of master plan and regulations of urban development in conformity with the plan. And as for built-up area, some compulsory measure or land adjustment system might be executed.

3) The basin of Magdalena River causes the strong rain water flow along arroyos and streets generate flooded areas in down town of Barranquilla City during the rainy season. And it is feared that in future the same phenomenon will occur in the basin of Arroyo Grande. Only from the standpoint of transport planning, the same countermeasure would have to be taken to secure smooth traffic flow and safety.

4) The characteristics of urban land use in Barranquilla City can be pointed out that the producing and distribution activities such as manufacturing industries and wholesale markets are located near the central part along the Magdalena River. This causes not only daily person trips of work but also cargo flows by truck through the down town area and, of course, plays a role of the generator of various environmental problems. It should be taken into account that the relation of some of these activities are to be studied in relation with appropriate plan of urban development and road network.

### 3-3-2. Identification of Existing Problems in the Central Area

Problems in the central area seem to be rather intricate in that they are, in most cases, mutually related each other and that they are somehow connected with the problems of the city structure. Thus the identification and analysis of problems should make clear these two aspects in order to facilitate the generation of the basic idea of the urban renewal in the central area.

#### 1) Concentration and Mixture of Activities

One of the features of the central area is the high concentration of activities. In spite of the rapid expansion of the city, this has not changed much and is the main cause of the centripetal pattern of trips and the concentration of traffic.

The central area is also characterized by the fact that a variety of

activities take place in the area. The most noteworthy feature is the adjacent configuration of the market and bus terminals to the business district in the very central area. This might be the principal reason of the congestion and confusion of traffic flow in the area.

Thus the concentration and mixture of activities bring about an outstanding problem of traffic congestion. It should be noted, however, that this aspect of congestion is one of the key factors which activate the central area. For example, the problems of street vendors has been so far pointed out many times as an obstacle to the traffic and to shops. But since their activities are an indispensable phase of urban economics, it will be most difficult to come to even a makeshift spatial resolution for this.

Another example of the problems of mixed activities might be the squatters in Zone 5 A. They are on public land and there is a tendency towards permanent settlement. Since any kind of public land is precious for the future renewal, this problem should be given some consideration in the frame of public housing policy.

## 2) Extension and Dispersion of Activities.

Contrary to the fact of concentration of activities, extension or more exactly dispersion of activities in the central area can be observed. Notable the establishment of commercial area up on the hill to the west has been under way and will continue in the future. The direction of the extension is apparently to the west, and the financial activities, which are the principal activities of the central area, have a tendency to move some one km to the west.

Residential activities have already seen a considerable decrease in the central area, and this tendency will be intensified in accordance with the dispersion of commercial activities to the west.

The dispersion tendency of activities is the cause of rather high vacancy of buildings in the central area, and is one of the key factors which may

exert an influence on the future urban structure.

### 3) Environmental Problems.

The canal Ahuyama which runs through the central part of the area has been almost fully contaminated. The dredging proposal by the Municipality might be an indispensable step for the betterment of the area surrounding the canal. But, since the degradation seems to have been caused by the adjoining land use together with the sanitary sewage system, the dredging program should be coordinated closely with those other factors.

The storm water is another environmental problem in the area. In the planning process of the renewal a careful consideration should be given to minimize the influx of storm water in the project area and to take some measures in order to avoid the chronic inundation of some areas.

Fig. 34-2-1

BARRANQUILLA-CENTRAL AREA - E.A. 1:10,000

STUDY AREA

- INDEX.
- C.A. BOUNDARY.
  - ZONE BOUNDARY.
  - SUBDIVISION BOUNDARY.
  - RIVER OR CANAL.

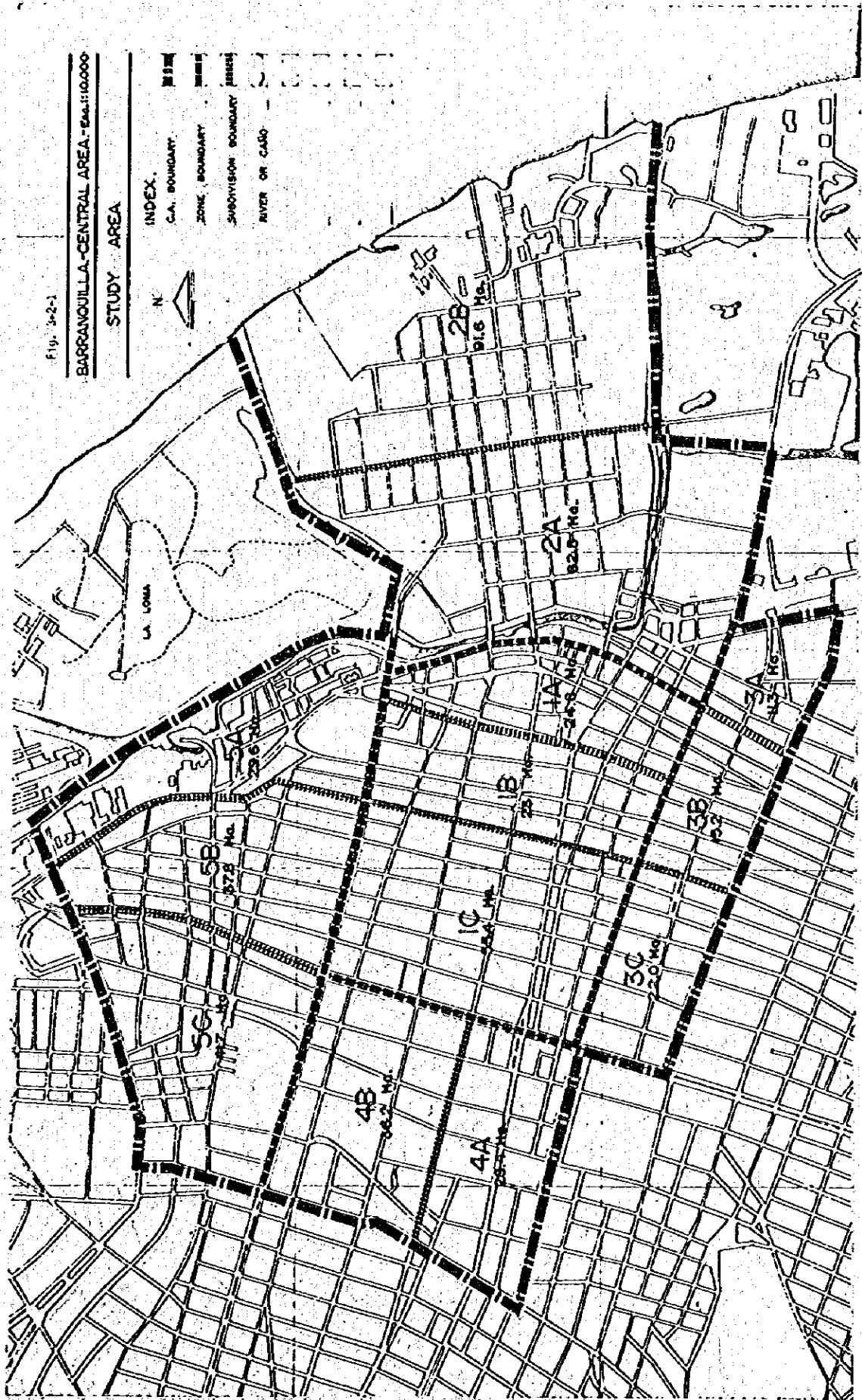


Fig. J-2-2

BARRANQUILLA-CENTRAL AREA - Scale 1:10,000

TOPOGRAPHY

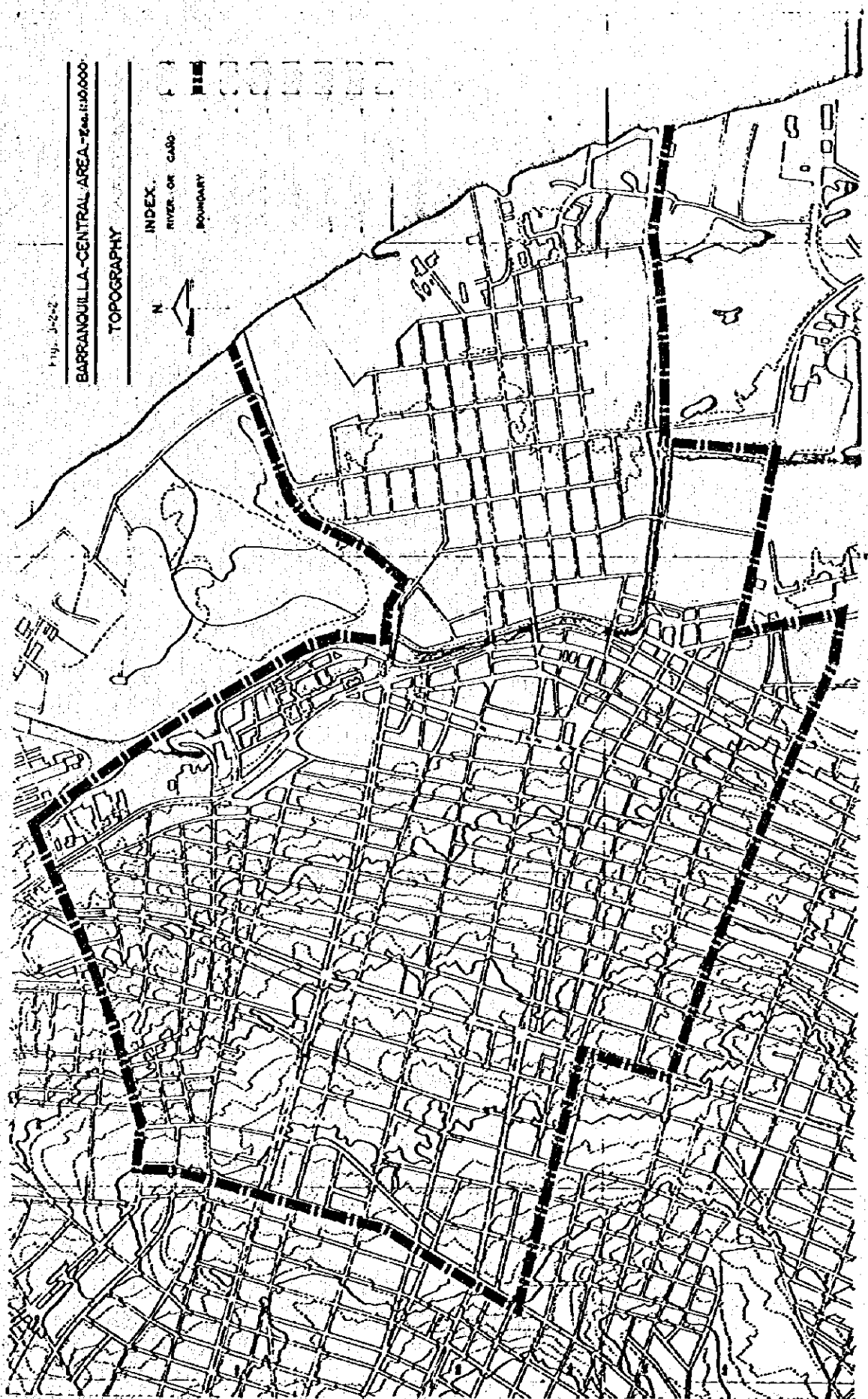
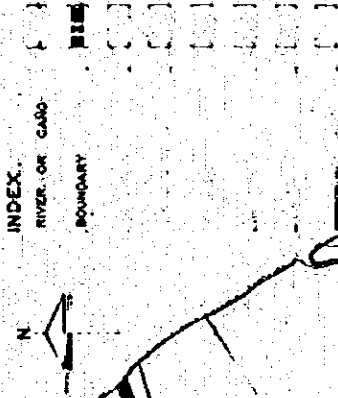


Fig. 3-2-3

BARRANQUILLA-CENTRAL AREA - Est. 1:10,000

LAND USE MAP - RESIDENTIAL

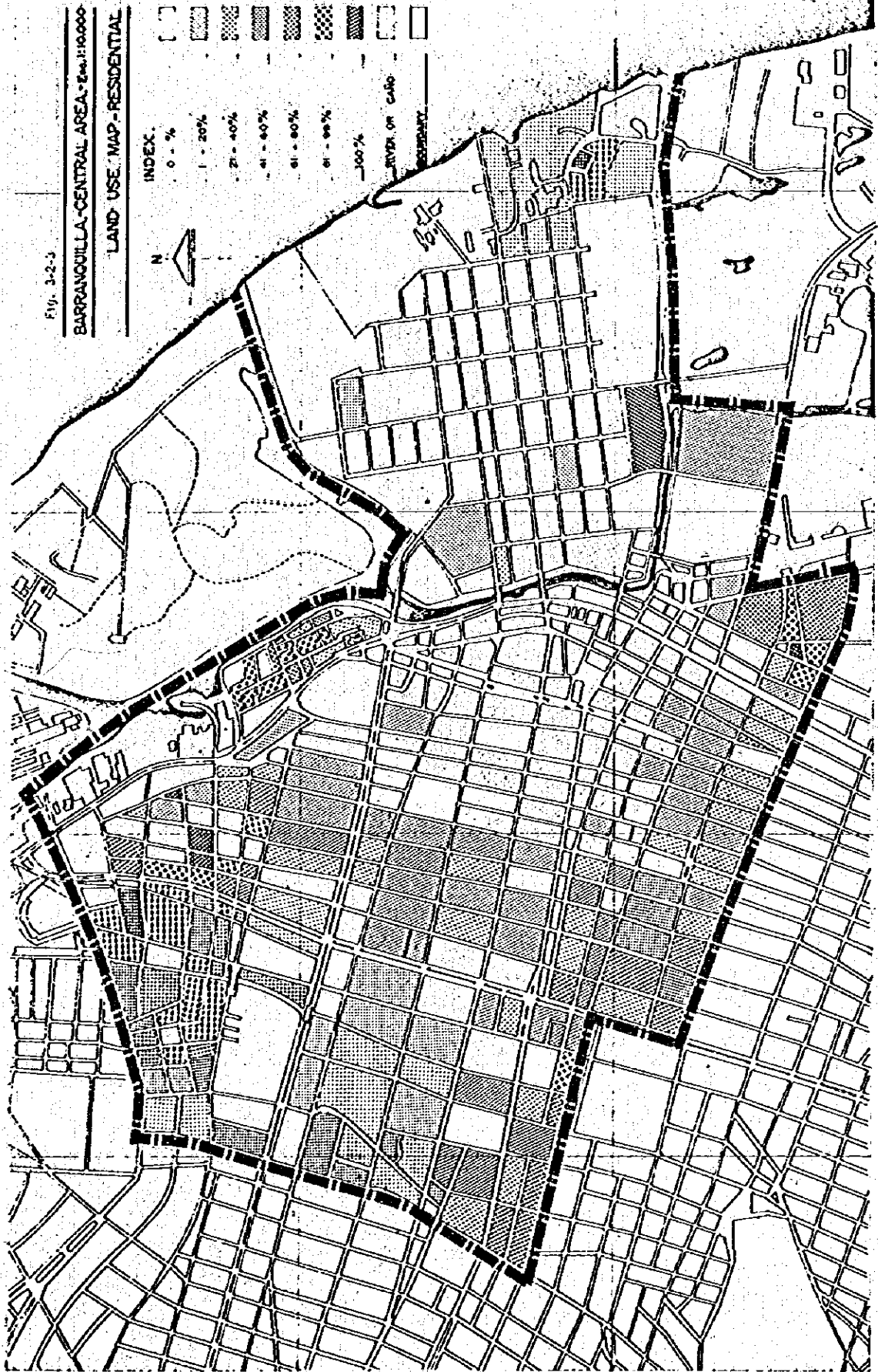
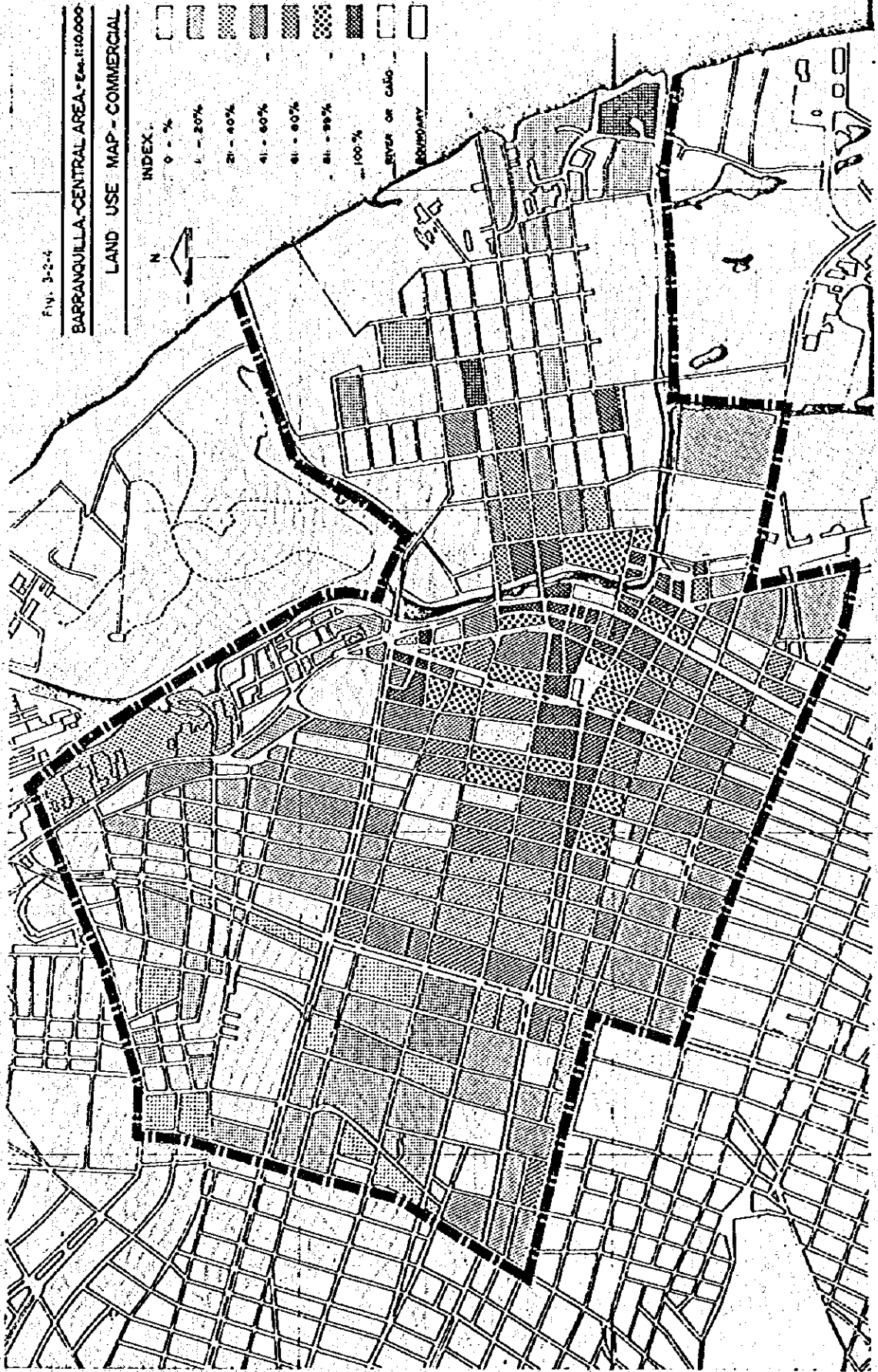




FIG. 3-2-4

BARRANQUILLA-CENTRAL AREA - Est. 1:10,000

LAND USE MAP - COMMERCIAL



INDEX.

- 0 - %
- 1 - 20%
- 21 - 40%
- 41 - 60%
- 61 - 80%
- 81 - 99%
- 100%
- eyes or cuts
- boundary

FIG. 1-15

# FINANCIAL ESTABLISHMENTS - EMPLOYEES

INDEX

1. ESTABLISHMENTS  
100. EMPLOYEES

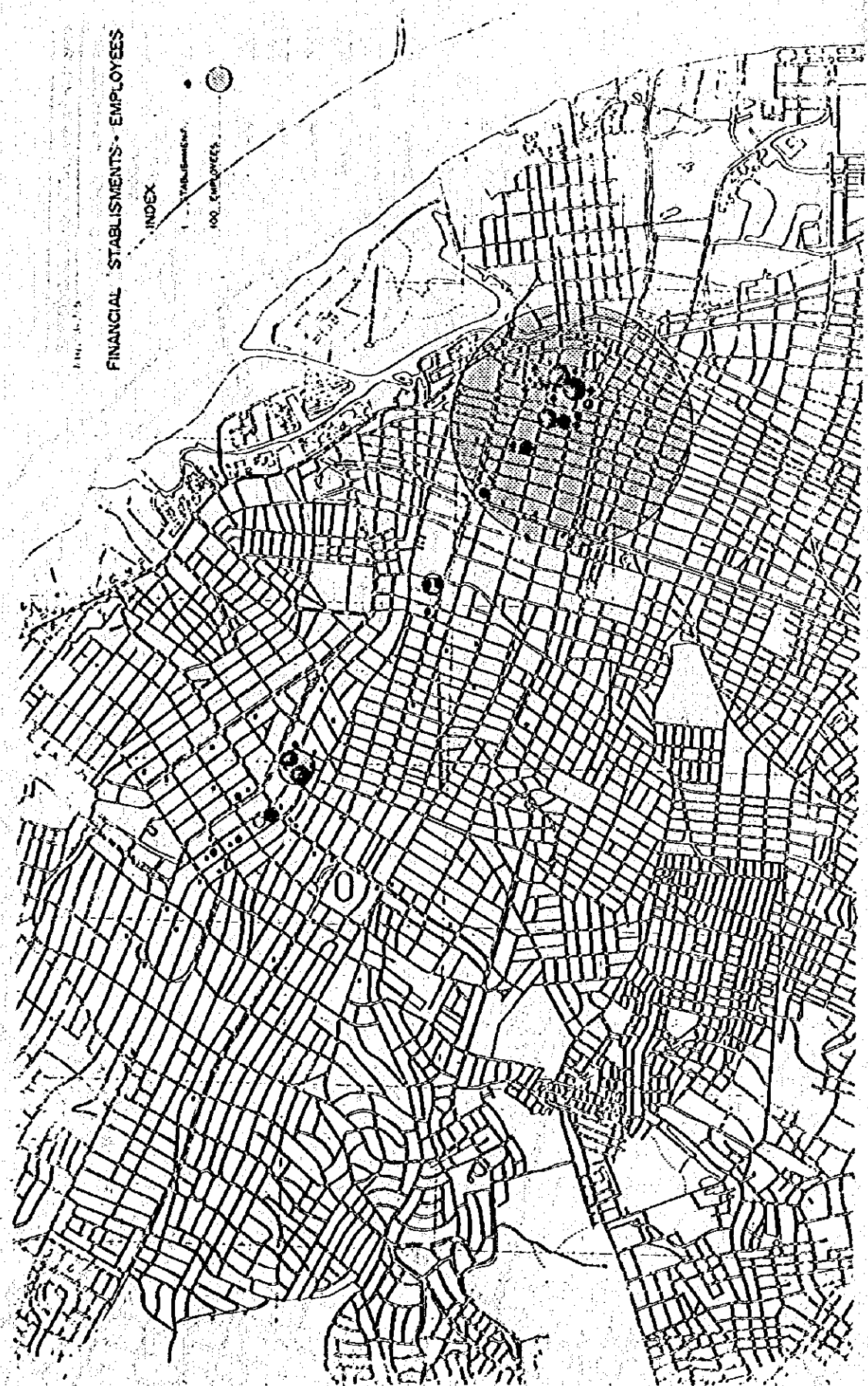


Fig. 3-2-6

BARRANQUILLA-CENTRAL AREA - Esc. 1:110,000

LAND USE MAP - INDUSTRIAL

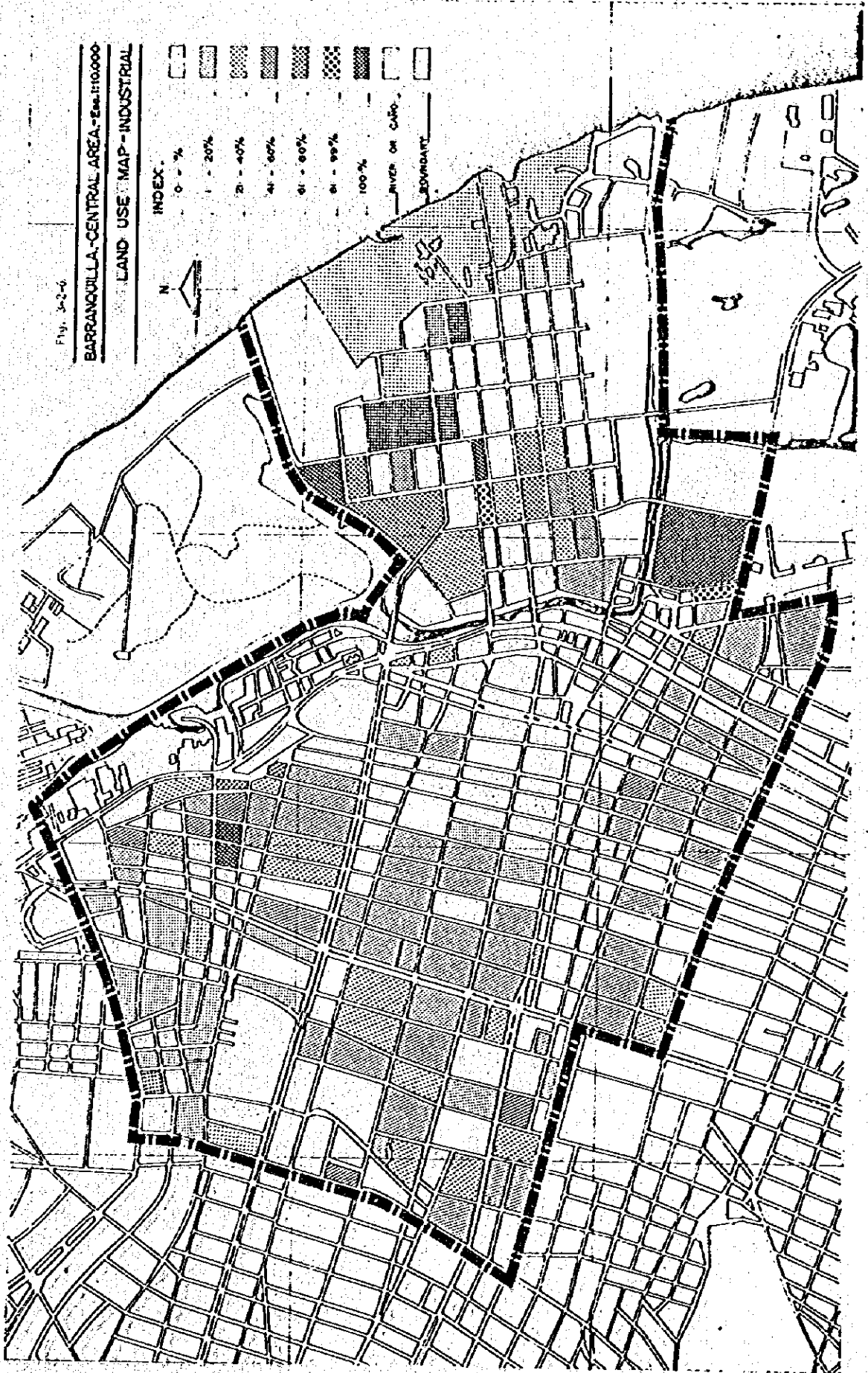
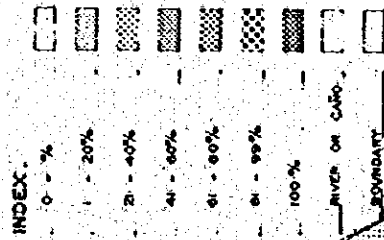


Fig. 3-2-7

BARRANQUILLA-CENTRAL AREA - Scale 1:10,000

BUILDING RATIO

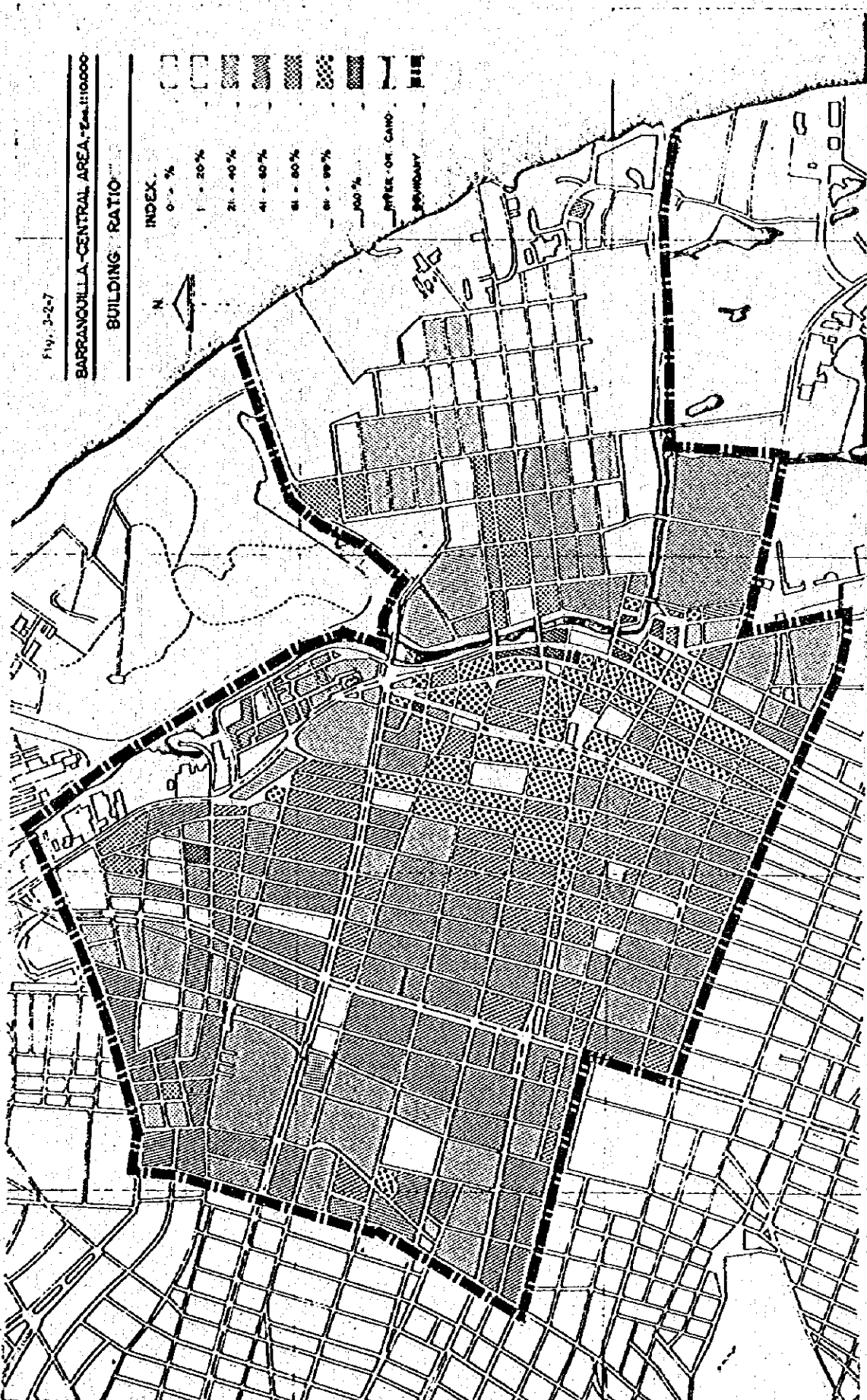
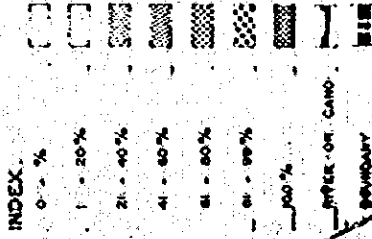


FIG. 3-2-3

**BARRANQUILLA-CENTRAL AREA - Scale 1:50,000**

**FLOOR AREA RATIO**

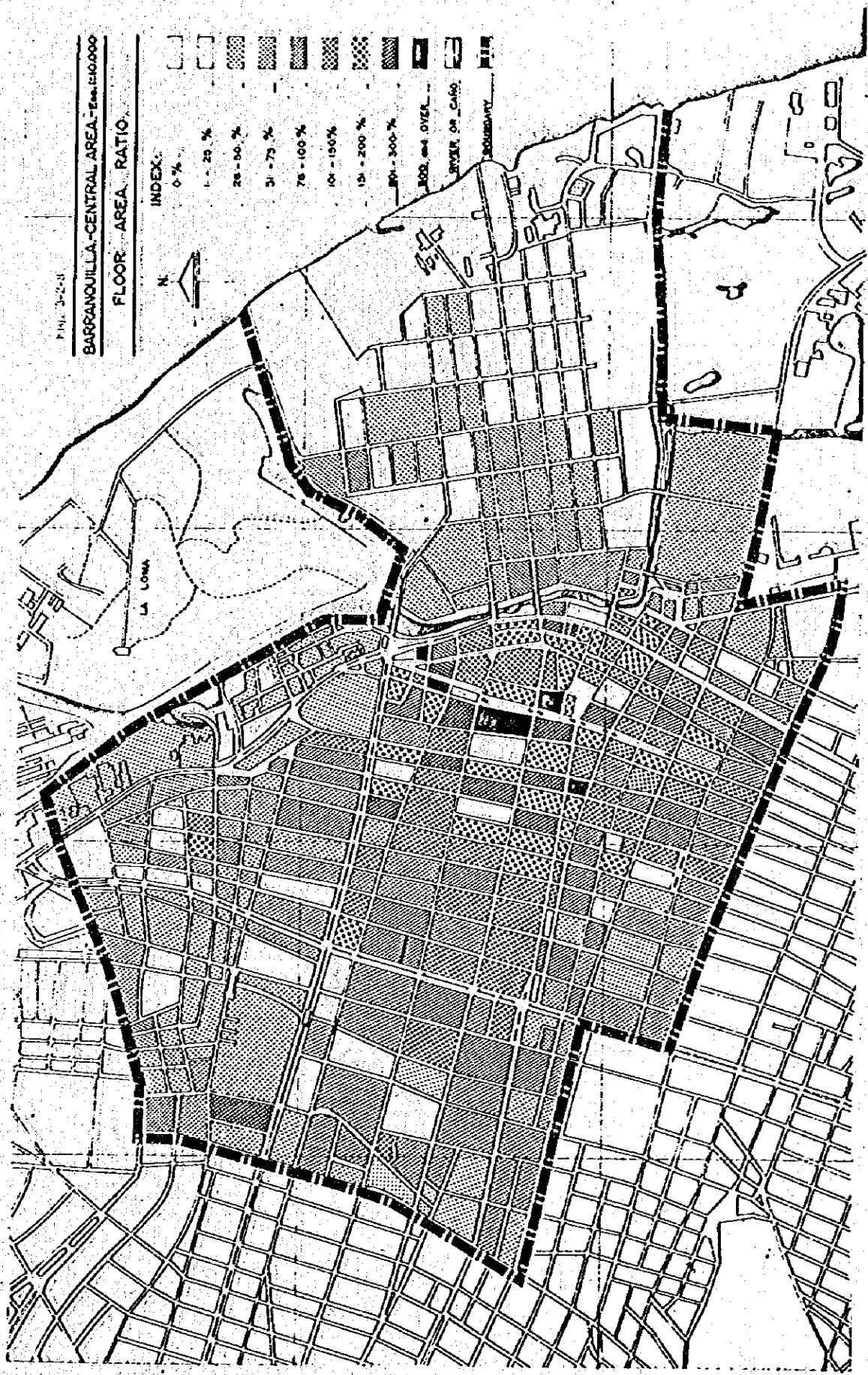
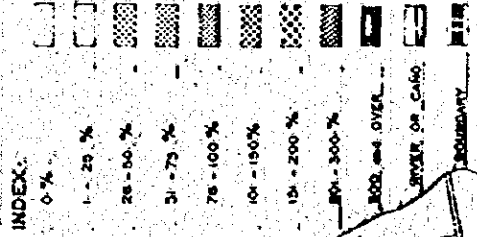




Fig. 3-2-S

BARRANQUILLA-CENTRAL AREA, Scale 1:70,000

LAND USE - MAP - VACANCY

INDEX

- 0 - %
- 1 - 20%
- 20 - 40%
- 41 - 60%
- 61 - 80%
- 81 - 99%
- 100 %

BOUNDARY OF CANO

BOUNDARY

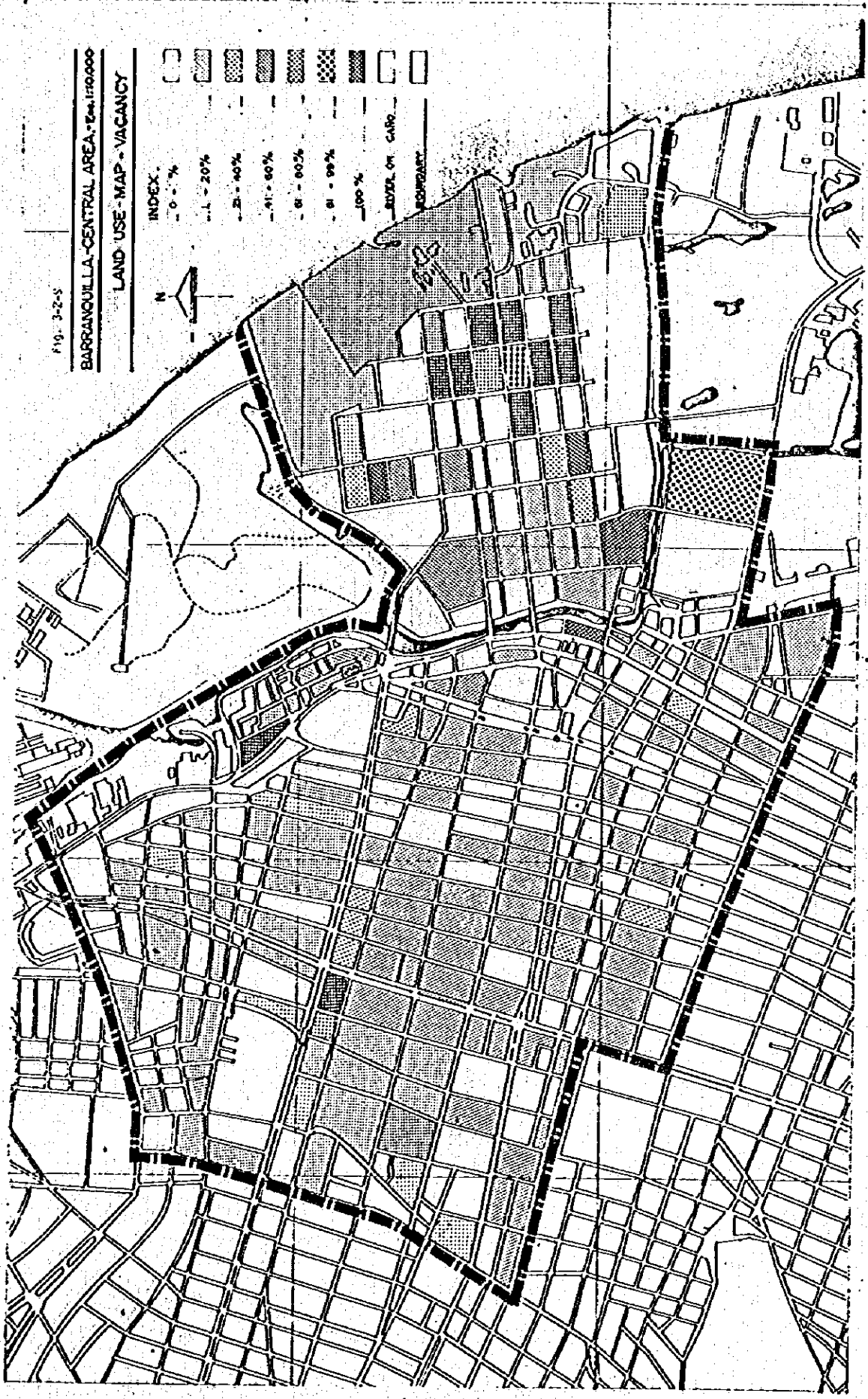


Fig. 3-2-10

BARRANOVILLA-CENTRAL AREA-SCALE 1:10,000

PUBLIC LAND TENURE

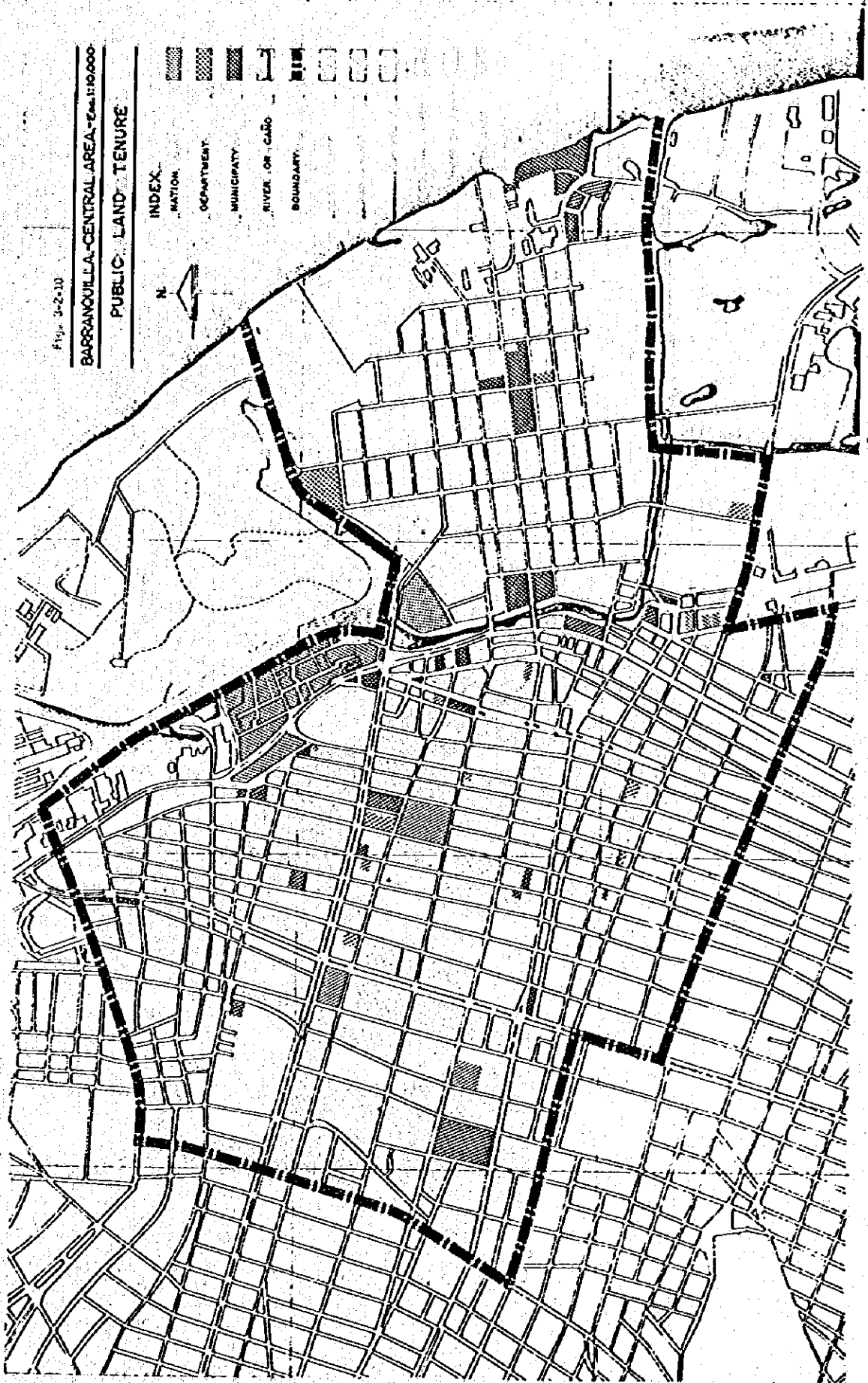
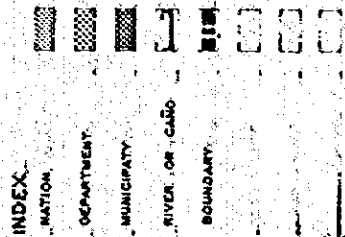


Fig. 3-2-11

BARRANGUILLA-CENTRAL AREA - East 1:10,000

LAND UNIT VALUE

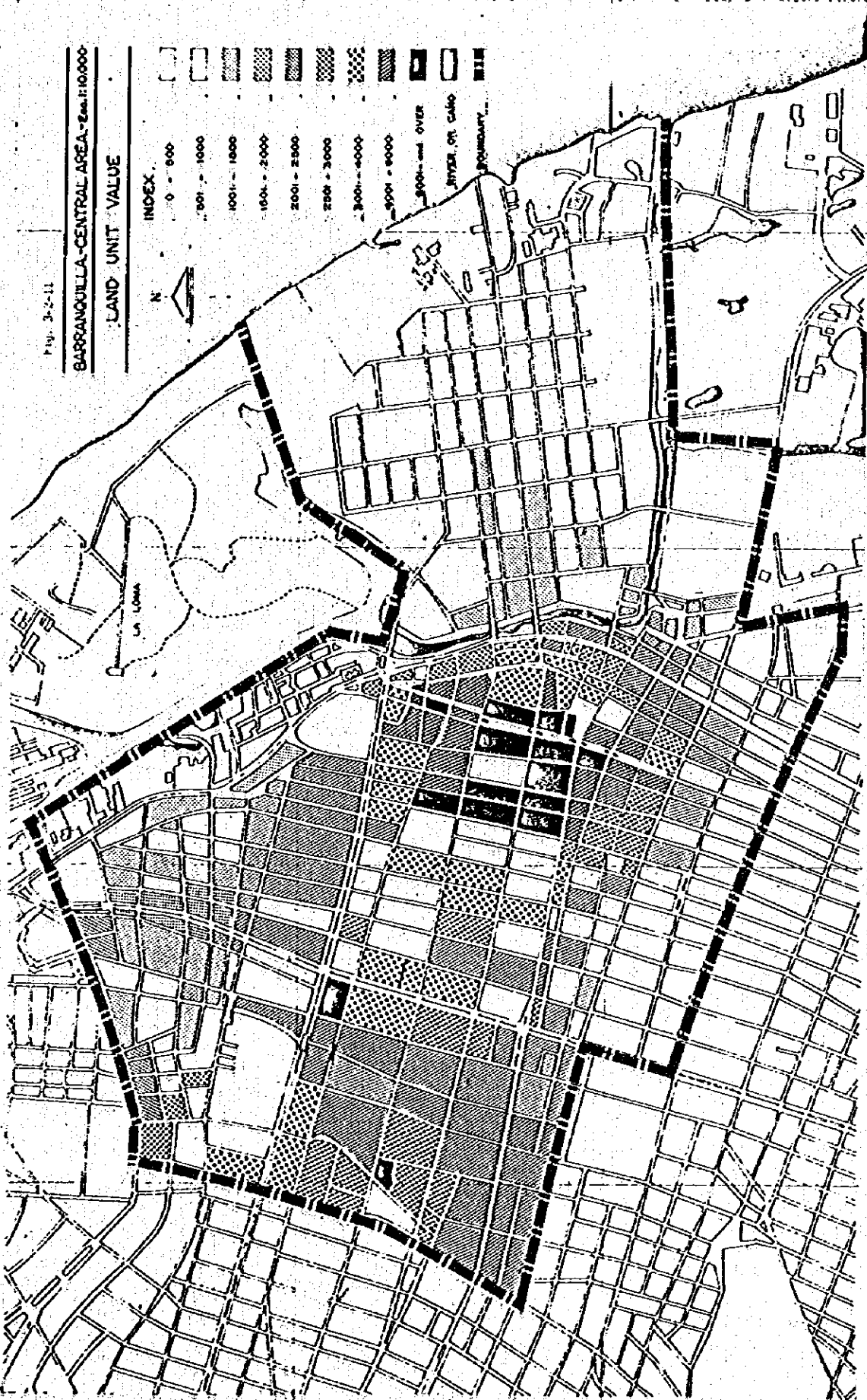




Fig. 3-2-12

BARRANQUILLA-CENTRAL AREA - 1:10,000

UNIT INVESTMENT

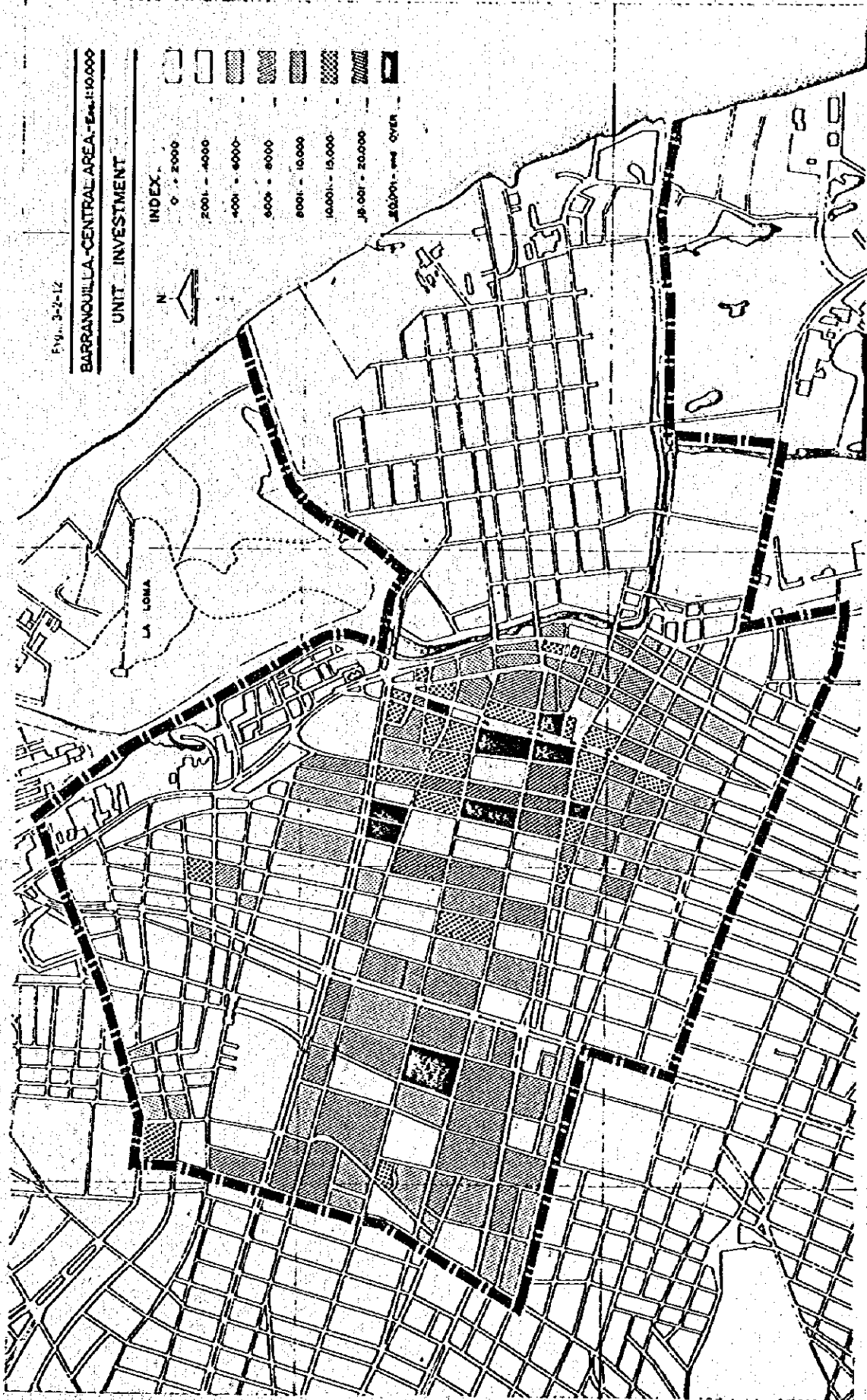
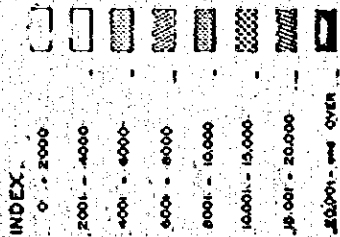


Fig. 3-2-13

BARRANQUILLA-CENTRAL AREA - Scale 1:10,000

WATER SUPPLY SYSTEM

INDEX

30" - 36" - 48"

18" - 20" - 24"

10" - 12"

6" - 8"

HYDRANT

RIVER OR CANAL

BOUNDARY



FIG. 3-2-14

**BARRANQUILLA-CENTRAL AREA - Scale: 1:10,000**

**SEWER SYSTEM**

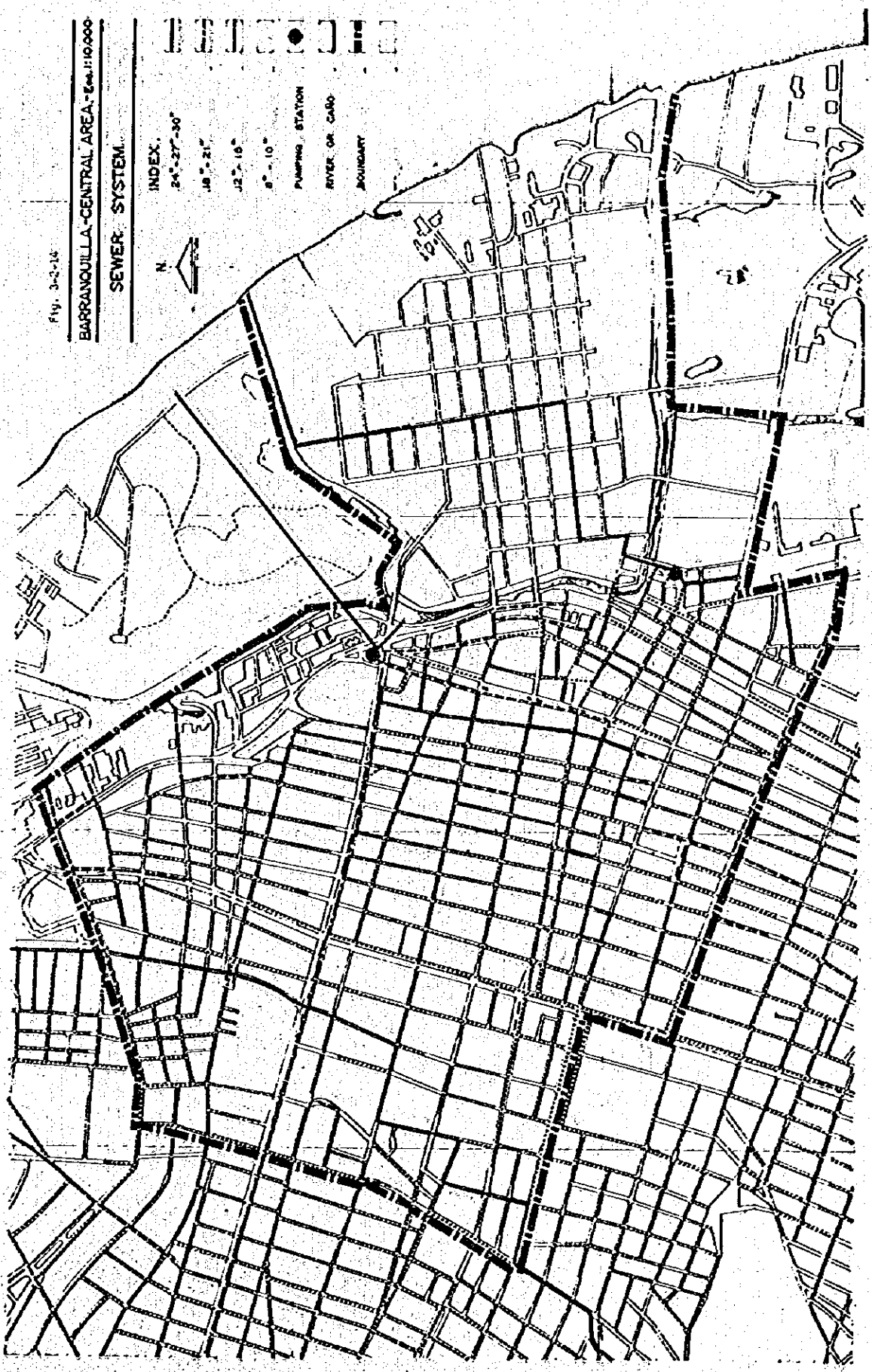
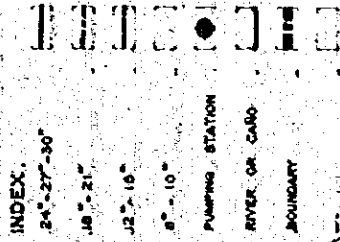


Fig. 3-2-15

**BARRANQUILLA-CENTRAL AREA-84110000**  
**SURFACE STORM WATER FLOW**

- INDEX.
- MAIN FLOW
  - SECONDARY FLOW
  - MINOR FLOW
  - OVERFLOW POINTS
  - FLOW OUTLET
  - STAGNANT WATER
  - RIVER OR CANAL
  - BOUNDARY

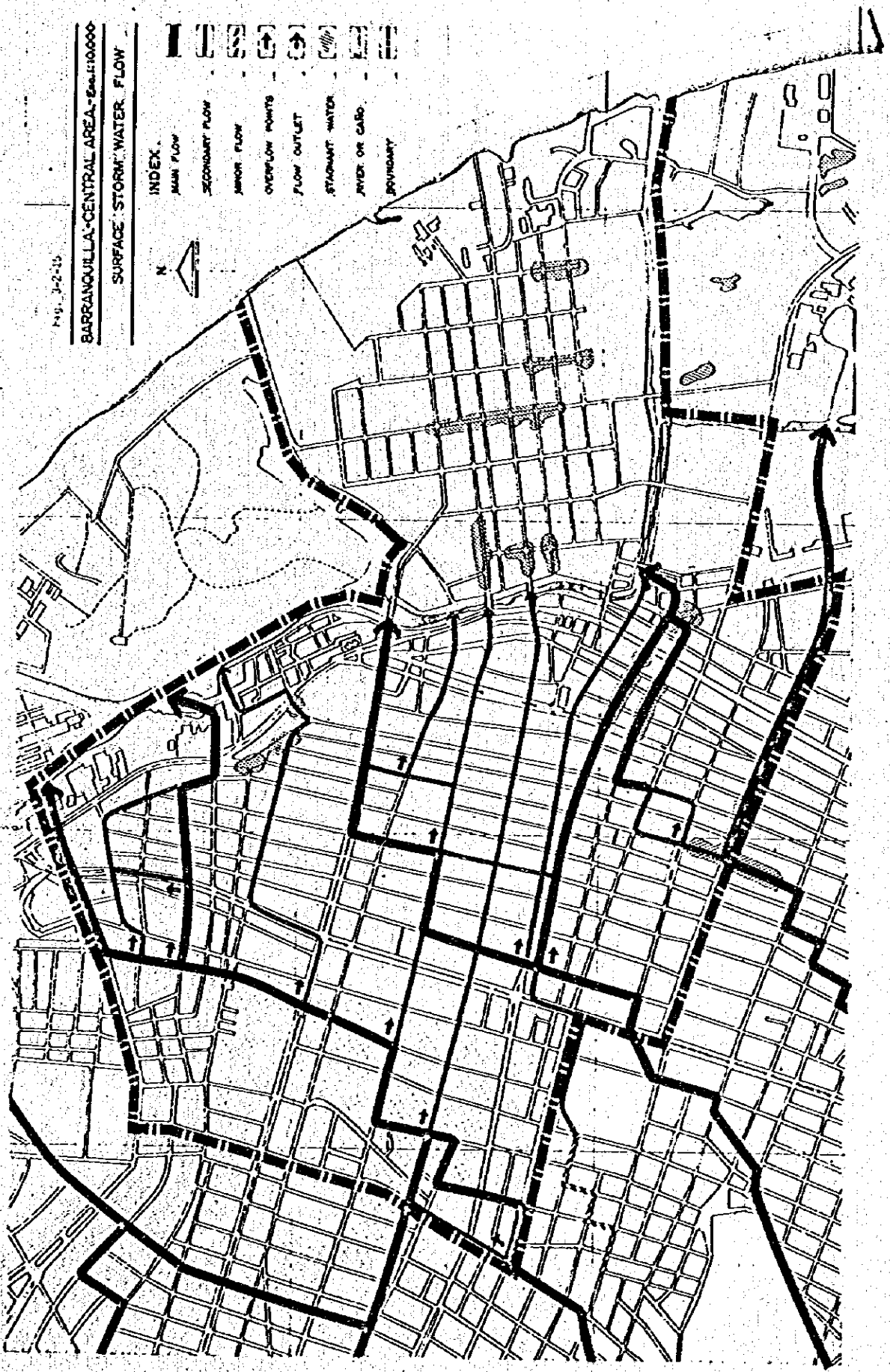


Fig. 3-2-16

BARRANQUILLA-CENTRAL AREA, Scale 1:10,000

ORDINANCE MAP

INDEX

	N.
	R3
	R4
	R6
	C3
	CA
	IL
	IP
	IC
	TYPE OF CANAL
	BOUNDARY





## Chapter 4 Future Socio-economic Framework and Development Concept.

### 4-1 Development Policy by Government

According to the Four Years Plan from 1983 to 1986, "PLAN NACIONAL de DESARROLLO" by DNP, the basic objectives of the Plan are as follows.

#### (1) Social Equity

This objective is to pursue a more balanced development among the regions in different levels of development and at the same time to improve the income distribution by creating more opportunities for the participation of low income groups .

#### (2) Reactivation of Colombian Economy

This aims not only to recover from the recent economy recession but also to enable the economy to grow more dynamically by stimulating the economically depressed industries.

By an intensive investment to infrastructure and a number of housing development in when area, the construction sector is expected to be a leading industry.

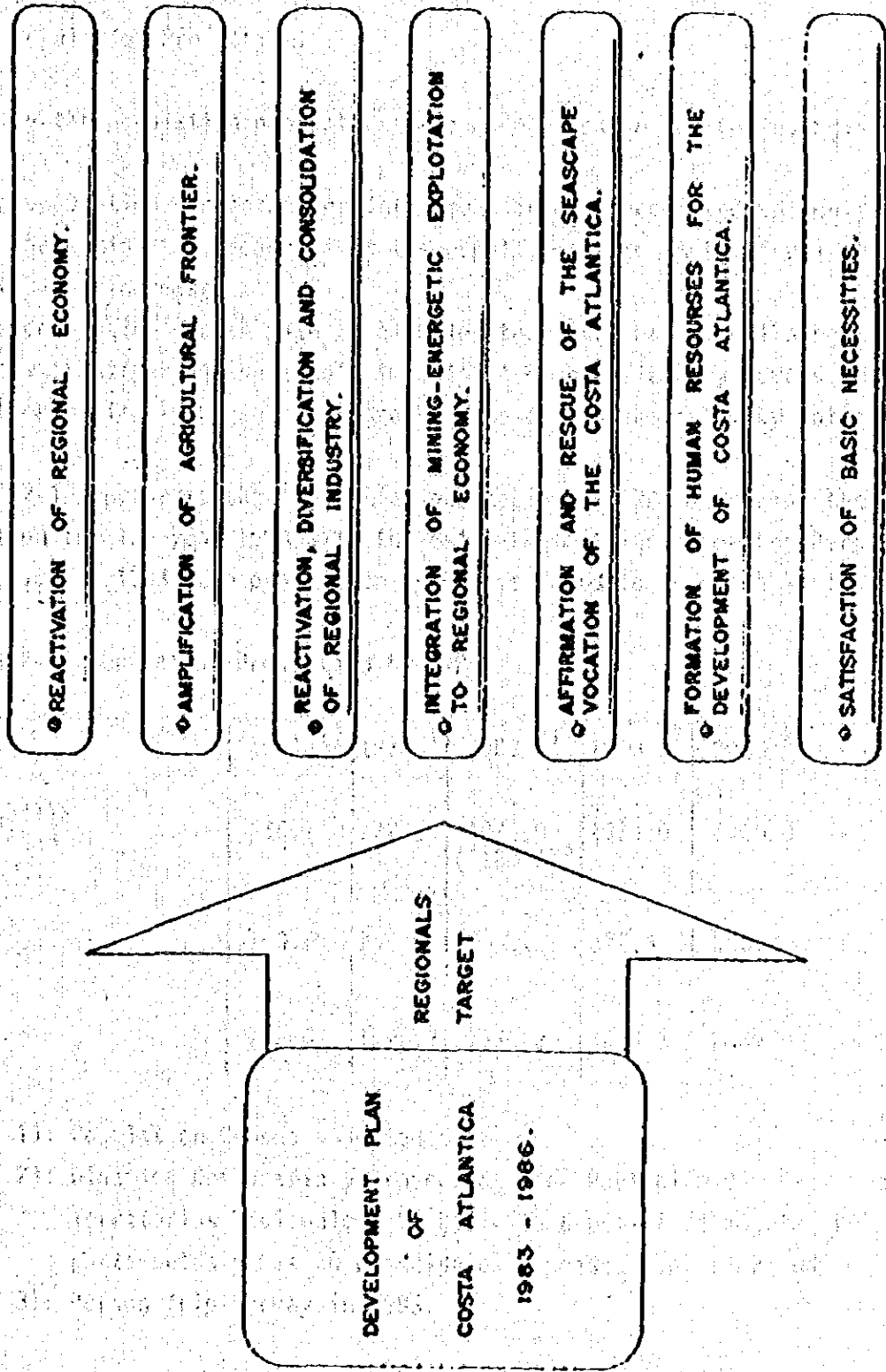
#### (3) Consolidation of Colombian Economy

This objective is to re-inforce the national economy and to improve the financial condition of both private and public sectors.

This also includes the improvement in the balance of payment, promotion of reinvestment, development of new industries etc.

On the basis of the above objectives, the development targets of the Atlantic Coast Region are identified as shown in Fig.4-1-1.

FIG. 4 - 1 - 1 DEVELOPMENT TARGET OF ATLANTIC COAST.



## 4-2. Future Socio-economic Framework.

### 4-2-1. Population Projection.

Generally the population projections are made based on the following:

- (1) The population concentration into urban area is predicted to continue in the coming two decades, but the population size in the rural area will also increase.
- (2) The population growth rate as a whole study area has a declining tendency, considering the likely impacts of higher literacy levels, promotion of family planning programs, and declining fertility rates.

Table 4-2-1 represents the population projection by DNP. Comparing the projection for the year 1983 with the estimates obtained from the Person Trip Survey in 1983, the projection by DNP is found to be slightly lower.

Table 4-2-1. Population Projection by DNP.

	1964 <sup>1)</sup>	1973 <sup>1)</sup>	1983 <sup>2)</sup>	1990 <sup>2)</sup>	2000 <sup>2)</sup>
Barranquilla and Soledad	536.1	772.1	1074.0 (1108.0) <sup>3)</sup>	1333.0	1705.0
Rest of Atlántico	180.6	256.8	305.1	332.3	364.9
Atlántico	717.4	1028.9	1379.3	1665.3	2069.9

Source: 1): Population Census adjusted DANE

2): Dinámica Demográfica y Proyecciones de Población del País, Los Territorios Nacionales, El Distrito Especial de Bogotá, Departamentos y Las 30 Principales Ciudades Sep. 1982, DNP.

3): Person Trip Survey in 1983.



The alternative population projections for Barranquilla and Soledad are presented in Table 4-2-2.

The high alternative estimates are those from the Plan Integral Desarrollo Urbano del Área Metropolitana de Barranquilla (PIDUMB), and the low estimates are the projection by DNP in Table 4-2-1. The medium estimates are obtained by modifying the growth rates of DNP in accordance with the adjustment of the projection in 1983 to the result derived from the Person Trip Survey.

Accordingly, the population projection for Barranquilla and Soledad in 2000 ranges from 1.7 million to 2.0 million.

However, the medium estimates appear to be the most likely ones, as the average annual growth rate is likely to decline over the years 1973 - 2000.

Based on the medium estimates, the population in Malambo, Galapa, and Puerto Colombia is projected as shown in Table 4-2-3. As elaborated in Chapter 2, the population growth of these satellite cities of Barranquilla during the past decade is tremendously high.

For the years from 1983 to 2000, the table presents three alternatives projections; however, the medium figures seem to be the most likely ones, considering the following factors:

- (1) The satellite cities are expected to grow with a high growth rate at least by 1985, since lots of housing development programs have been approved.
- (2) The rapid growth will incur various problems such as shortages in water supply, electricity, transportation, etc. and other social facilities. These problems may discourage the rapid expansion of the urbanized area.

Table 4-2-2. Population Projection in Barranquilla and Soledad.

( in thousand)

	Average Annual Growth Rate (%)					
	1) 1964	1) 1973	1983	1990	2000	
			64-'73	'73-'83	'83-'90	'90-'00
Barranquilla and Soledad						
H <sup>3)</sup>			1440.4	2003.5		3.8%
M <sup>4)</sup>	536.8 (74.8%)	772.1 (75.%)	1108.0 (75.4%)	1875.3	4.1%	3.5%
L <sup>5)</sup>			1330.0	1705.0		3.1%
Rest of Atlántico						
H <sup>6)</sup>	108.6	256.8	371.7	471.8	626.1	3.7%
M <sup>6)</sup>			362.2	429.5	514.1	3.5%
L <sup>5)</sup>			305.1	332.3	364.9	1.7%
Atlántico						
H <sup>6)</sup>	717.4	1028.9	1472.7	1912.2	2629.6	3.7%
M <sup>6)</sup>			1470.2	1839.2	2389.4	3.6%
L <sup>5)</sup>			1413.1	1665.0	2070.0	3.0%

Source: 1: Population Census Adjusted

2: Person Trip Survey in 1983

3: Estimated by PIDAMB

4: Estimated by modifying the growth rates of DNP

5: Estimated by DNP

6: Estimated by Study Team

Table 4-2-3 Population Projection in Malambo, Galapa, Pto. Colombia  
(in Thousand)

	1964	1973	1983	1990	2000	Average Annual Growth Rate				
						'64 '73	'73 '83	'83 '90	'90 '00	
B/Q & Soledad 1)	536.8	772.1	1108.0	1409.7	1875.3	4.1%	3.7%	3.5%	2.9%	
Malambo, Galapa Pto. Colombia	H			148.1	219.2			7.0%	4.0%	
	M2)	24.0	36.8	92.2	124.6	167.5	4.9%	9.6%	3.0%	
	L			106.2	129.5			2.0%	2.0%	
Outside of Study Area in Atlántico	L			281.4	294.9			0.6%	0.5%	
	M	156.6	220.0	270.0	304.9	346.6	3.8%	2.1%	1.3%	
	H			323.3	384.6			2.6%	2.5%	
Atlántico 1)	717.4	1028.9	1470.2	1839.2	2389.4	4.1%	4.1%	3.25%	2.65%	

Note: 1: The medium value in Table 4-2-2 was applied.

2: Estimated by Empresa de Obras Sanitarias del Atlántico "EMPOTLAN". Feb.1984

(3) The outside of the Study Area will also have a relevant development, taking the past trends into account.

As consequence, the population in the Study Area is likely to grow from 1.2 million in 1983 to 1.53 million in 1990 and 2.04 million in 2000 as shown in Table 4-2-4.

Table 4-2-4. Population Projection in Study Area. (in thousand)

	1983	1990	2000
Barranquilla and Soledad	1108.0	1409.7	1875.3
Malambo, Galapa, Puerto Colombia	92.2	124.6	167.5
Total Study Area	1200.2	1534.3	2042.8

#### 4-2-2. Future GRDP of Atlántico.

##### 1) Future GDP of Colombia.

For projection of the future GDP of Colombia, the following considerations were taken into account:

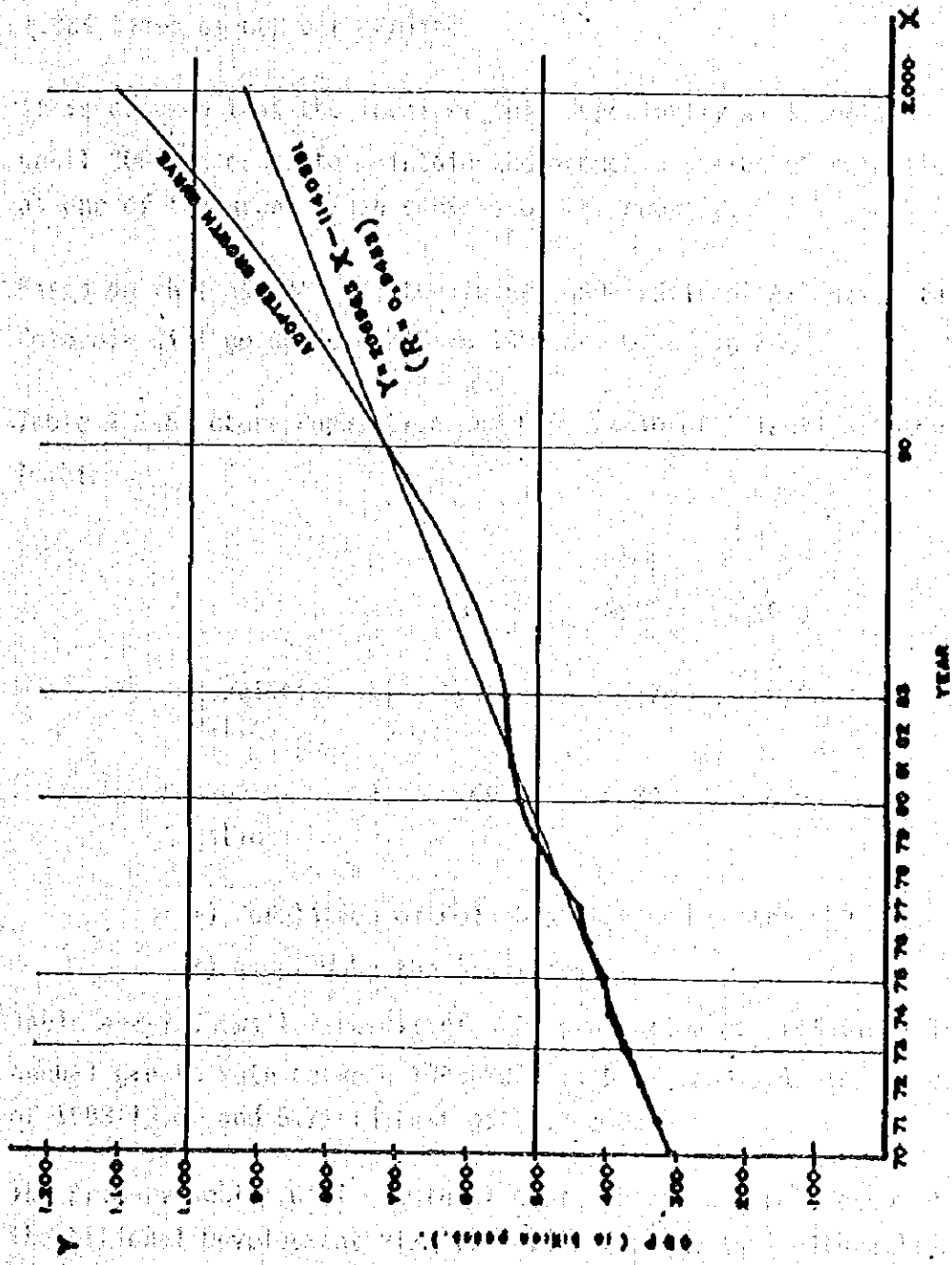
- (1) It is difficult to expect a rapid recovery of the world economic situation in a few years, hence the Colombian economy.
- (2) The growth curve of GDP between 1970 and 1982 (at 1975 constant prices) can be regressed to a straight line. If we use this regression line, the GDP will be 720,000 million pesos in 1990 and 930,000 million pesos in 2000 at 1975 constant prices. This projection seems to be most probable, but from the standpoint of planning, we would like to intensify the growth a little more in long term.
- (3) So, we expect the annual growth rate to rise gradually from 0.9% in 1983 to 4.5% in 1986, by the governmental effort through the National Development Plan 1983 - 1986, and after 1986, to continue the level of 4.5% until 2000.

The result is shown in Table 4-2-5 and Fig. 4-2-1.

Table 4-2-5 Projection of Future GDP of Colombia at 1975 Constant Prices.

	1983	1990	2000
GDP (million pesos)	547,600	719,800	1,117,800
Annual Growth rate(%)	0,9	4,5	4,5

Source : Estimated by Study Team.



PROJECTED GROWTH CURVE OF GDP IN FUTURE.

Fig. 4-2.2

## 2) Future GRDP of Atlántico.

In 1983, the population ratio of Atlántico to Colombia is 5.35% and is estimated to rise to 5.69% in 2000. On the other hand, the GRDP ratio is 5.69% in 1983, that means that GRDP per capita is 1.064 times of GDP per capita.

It is assumed that the level of this superiority will continue until 2000 in order to maintain the economic status of Atlántico as one of the great urban centers of the country.

Based on this assumption, the future GRDP ratio of Atlántico to Colombia will go up to 6.24% in 1990 and 6.98% in 2000.

Table 4-2-6 Future Population and GRDP ratio of Atlántico to Colombia

		%		
		1983	1990	2000
Population Ratio	1)	5.35	5.87	6.56
GRDP Ratio	2)	5.69	6.24	6.98

1) Population of Colombia is based on the DNP estimation

2) Assumed by the Study Team

Table 4-2-7 shows the result of GRDP projection of Atlántico. The annual growth rate between 1983-2000 is 5.5%, and 5.4% in the period of 1983-1990, and 5.7% in that of 1990-2000.

The primary sector will growth at 4.0%; the growth rate assumed by the National Development Plan 1983-1986 for the agriculture-livestock sector.

The secondary sector will recover gradually, and the leadership for developing the economic activity in the departament will grow at average annual rate of 4.5%.

The tertiary sector is expected to absorb the increasing demand of job generated by the growing population economically active, so it will have to grow at the highest rate among the sectors at 6.2% annually.

Table 4-2-7 Projection of Future GRDP of Atlántico by Three Sectors of Economic Activity at 1975 Constant Prices.

	1973	1983	1990	2000	1973 -1983	1983 -1990	1990 -2000
Primary	1.260	2.100	2.760	4.090	5.2	4.0	4.0
Secondary	7.210	10.030	13.440	21.060	3.4	4.3	4.6
Tertiary	12.370	19.030	28.720	52.870	4.4	6.1	6.3
Total	20.840	31.160	44.920	78.020	4.1	5.4	5.7



#### 4-2-3 Employment Projection

##### 1) Labor Force Supply

Labor force projections are based on the consideration of the following factors viz :

- (1) The age composition of the labor force will be slightly higher in the future than at present because of health facilities, education, and the promotion of family planning which therefore lowers the fertility and birth of rate. It can be also anticipated that the substantial proportion of population who are made up of migrants tend to be centered around the economically active age group.

In view of all these, an increase in the percentage of the working age population is anticipated in the future.

- (2) According to the past trend, the participation rate on the average tended to increase over the years 1973-1983. However, it is anticipated that the percentage of school attendance for higher education and the rate of female participation are likely to increase.

Considering the above prospects together with the past trends, the labor participation ratio will slightly increase in future.

The projected labor force in the Study Area is shown in Table 4-2-8

The labor force in the Study Area will increase from about 400,000 in 1983 to about 550,000 in 1990, and 770,000 in the year 2,000.

Expecting a decrease in unemployment rate over the years 1,983 - 2,000, the required job opportunities in the Study Area are estimated as about 480,000 in 1990 and about 690,000 in 2,000.

TABLE 4-2-8 PROJECTED LABOR FORCE IN STUDY AREA

(in thousand)

	1983			1990			2000 (3)		
	(1) B/Q & Soledad Galapa & Pto. Col.	(2) Malambo, Galapa & Pto. Col.	Study Area	B/Q & Soledad	Malambo, Galapa & Pto. Col.	Study Area	B/Q & Soledad	Malambo, Galapa & Pto. Col.	Study Area
Total Population	1108.0	92.2	1200.2	1409.7	124.6	1534.3	1875.3	167.5	2042.8
Working Age	786.5	64.6	851.1	1074.2	95.0	1169.2	1483.4	132.5	1615.9
Labor Force	372.1	27.7	399.8	511.3	41.3	552.6	712.0	58.3	770.3
Participation Rate	47.3%	43.0%	47.0%	47.6%	43.5%	47.2%	48.0%	44.0%	47.6%
Activity Rate (Gross)	33.6%	30.0%	33.3%	36.3%	32.2%	36.0%	38.0%	34.8%	37.6%
Unemployment Rate	14.9%	18.0%	15.1%	13.0%	15.0%	13.2%	10.0%	10.0%	10.0%
Unemployed Persons	55.3	5.0	60.3	66.5	6.2	72.7	71.2	5.8	77.0
Total Job Requirement	316.8	22.7	339.5	444.8	35.1	479.9	640.8	22.5	693.3

Source: (1) Person Trip Survey 1983.

(2) Estimated by the Study Team by using the information of Departamento Administrativo Nacional de Estadísticas - DANE 1983 and Encuesta en el sitio 1982.

(3) Projected by the Study Team.

## 2) Employment.

The productivity of each sector is calculated as shown in Table 4-2-9. The primary and the secondary sectors have gained 1.74% and 0.75% annual increase respectively between 1973 and 1983, but the tertiary sector has experienced a 1.57% annual decrease because of the rapid absorption of job demand.

Table 4-2-9 productivity by Sector at 1975 Constant Prices.

	(in pesos / person)	
	1973	1983
Primary	47.490	56.360
Secondary	101.040	108.750
Tertiary	81.070	69.120
Total	83.200	96.980

Source : Calculated by the Study Team based on the data from DANE, INANDES and P.T. Survey .

For future projection of employment, it is assumed that the productivity of the primary and the secondary sectors will continue to rise at the same rate of the past decade, but the productivity of the tertiary sector will have to be changed to an upward trend and will go up to the level of 65% and 70%, in 2000 respectively, compared to that of the secondary sector.

The future employment of Atlántico was estimated by applying each sectoral productivity to the corresponding GRDP.

Table 4-2-10 Future Productivity by Sector, at 1975 Constant Prices  
(in pesos / person)

	1983	1990	2000
Primary	56,360	61,270	74,690
Secondary	108,750	115,790	126,640
Tertiary	69,120	70,000	88,650

Primary :	1983 - 1990	1,2% up annually, contributing 30% to the sectoral growth rate 4,0%
	1990 - 2000	2,0% up annually, contributing 50% to the sectoral growth rate 4,0%
Secondary	1983 - 2000	0,9% up annually, reflecting recent growth rate of manufacturing industries in to Department .
Tertiary	1983 - 1990	shows little change
	1990 - 2000	grows up until the 70% level of the secondary sector.

Table 4-2-11 Future Employment by Sector - Atlántico -

	1983	1990	2000
Primary	37,300 ( 9.2)	45,000 ( 7.9)	54,700 ( 6.7)
Secondary	92,200 ( 22.8)	116,100 ( 20.3)	166,300 ( 20.3)
Tertiary	275,300 ( 68.0)	410,300 ( 71.8)	596,400 ( 73.0)
Total	408,800 ( 100.0)	571,400 ( 100.0)	817,400 ( 100.0)

Figures in parentheses show percentage distribution by sector for each year.

The employment concentration to the Study Area will be made more intense, although the gap against population concentration will gradually be diminished.

Table 4-2-12: Population and Employment Concentration Rate of the Study Area to Atlántico

	1973	1983	1990	2000
Population Concentration Rate (%) (A)	78.6	81.6	83.4	85.5
Employment Concentration Rate (%) (B)	81.2	83.9	85.5	87.1
Difference (B) / (A)	1.033	1.028	1.025	1.019

The total employment of the Study Area was estimated by applying this employment concentration rate to that of Atlántico.

As for the sectoral distribution, following factors were taken into account :

- (1) In the rest of Atlántico, the composition of the secondary and tertiary sectors will grow gradually.
- (2) Agricultural activities in the Study Area will be affected by the urbanization and some parts of them will change to agro-industries.
- (3) The concentration of tertiary sector to the Study Area will continue in future.
- (4) The share of secondary sector of the Study Area to Atlántico will recover by industrial development at Malambo and Free Zone as well as by construction activity.

Table 4-2-13 shows the result of sectoral estimation of employment for the Study Area and rest of Atlántico.

Table 4-2-13 Future Employment by Sector and Area

		1983	1990	2000
Atlántico	Primary	37,300 (9.2)	45,000 (7.9)	54,700 (6.7)
	Secondary	92,200 (22.8)	116,100 (20.3)	166,300 (20.3)
	Tertiary	275,300 (68.0)	410,300 (71.8)	576,400 (73.0)
	Total	408,800 (100.0)	571,400 (100.0)	817,400 (100.0)
Study Area	Primary	8,000 (2.4)	8,800 (1.8)	9,500 (1.3)
	Secondary	80,800 (23.8)	101,400 (20.8)	147,400 (20.7)
	Tertiary	250,700 (73.8)	378,300 (77.4)	555,100 (78.0)
	Total	339,500 (100.0)	488,500 (100.0)	712,000 (100.0)
Rest of Atlántico	Primary	29,300 (44.9)	36,200 (43.7)	45,200 (42.9)
	Secondary	11,400 (17.4)	14,700 (17.7)	18,900 (17.9)
	Tertiary	24,600 (37.7)	32,000 (38.6)	41,300 (39.2)
	Total	65,300 (100.0)	82,900 (100.0)	105,400 (100.0)

Figures in parentheses show percentage distribution by sector for each year.

### 4-3. Development Concept of Urban Structure

Urban structure in a transport study is viewed from the following three factors:

- 1) Location of activities or land use,
- 2) Trip patterns,
- 3) Transport network.

The development concept of urban structure in this Study is based on the existing urban structure of the Metropolitan Region. The on-going process or tendency of urbanization has been also taken into account, and three idealized and hypothetical patterns of structure have been worked out as possible alternatives. These patterns have been simplified to show the clear-cut difference of image of each which is shown in Fig. 4-3-1, Fig. 4-3-2, and Fig. 4-3-3 respectively.

#### 4-3-1. Pattern A

This pattern is, in a sense, an idealized trend pattern mainly in terms of location of activities. Principal activities which accommodate employment concentrate in the central area of Barranquilla, while housing development extends to its outskirts along arterial roads. There will be little tendency of creating sub-centers, and hypothetically the function of the central area is intensified.

Thus trip patterns are, on the whole, centripetal and centrifugal in accordance with the configuration of activities.

The arterial transport network takes a radial form to facilitate the trip patterns. The construction or improvement of the arterials may tend to be follow-up works after the allocation of activities. Further, the existing beltway will be given little positive role in this structure pattern.

#### 4-3-2. Pattern B

This pattern is brought forward mainly with the idea of the establishment of multinucleated sub-centers which might help to reduce the too much concentration of activities and traffic in the central area. These sub-centers are located at the intersections of the inner beltway, and the function are commercial, in principal, to serve the district. They may, however, preferably share in the employment cores of the Region. The central area, although a regional and city center as it is, is presumed to be one of those sub-centers and houses more people with better residential environment.

The daily trip patterns are, thus, rather confined, ideally speaking, to the inside of districts.

In this case the arterial road network is ring-radial, and the inner beltway is vital to this structure. This inner beltway will facilitate the formation of sub-centers; therefore, its construction requires an advance measure and coordination with zoning planning of the city.

#### 4-3-3. Pattern C

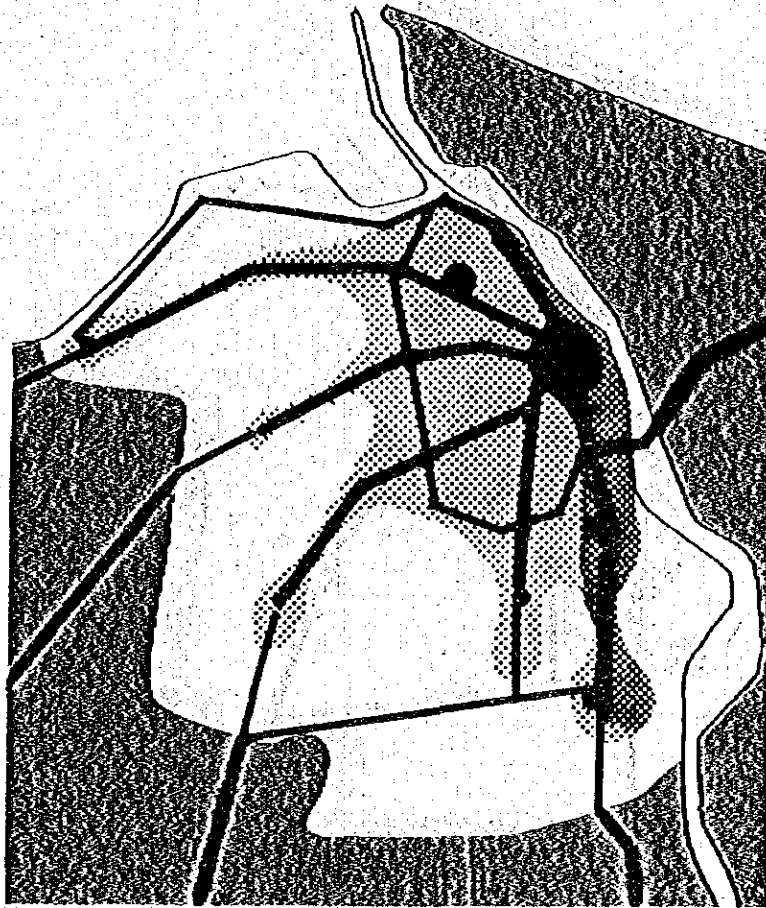
In this structural pattern the location of activities is arranged in a most distinctive way. Moreover, the existing development tendency of the Region to the south is taken into account. Commercial, business, and industrial activities are located primarily along the River forming a north-south high employment belt. On the other hand, residential areas are arranged to extend linearly on a north-south axis just behind the high employment belt. A pair of a residential area and a employment core on the belt will shape a district.

Daily trip patterns are supposed to take place in the east-west direction to minimize the home to work-place distance, while trips related to industrial activities will move on the riverside linear axis.



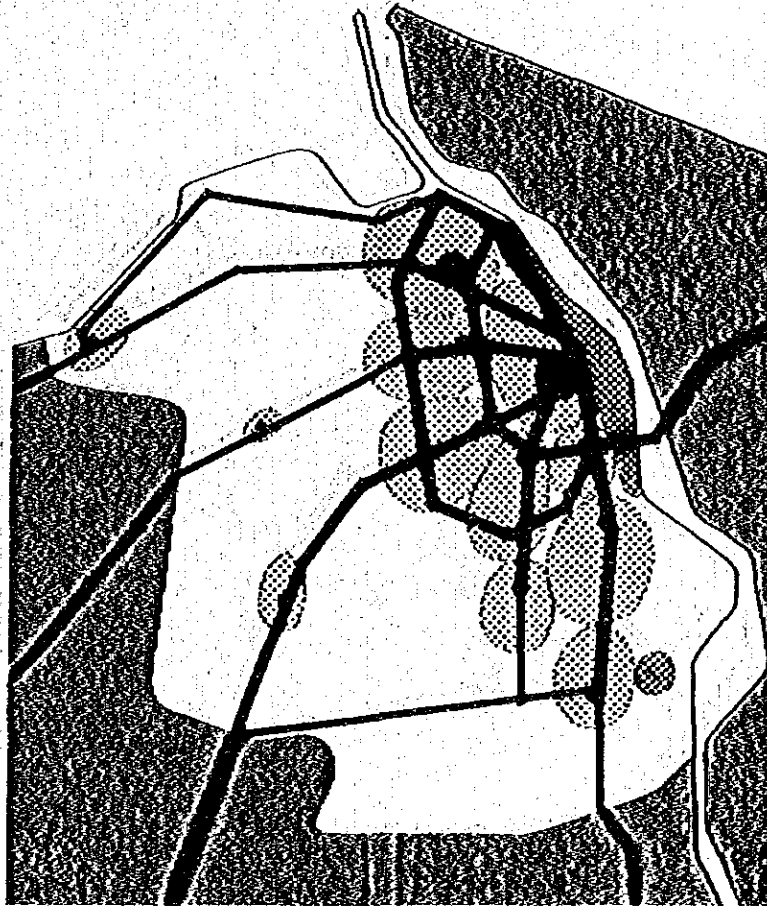
The principal transport network takes a linear or ladder form. The outer riverside artery is mainly for industrial use and the inner artery is, although secondary, to facilitate the trips among residential areas and rather distant home to work-place trips. The construction of this inner artery is one of the features of this structure and the existing beltway is given a minor role.

Fig. 4-3-1 Development Pattern A



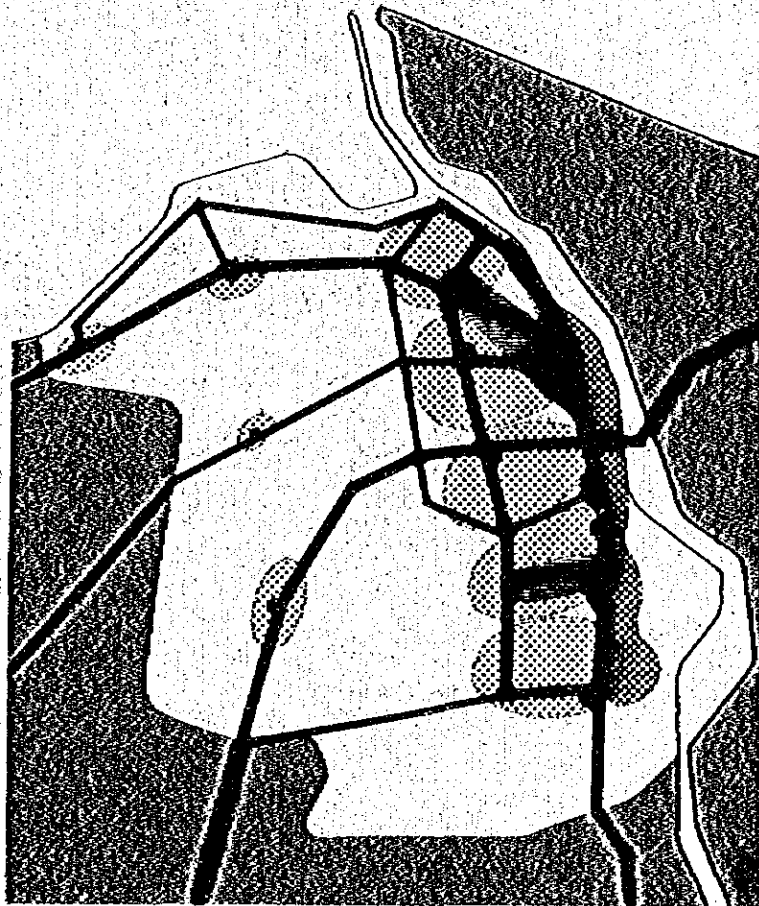
ACTIVITIES: Employment cores in the central areas and residential areas in the outskirts  
TRIP PATTERNS: Centripetal/centrifugal  
ARTERIAL NETWORK: Radial/finger/star

Fig. 4-3-2 Development Pattern B



ACTIVITIES: Formation of districts with sub-centers  
TRIP PATTERNS: Possible confinement in a district  
ARTERIAL NETWORK: Ring radial

Fig. 4-3-3 Development Pattern C



**ACTIVITIES:** Industrial activities along the riverside axis, and residential areas behind the industrial axis  
**TRIP PATTERN:** East-west movement between residential and employment cores  
**ARTERIAL NETWORK:** Linear/radder