

Table 4.2-21 Average Occupancy Rate of Passenger

Route No.	Number of Round Trip	Total Number of Passenger	Occupancy Rate (passengers)	Type of Service
1	27	85.2	18.5	bus ord.
2	36	123.9	29.1	bus ord.
3	54	117.8	25.9	bus ord.
4	52	124.8	30.0	bta ord.
6	12	119.0	27.5	bta ord.
8	41	150.8	25.8	bus ord.
12	28	87.9	16.0	bus ord.
13	30	100.9	21.2	bus ord.
15	38	98.6	21.4	bta ord.
16	16	142.6	30.0	bus ord.
17	24	88.3	26.5	bus ord.
18	31	113.6	31.7	bus ord.
20	30	117.7	18.6	bta ord.
22	18	54.2	13.4	bus ord.
24	30	67.3	14.7	bus eje.
25	23	76.8	16.7	bus eje.
28	30	70.5	15.5	bus eje.
32	17	79.7	12.5	bus eje.

source: Study Team,

Occupancy Rate: Passenger*km/Vehicle*km

(6) Length of Bus Routes

302. The length of bus routes are shown in Table 4.2-22. This table indicates that the longest route is 40 km and that half the routes are more than 20 km long. Thus, the average distance in operation is 20.4km. These are the characteristics of the bus routes in Cartagena. Almost all the routes enter into the Centro area, which explains why the length of bus routes become as long as mentioned above.

Table 4.2-22 Length of Bus Routes

Route No.	Route Name	Length(km)
1	Esperanza-Centro	11.5
2	Zaragocilla-Calamares-Centro	15.6
3	Ternerá-Av. Pedro de Heredia-Centro	25.2
3A	Ternerá-Av. Pedro de Heredia-Centro	25.2
4	Olaya-Av. Pedro Romero-Centro	21.0
5	Socorro-Centro	27.4
6	Socorro-Centro	23.4
7	Blaz de Lezo-Av. Pedro de Heredia-Centro	26.2
8	Bosque-Blaz de Lezo-Centro	28.9
9	Torices-Santa María-Centro	9.5
10	Paraguay-Junin-Centro	13.7
11	Gaviotas-Av. Pedro de Heredia-Centro	16.4
11A	Gaviotas-Av. Pedro de Heredia-Centro	16.4
12	Alto Bosque-Centro	16.5
13	Trece de Junio-Centro	21.6
14	Seguros Bolívar-Centro	2.4
15	Caracoles-Av. Pedro de Heredia-Centro	29.0
16	Albornoz-Bosque-Centro	29.3
17	Chille-Los Cerros-Centro	13.2
18	Daniel Lezaitre-Centro	11.0
19	Daniel Lezaitre-Bazurto	18.0
20	Crespo-Centro-Manga-Paraguay	7.0
20A	Crespo-Centro-Castillo	23.2
21	Carmero-Blaz de Lezo-Crisanto Luque-Centro	26.3
22	Manga-Bazurto-Centro	11.2
22A	Manga-Popa-Centro	7.0
22B	no operation	
22C	Laguito-Centro	6.0
23	Guillermo Posada-Centro	6.0
24	Ternerá-Centro-Laguito	32.0
25	Socorro-Bosque-Castillo	34.0
26	Paraguay-Manga-Popa-Centro-Castillo	10.0
27	Caupestire-Bosque-Laguito	40.0
28	Caupestire-Avenida-Castillo	33.8
29	no operation	
30	no operation	
31	Zaragocilla-Bosque-Bocagrande	28.5
32	Pozon-Trece de Julio-Centro-Paseode Bolívar	37.0
33	no operation	
34	no operation	
35	Simón Bolívar-St. Fernando	28.5
Total		731.7

303. The relation between the length of bus routes and number of bus vehicles is shown in Figure 4.2-5. This figure shows that the long routes have also as many buses in operation as the short routes.

304. According to the relation between the operation time for a round trip and the length of routes, shown in Figure 4.2-6, the time increases at a lesser rate than the increase in the length of routes. However, passengers spend a lot of time for travel especially for the long distances. That is clearly shown in Figure 4.2-6. All the routes whose length are 20 - 30 km take more than one hour to travel.

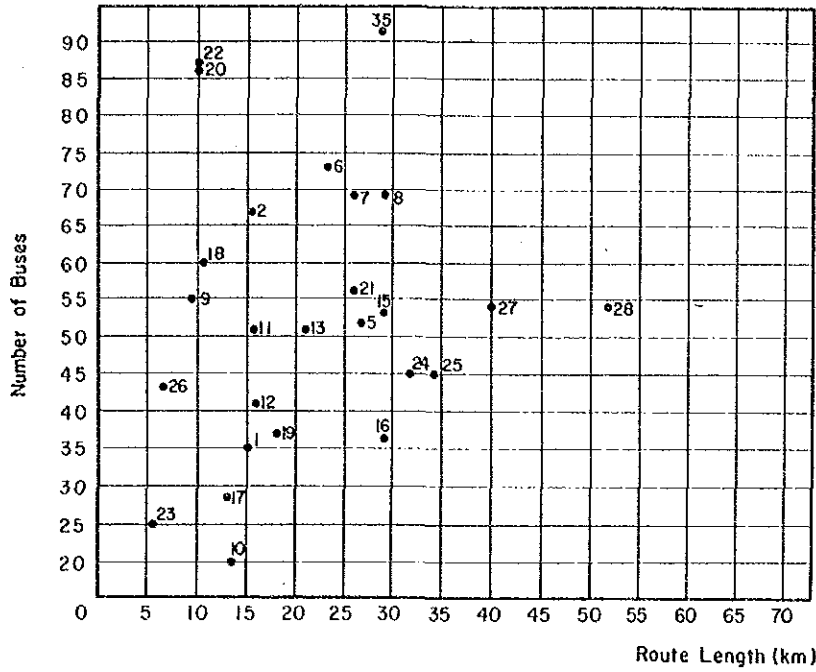


Figure 4.2-5 Length of Bus Routes and No. of Bus

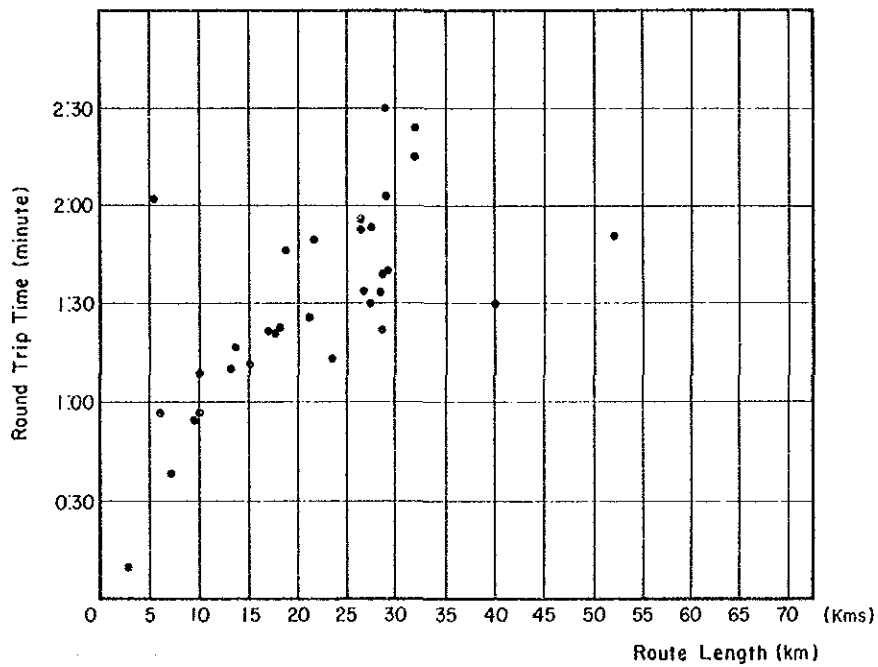


Figure 4.2-6 Time and Length of Bus Route

(7) Operation Rate

305. According to the dispatchers' records by ADESTRACOSTA from July 1st to 10th 1991, the plate number of buses have been shown with each departure time on each day. This data indicated that many buses are operated at the terminal when in fact they were absent for operation.

306. Taking a sample bus route as Route No.1 and No.2, the following results are obtained; On average, 75% of the total recorded vehicles on route No. 1 by the dispatch table has been operated. Also on route No.2, 86% of the total vehicles have been operated in such 10 days, indicating an almost stable percentage more than 80% on week day.

307. The average absence from operation per 10 days was 2.9 days in Route 1 and 2.6 days in Route 2. This means 1.8 day (22.3%) on route 1 and 1.2 days (15.4%) on route 2 showed absence of operation per 8 week days except Sunday and holiday.

(8) Bus Operation Control

308. Each bus route has a terminal which is located at the opposite side of the Centro. At the terminal point of the routes, there is so called "Dispatcher", who is employed and/or assigned by ADESTRACOSTA and controls the bus operation. Dispatcher is a controller for bus drivers who start or return from/to the terminal. The bus drivers are indicated their starting time from the terminal and the passing time at the clock control points by dispatcher. The number of departed buses depends upon the frequency that the municipality had fixed by "Decreto".

309. Thus, the dispatcher has an important role in controlling the frequency and punctuality of bus operation. Furthermore, the dispatcher has the power to impose a penalty for the punctuality, that is, he can decrease the number of operation of a bus which is delayed at the clock control points (refer to Figure 4.2-7).

310. The clock control is a system to keep the regularity of the bus operation. On the average there are two clock control points in each route. As the bus routes concentrate in the main trunk roads, those clock control points on the roads maintain a check on several routes at the same time.

311. There are two or three places where buses concentrate and wait the passengers in the Centro (refer to Figure 4.2-8). However, those places are not terminals to control the bus opera-

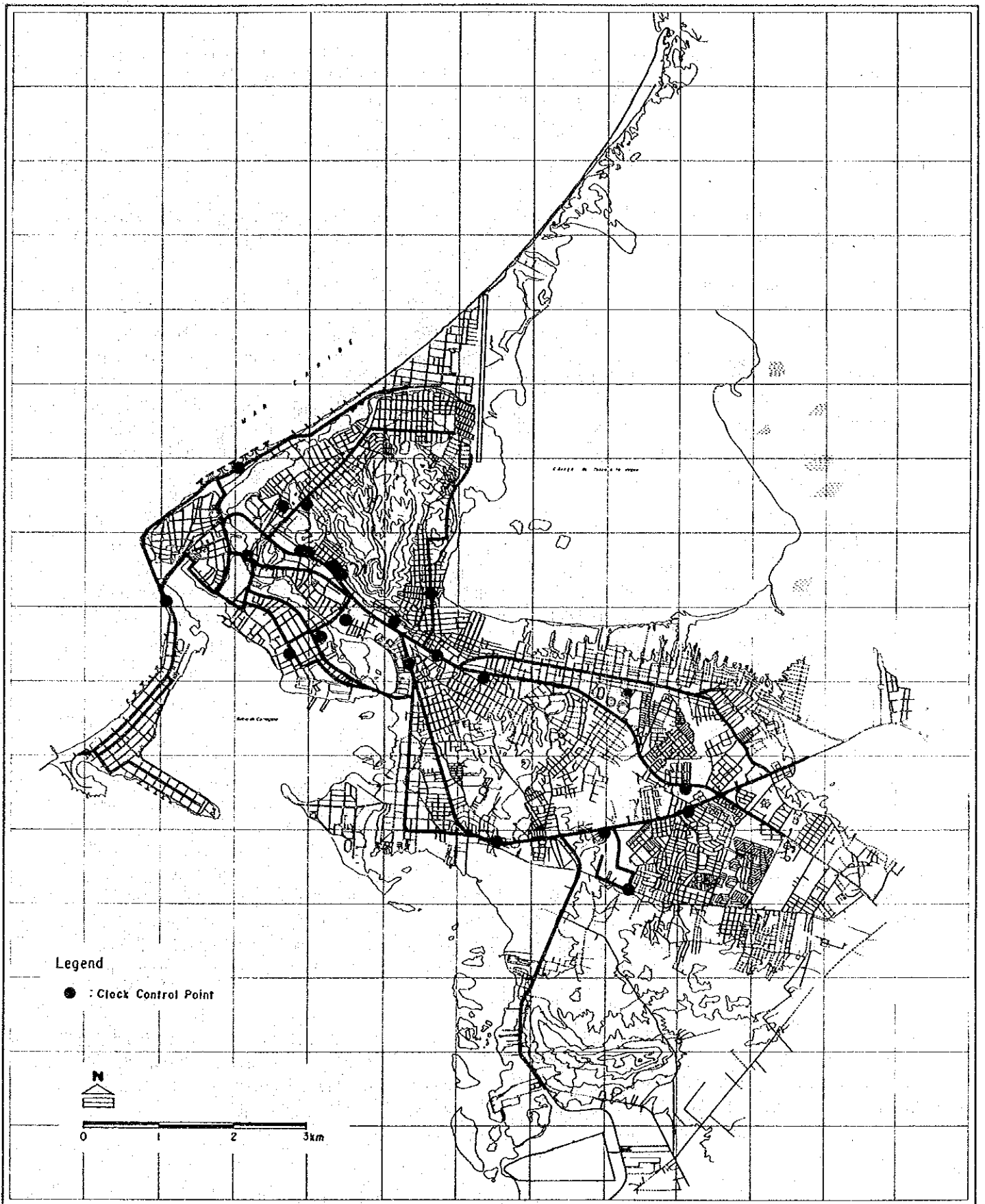


Figure 4.2-7 Clock Control Points

tion. It can be said those places are the accumulated bus stops (Gran-parada). Only the traffic police can manage the flow of traffic on the road in those places.

312. Concerning the control of bus operation, the following points can be pointed out;

- a. The present system is not systematic. All the operational conditions depend upon the decision of a dispatcher. There is no apparent criteria on check system or control system for the dispatchers.
- b. The control of bus operation after 20:00 (8:00 pm) has not been managed by dispatchers, because of the working hours for the dispatcher which runs up to 20:00 o'clock. The bus operation hour is until 23:00 o'clock. During the time between 20:00 and 23:00 o'clock, basically there is no control condition. The bus operation depends on the judgment of bus drivers.
- c. It is necessary to improve and/or change the method of the clock control and to guide the way of driving on the roads. "Ejectivo" is operated to run through at much higher speed on the main road and abruptly stops and starts. This operation is a dangerous situation for the passengers, especially old persons and children.

4.2.4 Bus Facilities

(1) Bus Stop

313. In general, there should be bus stops at fixed locations. However, there is no any facility at bus stops at present. The passengers can stop a bus wherever they want on the roads. Therefore, the improvement of the bus stops has been delayed. There are some bus stops in Bocagrande where there is influx of tourists. Although it can be said that bus stops are actually used, nevertheless the buses also can stop everywhere along the roads. From other point of view, the congestion of traffic flow on the roads is partly due to this random stopping of buses.

314. There are many places where bus stops are located, under big trees near the intersections. Those are convenient for rainy days and also sunny days. Countermeasures have not been taken to meet these situations.

(2) Bus Terminal

315. There is no bus terminal for urban buses where people gather and use buses in the main parts of the city. Some places in the Centro where the bus routes concentrate can be said to have a function such as a bus terminal. But, in reality, these are only big bus stops from the view point of the public facility. There are some places along the road where the buses can make a queue to park and wait the passengers. However, there is nothing organized at all, such as indications, information, control and functions for the passengers, etc.

316. Each bus route has a terminal in the residential area (refer to Figure 4.2-8). Generally, at these terminals, buses can be parked, for washing the body, light maintenance, supplying fuel and for the drivers' rest. All of them are facilities for bus operations. It is not enough for a bus terminal only to provide the above facilities. More importantly is to provide facilities and information for the passengers.

317. The improvement of the facilities as a bus terminal is difficult to be undertaken by bus company, because on one (1) route, for instance, many bus companies operate their buses together. At present, these bus terminals have only facilities for the bus operation requirements. Therefore, the function of ADESTRCOSTA and strong guidance of the municipality will play an important role in these improvements from now on.

4.2.5 Bus Fare System

318. The fares for the urban bus service in the city of Cartagena have been regulated as follows (as of August 1991);

- a. Ordinary Bus (Bus Ordinario)
 - Ordinary days : 60 pesos
 - Night, Sunday and Holiday : 65 pesos
- b. Ordinary Buseta (Buseta Ordinario)
 - Ordinary days : 65 pesos
 - Night, Sunday and Holiday : 70 pesos
- c. Bus Ejectivo
 - Ordinary days : 140 pesos
 - Night, Sunday and Holiday : 150 pesos
- d. Buseta Ejectivo
 - Ordinary days : 125 pesos
 - Night, Sunday and Holiday : 140 pesos
- e. Colectivo
 - Ordinary days : 80 pesos
 - Night, Sunday and Holiday : 100 pesos

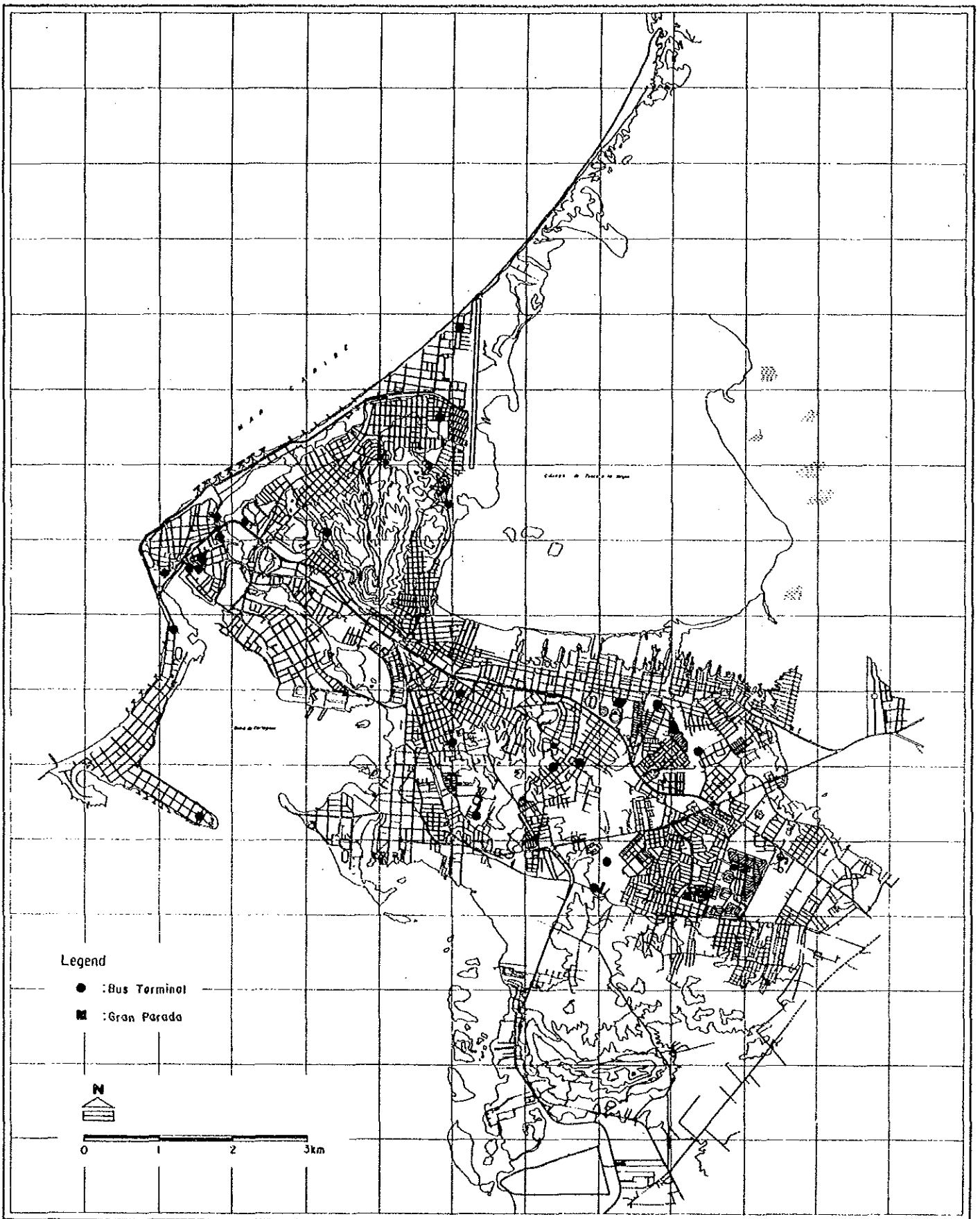


Figure 4.2-8 Location of Bus Terminals

319. For the following specific routes which have the characteristics of suburban bus service, following fares are fixed;

Boquilla-Cartagena (to the Centro)	: 70 pesos
Boquilla-Cartagena (to the Mercado de Bazurto)	: 80 pesos
Cartagena-Pasacaballos	: 75 pesos
Pasacaballos-Santana	: 100 pesos
Pasacaballos-Baru	: 200 pesos

320. From the Decreto No.8, 1991 published on January 8,1991, these fares were to be valid after January 15, 1991. According to the newspaper on August 28, 1991, it was changed on September 1st, 1991 as below.

Bus Ordinario	Ordinary days	: 70 pesos
	Night, Sunday, Holiday	: 75 pesos
Buseta Ordinario	Ordinary days	: 75 pesos
	Night, Sunday, Holiday	: 80 pesos
Bus Ejectivo	Ordinary days	: 160 pesos
	Night, Sunday, Holiday	: 170 pesos
Buseta Ejectivo	Ordinary days	: 140 pesos
	Night, Sunday, Holiday	: 150 pesos

4.2.6 Financial Condition of Bus Operation

321. In order to examine the financial condition of the public bus operation, the balance of revenue and operation cost is investigated based on the financial data of September 1991.

(1) Public Bus Fares

322. The fare system in September 1991 is as follows;

- a. bus ordinario: 70 pesos
- b. bus ejetivo : 160 pesos
- c. bta ordianrio: 75 pesos
- d. bta ejetivo : 140 pesos

(2) Operation Cost

323. Operation cost consists of the following components:

- a. fuel/oil cost,
- b. tire cost,
- c. depreciation cost,
- d. maintenance cost,
- e. personnel cost,
- f. administration/license/taxes,
- g. insurance cost, and
- h. opportunity cost.

324. The results of analysis is shown in Table 4.2-23.

Table 4.2-23 Vehicle Operation Cost (peso/km)

Type	Bus		Buseta	
	eje.	ord.	eje.	ord.
a. fuel and oil cost	75.5	75.5	58.5	58.5
b. tire cost	24.8	24.8	16.2	16.2
c. depreciation cost	40.5	11.2	26.7	9.6
d. maintenance cost	46.7	46.7	28.8	28.8
e. personnel cost	42.9	42.9	30.5	30.5
f. admin./license cost	55.7	37.0	47.7	31.7
g. insurance cost	15.0	15.0	8.0	8.0
h. opportunity cost	72.0	25.7	43.4	14.7
Total	373.2	278.8	259.8	198.1

(3) Managerial Index

325. Managerial index is estimated using above passenger fares and vehicle operation costs (refer to Table 4.2-24). As the

overall total, managerial index shows about 1.3 which seems to indicate adequate financial condition, although each route shows the index of profit or deficit.

Table 4.2-24 Managerial Indices of Routes

Financial Condition of Bus Company (as of September 1991)

Route	Type of Service	No of Bus	No of Trip	Route Length (km)	Average of Passenger	No of psn	Bus.km	Total Rev. 1000 pesos	Total Cost 1000 pesos	Managerial Index
1	bus/ord.	37	300	11.5	95.4	28620	3450.0	2003	962	2.08
2	bus/ord.	60	498	15.6	95.0	47310	7768.8	3312	2166	1.53
3	bus/ord.	50	255	25.2	109.8	27999	6426.0	1960	1792	1.09
3A	bta/ord.	65	585	25.2	101.6	57404	14238.0	4305	1273	3.38
4	bus/ord.	107	653	21.0	95.4	62296	13713.0	4361	3823	1.14
5	bus/ord.	40	316	27.4	92.5	29230	8658.4	2046	2414	0.85
6	bta/ord.	78	624	23.4	86.5	53976	14601.6	4048	2892	1.40
7	bta/ord.	60	486	26.2	109.9	53411	12733.2	4006	2522	1.59
8	bus/ord.	70	441	28.9	151.3	66723	12744.9	4671	3553	1.31
9	bus/ord.	35	304	9.5	80.0	24320	2888.0	1702	805	2.11
10	bus/ord.	6	55	13.7	81.9	4505	753.5	315	210	1.50
11	bus/ord.	25	260	16.4	70.4	18304	4264.0	1281	1189	1.08
12	bus/ord.	33	389	16.3	90.4	35166	6340.7	2462	1768	1.39
13	bus/ord.	38	346	21.6	87.9	30413	7473.6	2129	2084	1.02
14	bus/ord.	6	49	2.4	80.0	3920	117.6	274	33	8.37
15	bta/ord.	80	648	29.0	90.5	58644	18792.0	4398	3722	1.18
16	bus/ord.	33	244	29.3	94.1	22960	7149.2	1607	1993	0.81
17	bus/ord.	20	142	13.2	84.4	11985	1874.4	839	523	1.61
18	bus/ord.	60	378	11.0	80.2	30316	4158.0	2122	1159	1.83
19	bus/ord.	24	214	18.0	101.6	21742	3852.0	1522	1074	1.42
20	bta/ord.	35	238	7.0	108.5	25823	1666.0	1937	330	5.87
20A	bus/ord.	30	210	23.2	85.0	17850	4872.0	1250	1358	0.92
21	bta/ord.	12	101	26.3	96.4	9736	2656.3	730	526	1.39
22	bus/ord.	20	152	11.2	145.5	22116	1702.4	1548	475	3.26
22A	bus/ord.	1	8	7.0	101.6	813	56.0	57	16	3.64
22C	bus/ord.	15	140	6.0	101.6	14224	840.0	996	234	4.25
23	bus/ord.	22	229	6.0	101.6	23266	1374.0	1629	383	4.25
24	bus/ejec	60	528	32.0	67.3	35534	16896.0	5686	6305	0.90
25	bus/ejec	57	479	34.0	76.8	36787	16286.0	5886	6077	0.97
26	bus/ord.	35	301	10.0	114.0	34314	3010.0	2402	839	2.86
27	bus/ejec	15	156	40.0	108.3	16895	6240.0	2703	2329	1.16
28	bus/ejec	44	374	33.8	106.2	39719	12641.2	6355	4717	1.35
31	bta/ejec	24	228	28.5	65.0	14820	6498.0	2075	2425	0.86
32	bus/ejec	39	331	37.0	79.7	26381	12247.0	4221	3182	1.33
35	bta/ord.	20	194	28.5	101.6	19710	5529.0	1478	1095	1.35
Total		1356	10836	715.3		1027234	244510.8	83316	66249	1.33

4.3 Urban Bus Passenger OD

4.3.1 Bus Passenger Survey

(1) Purpose of Survey

326. This survey aims to get the data of Origin and Destination of Bus passengers' trip which is the major part of public transport. Based on this result, it is possible to identify the total demand and its movement pattern in the urban area of Cartagena.

327. This survey was carried out for the urban bus routes and passengers. The inter-city bus passengers movement was covered by the Cordon Line Survey.

(2) The Type of Survey

328. Bus Passengers Survey consists of three (3) kinds of survey as follows;

- a. Bus Passengers Origin-Destination Survey
- b. Bus Passengers Counting Survey
- c. Bus Fleets Counting Survey at terminal.

(3) Bus Passengers OD Survey

1) Objectives

329. This survey aims to obtain the origin and destination of the bus passengers in order to know the total demand of transportation and also to get the data for future projection.

2) Method of Survey

330. The survey was carried out through interview of all passengers in the selected bus vehicles for all round-trips in a day (refer to Table 4.3-1). The surveyed bus fleets were selected by random sampling, depending upon the number of buses in operation. The targeted routes were also selected as follows;

331. The urban bus routes were classified into categories by the service area and roads to use. The representative bus routes were selected from each category as a sample for the survey. The total number of the sampled routes was 18 routes, involving 15 Ordinario and 3 Ejectivo.

332. The number of bus vehicles interviewed was determined in proportion to the number of round trips on the sampled routes.

Total number of sampled bus fleets was 90. Number of sampled bus vehicles in each route is shown in Table 4.3-2.

333. Basically, the interview of bus passengers was carried out for all passengers in the bus. However, at the peak hour, it happened that the interview was not feasible to be continued in the bus. In that case, the interviewer tried to carry out the interview to the best extent possible. The survey schedule, sampled routes and the number of bus vehicles interviewed are shown in Table 4.3-1 and Table 4.3-2.

Table 4.3-1 Survey Schedule and Routes

Survey Date		Route			
August	20	R2	R3		
	21	R1	R4	R6	
	22	R15	R18		
	23	R12	R16	R17	R22
	26	R20	R18	R13	
	27	R24	R25	R28	
	28	R32			

Table 4.3-2 Survey Routes and No. of Bus

Route	Number of Bus	Type of Bus
R2	6	Ordinario
R3	9	Ordinario
R1	4	Ordinario
R4	9	Ordinario
R6	2	Ordinario
R15	6	Ordinario
R8	9	Ordinario
R17	4	Ordinario
R22	3	Ordinario
R12	4	Ordinario
R16	4	Ordinario
R13	5	Ordinario
R20	5	Ordinario
R18	5	Ordinario
R28	6	Ejectivo
R25	4	Ejectivo
R24	5	Ejectivo
R32	4	Ejectivo
Total	94	

3) Contents of Survey

334. The contents of the survey items are as follows;

- a. bus stop where boarding
- b. bus stop where getting off
- c. bus route to transfer
- d. destination after transfer of route
- e. trip purpose

335. The purpose of trip is defined in eight (8) categories, as follows;

- a. back to home
- b. go to work
- c. go to school
- d. go to business
- e. back to company from business
- f. go to shopping
- g. go to sightseeing, recreation
- h. Go to social/private matters.

(4) Bus Passenger Count Survey

1) Objectives

336. The objective of this survey is to count the total number of passengers transported by the buses interviewed in Bus Passenger OD Survey.

2) Survey Method

337. The passenger counting was carried out simultaneously in the same vehicles for the Bus Passengers OD Survey. The counting of the bus passengers was carried out to record how many passengers board/got off at each bus stop.

(5) Bus Counting Survey at Bus Terminal

1) Objectives

338. The interviewed bus vehicles are only a part of the total number of bus vehicles operated by each route. Thus, it is necessary to know how many times the round trips start at the terminal and how many buses are operated actually in each route. This results can be used for verifying the results of the interview survey.

2) Survey Method

339. The plate number and the starting time of each bus from the terminal were recorded on the sheet. This sheet was confirmed with the control table of Dispatcher after the survey was completed.

4.3.2 Passenger OD

(1) Sample Rate for Interviewed Bus Passengers

340. The total number of round-trips interviewed was 537. The total number of passengers interviewed was 50,552. The total number of bus passengers transported by sampled buses was 56,293 in surveyed routes. The sample rate for the total number of the passengers transported by interviewed buses is 89.8%.

341. However, the total number of the bus passenger demand in Cartagena has not been cleared yet. The sample rate to the total bus passenger number has not been calculated.

(2) Passenger OD

342. The bus passenger OD and its trip characteristics are described in Chapter 3, section 3.3.4, together with vehicle trip OD and their trip characteristics.

4.4 Inter-City Bus Transportation

4.4.1 Bus Company

343. There are 10 bus companies to operate the inter-city bus transportation (refer to Table 4.4-1). From the characteristics of their services, three (3) companies can be considered as local companies while the other seven (7) companies can be considered as nation-wide companies.

344. The three local companies are "Renaciente", "Media Luna" and "Cootransar". Renaciente and Media Luna have their office in Cartagena. Cootransar has its office in Arjona which is a little town in Bolivar State.

345. These companies are operating the inter-city bus routes within the Bolivar State (Departamento). Renaciente has only the route connecting with Barranquilla. These three (3) companies have terminals (parking lots), which are located near Chambacu bridge for La Boquilla, Arjona, Turbaw and near the public market (Mercado de Bazurto). All the vehicles of these three (3) companies are the type of bus corrientes which are similar with Ejecti-

vo. Those buses are operated as a system almost the same as urban bus transportation. The dispatch system is also same as urban buses through authorized schedule by INTRA.

346. The other 7 companies are operating the inter-city bus routes connecting the cities outside of Bolivar State (so called inter-departamento). Their main offices are located in other cities and the branch offices are in Cartagena. The terminals (parking lots) for their own buses are located next to their offices. They control the dispatches of their buses at the terminal. However, Coolibertador does not have its own office or terminal. Coolibertador uses the facilities of Unitransco.

Table 4.4-1 Inter-City Bus Company

Bus Companies	No. of Buses	No. of Routes
1. RENACIENTE	252	23
2. MEDIA LUNA	53	30
3. COOTRANSAR	79	10
4. UNITRASCÓ	177	42
5. COOPETRAN	55	7
6. BRASILIA	384	10
7. TORCOROMA	128	16
8. LA COSTENA	150	40
9. RAPIDO OCHOAY	235	2
10. COOLIBERTADOR	114	1
TOTAL	1627	183

4.4.2 Service Network

(1) Inter-City

347. The inter-city bus routes, which are connecting between the main cities in Bolivar State (Departamento) and Cartagena, are operated by 3 companies; Renaciente, Media Luna and Cootransar. The connected cities with Cartagena are listed in Table 4.4-2. Intercity bus network is shown in Figure 4.4-1.

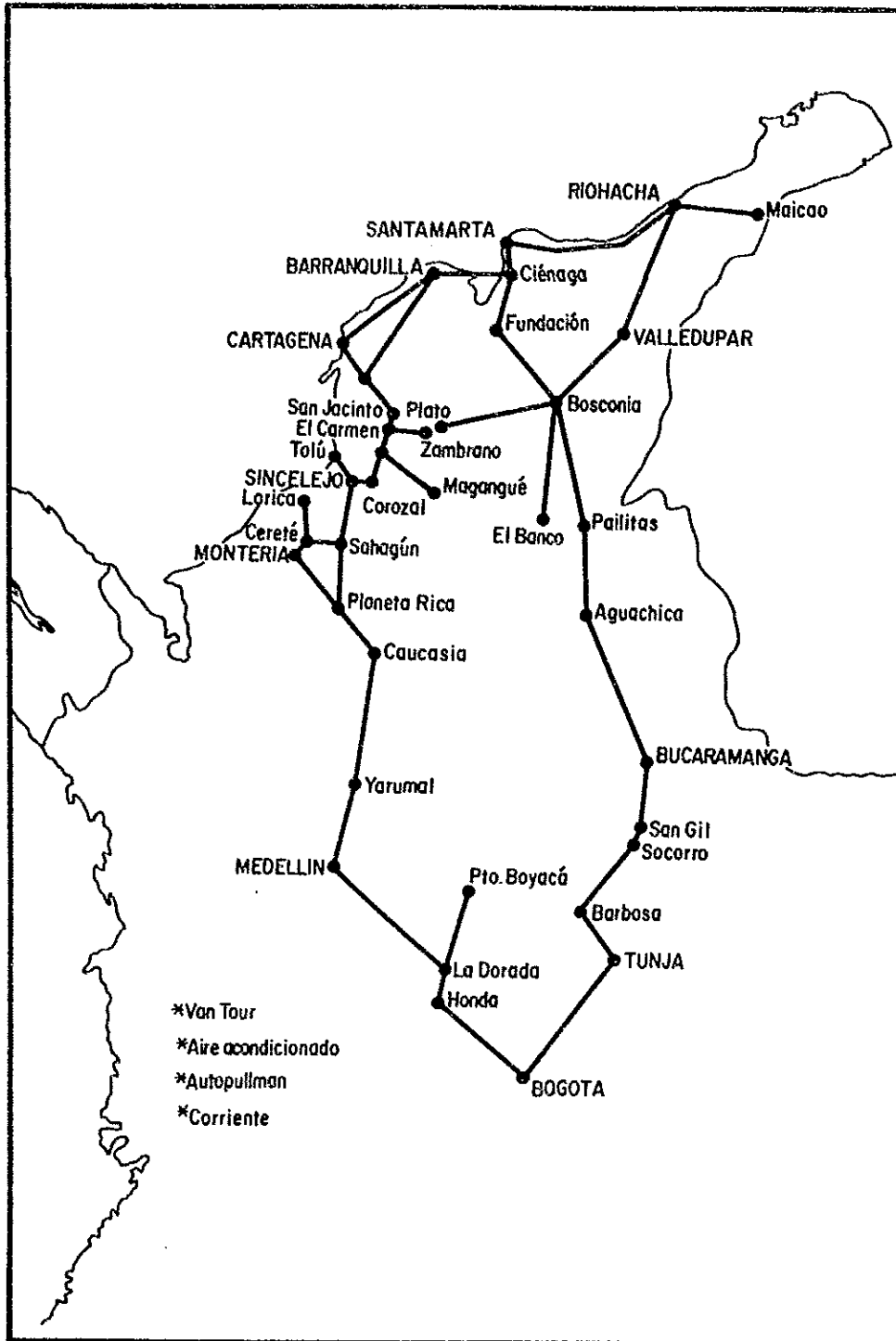


Figure 4.4-1 Intercity Bus Network

Table 4.4-2 Cities Connected by Inter-city Bus

RENACIENTE	MEDIA LUNA	COOTRANSAR
Arenal	Turbaco	Arjona
Bayunca	Mahates	Marialabaja
Turbana	Calamar	Santa Rosa
Santa Catalina	Arjona	Calamar
Galerazamba	Santa Catalina	Turbana
Marialabaja	Galerazamba	Villanueva
Hata Viejo	Turbana	
Santa Rosa	San Joaquin	
Villanueva	San Antonio	
Turbaco	El Nispero	
Zipacoa	Framenco	
Canaveral	Marialabaja	
Carmen de Bolivar	San Basilio	
Arroyo Grande	San Onofre	
San Juan	Las Piedras	
Lonia	Bayunca	
San Onofre	Santa Rosa	
Rocha	Villanueva	
	Arenal	
	Canaveral	
	Zipacoa	

Note: Renaciente has the route for Barranquilla

(2) Inter-State

348. The inter-state bus routes are operated by 7 other companies, which are connecting between the major cities outside of Bolivar State (Departamento). These cities are shown in Table 4.4-3.

Table 4.4-3 Cities Connected by Inter-state Bus

Bus Routes between Cartagena;		
Sincelejo	San Bernardo	Medellin
Monteria	Montelibano	Bucaramanga
Magangue	Ayapel	Tolu
Lorica	Caucasia	San Antevio
Maicao	San Marcos	Mompos
Barranquilla	Plante Rica	Cucuta
Bogota	Zambrano	Barranca
Villedupar	Since	Santa Marta

4.4.3 Operation

(1) Type of Service

349. Several types of bus fleets are used and each type has different service as follows;

- a. Bus Corriente
- b. Bus de Lujo
- c. Bus Thermoking
- d. Coche Cama/Rey Dorado
- e. Van tour

1) "Bus Corriente"

350. This type is similar with Ejectivo of urban services. Its capacity is 32 - 45 seats.

2) "Bus de Lujo"

351. This type is larger and more comfortable than Bus Corriente. Its capacity is 40-45 seats.

3) "Bus Thermoking"

352. This type is a vehicle with air conditioning. Usually these buses make direct trips to major cities (not stopping in small towns). The capacity is 33 - 45 seats.

4) "Coche Cama"/"Rey Dorado"

353. This type of bus offers almost the same level of services as Thermoking. The seats can be reclined and extended. Brasilia is the company that offers "Coche Cama" services and Rapido Ochoa provides the "Ray Dorado" service. The capacity is about 33 seats.

5) "Van Tour"

354. This type is a small bus whose capacity is 13 passengers with the air conditioning. This type of buses is owned only by Brasilia.

355. Each level of these services charges different fares.

(2) Number of Operations

1) Inter-city Bus

356. With regard to the inter-city buses connecting the cities within the Bolivar State, the total number of operation by three(3) companies are 390 round trips per day. The routes that have a high-frequency with Cartagena are Arjona (95 round-trips), Sta. Rosa (38 round-trips) and Villanueva (35 round-trips), as shown in Table 4.4-4.

357. On these routes, the total number of bus fleets in operation by 3 companies are 285. The routes that many buses are operated on are Arjona (43 fleets/day), Turbaco (43 fleets), Villanueva (27 fleets), Maria Labaja (27 fleets) and Arenel (21 fleets) etc., as shown in Table 4.4-5.

Table 4.4-4 Number of Trip

Between Cartagena and:	
San Juan	7
El Carmaon	1
San Jacinto	2
Sat. Catalina	12
Galerazamba	13
Sat. Rosa	38
Arenel	26
Villanueva	35
Bayunca	21
Mahates	17
Turbana	38
Turbaco	48
Maria Labaja	15
Calamar	8
San Jeaguin	2
San Antonio	3
El Nispero	1
Framenco	1
Hato Viejo	2
San Basilio	3
Las Piedras	1
CalenaZamba	1
Arjona	95
Total	390

Table 4.4-5 Number of Bus Fleet

Between Cartagena and :	
San Juan	8
El Carmaon	1
San Jacinto	2
Sat. Catalina	9
Galerazamba	9
Sat. Rosa	14
Arenel	21
Villanueva	27
Bayunca	4
Mahates	11
Turbana	18
Turbaco	43
Maria Labaja	27
Calamar	4
San Jeaguin	1
San Antonio	3
El Nispero	1
Framenco	1
Hato Viejo	1
San Basilio	
Las Piedras	2
CalenaZamba	
Arjona	43
Rocha	2
Boquilla	3
P/caballos	20
Arroy Grande	2
Puerto Badel	1
Canaveral	1
Ratiro Nuevo	4
Playon	2
Total	285

2) Inter-State Bus

358. With regard to the inter-state buses, they are operating 549 round trips per day between Cartagena and other cities. Moreover, 114 round trips discharge passengers in Cartagena on the way between other cities. Therefore from Cartagena to other cities, the total number of round trips are 663. Barranquilla (254 round trips/day), Monteria (68 round trips), Magangue (40 round trips) and Medellin (38 round trips) are the cities to which many buses are operated (refer to Table 4.4-6).

359. The number of bus vehicles in operation actually is not clear since some owned buses are operated for the other lines.

Table 4.4-6 Number of Trip by Inter-State Bus

Between(through) Cartagena	
Sincelejo	9(2)
Monteria	23(11)
Magangue	20
Lorica	12(5)
Malcao	15
Barranquilla	100(27)
Bogota	11
Villedupar	7
San Bernardo	2
Montelibano	1(3)
Ayapei	2(3)
Caucasia	4
San Marcos	(3)
Plante Rica	(3)
Zambrano	3
Since	3
Medellin	19
San Onofre	5
Tolu	3
San Antevio	1
Mompos	4
Cucuta	1
Barranca	1
La Mina	2
El Carmen	2
Total	549(114)

Note: (·) is routes through C/gena

4.4.4 Fare System

360. INTRA is also responsible for determining and approving the fare. The fare is different by each type of service. Even though on the same route with almost the same services, each company sets a different fare. Table 4.4-7 shows the sample fare to indicate the level of fares. In the case of Barranquilla, the fare of Corriente is 1345 or 1370 pesos (as of August 1991). The fare of Lujo is 1600, 1700 or 1750 pesos. The fare of Thermoking is 1625, 1700, 1800, 1950 or 2010 pesos. The fare of Rey Dorado is 2200 pesos. Each fare depends upon the fare table of each company.

Table 4.4-7 The Fare of Inter-State Bus

	Corriente	Lujo	Time
Sincelejo	1969	2600	4:00
Monteria	3187	3600	7:00
Magangue	2400	3000	4:30
Lorica	3056	3000	7:00
Malcao	4814	6100	9:30
Barranquilla	1345	1600	2:45
Bogota		15100	
Villedupar		5450	
San Bernardo	3534		7:30
Montelibano	4055	4573	8:00
Ayapei	4559	4750	9:00
Caucasia	3809	4950	8:00
San Marcos	2989		6:50
Plante Rica	3175	4100	5:25
Zambrano	1681	2850	3:45
Since	2000		4:15
Medellin	9000		
San Onofre	1086	1500	2:15
Tolu	1650	2300	3:15
San Antevio	2010		

Note: Fares mainly from 1. Corriente(Servicio Comu Torcoroma, Copetran, Unitransco etc.
2. Bus Lujo is Brasilia etc.

4.5 Taxi Transportation

4.5.1 Operation Condition

361. Taxi services are offered by 6 taxi companies. Four (4) taxi companies have joined in the taxi association of "COO-PROTAX". While the other two (2) companies are managed individually.

362. The total number of taxi vehicles are about 2400 (refer to Table 4.5-1). They operate their taxis at the main taxi stops (Taxi-parada), which are located at 10 places in the city. There are some other small taxi stops and the inter-city taxi stops. The major taxi stations are shown in Figure 4.5-1.

363. The taxi operation is authorized and licensed by INTRA. Each taxi vehicle is permitted to make a trip to the outside of the city 5 times per month (an inter-city trip). In this case, the taxi companies buy the tickets for an inter-city trip from INTRA. The trips to the outside of the city are checked by the police at the boundary of the city.

364. These inter-city trips are limited by the Decreto of the municipality. The reasons are;

- a. to encourage the use of the inter-city bus service,
- b. the city of Cartagena has only the urban taxi services while other cities have two kinds of taxi service, that is the urban taxi and inter-city taxi services.

365. The fare of taxi is established by the Decreto No.24, 1991. The fares are fixed, generally, as the fare from the Centro to some areas. If a trip does not correspond to these fares, the taxi driver can determine the most suitable fare among them. The minimum charge is 400 pesos. Each taxi should display this fare table for the passenger's viewing. In these fares, there are special fares that are adopted for the trip to inter-municipal Bus Terminal, the Airport and some main touristic areas.

366. It is common practice to add an additional charge of 10% for the air-conditioning if it is working well. Also it is accepted that on the night trip between 22:00 and 5:00 the fare is increased 10% above the nominal fare. No other increment of fares are permitted for night trips or trips during holidays. Fines for violation involve an amount equivalent to a minimum of 5 days' wages (salaries).

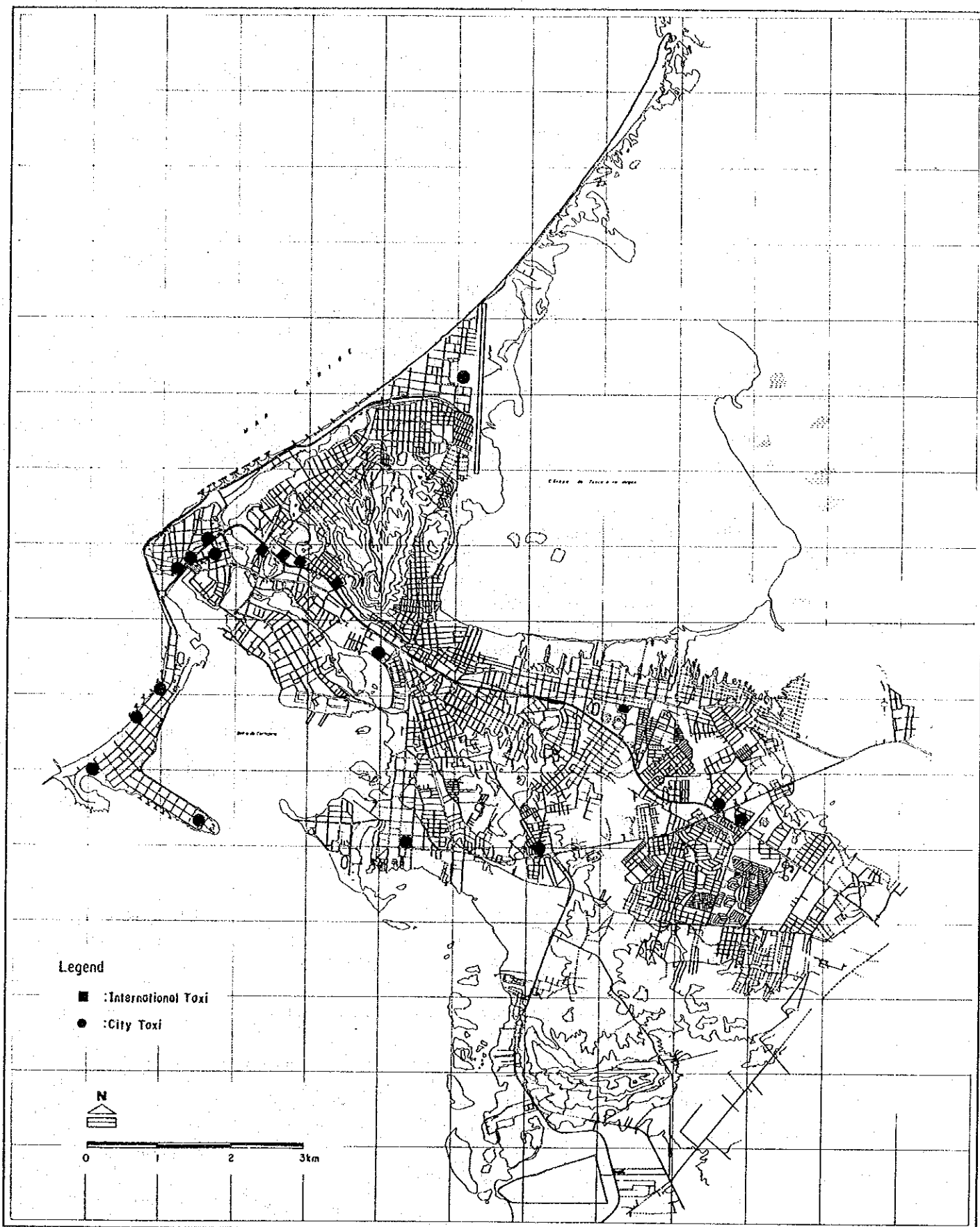


Figure 4.5-1 Major Taxi Stations

Table 4.5-1 Taxi Company and Fleet

Companies	Taxi Fleets
1. HEROICA	208
2. PEMAPE	217
3. MONTERO	130
4. COOTRNSBOL	438
5. RAPIDO EL CARMEN	78
6. RENACIENTE S.A.	717
7. COOCPROTAX	419
8. SERVICIO INDIVIDUAL	152
TOTAL	2352

NOTA: DATA FROM DATT

(1) Ordinary Service of Taxi

- Centro - Bocagrande, Clinica del Club de Leones, El Espinal, Getsmani, Cabarero, Marabella, Pie de la Popa, Manga, Pie del Cerro, San Diego, Lo Amador, Torices (Sector Teatro Caribe); 400 pesos
- Centro - Castillogrande, El Laguito, Mercado de Bazuruto, Terminal Maritimo, Santa Rita, Mercado Turistico ; 500 pesos
- Centro - Alcibia, Martinen Martelo, La Esperanza, La Maria, El Prado, Pablo VI, Canapote, Pedro Salazar, Daniel Lamaitre, Grespito, Siete de Agosto, Espana, Boston, Tesca, Paraguay, Buenos Aires, Zaragocilla, Los Cerros, Chile, Bosque, Alto Bosque, Piedra de Bolivar, Armenia, Las Loma ; 600 pesos
- Centro - Bosquecito, Nuevo Bosque, Caballo, Calamares, Tacarigua, Los Angeles, La Castellana, Las Delicias, Gaviotas, Los Alpes, Republica de Venezuela, Claya Herrera, San Isidoro, Club Subticiales de Crespo ; 650 pesos
- Centro - Fredonia El Porrenir, Anita, El Callo, Santa Lucia, La Concepcion, El Recreo, Santa Monica, San Pedro, Caracoles, El Carmen, Socorro, Plan 400, El Carmelo, La Central, Clinica Cartagena, La Magdalena, Chapacua, La Palmeras, Trece de Junio, ; 850 pesos
- Centro - Ternera, Consolata, San Fernando, San Pedro Martir, Bellavista, Albornoz, 11 de Noviembre, Simon Bolivar, La Princesa ; 900 pesos
- Centro - Los Jardines de Paz, El Cortijo, Membrillal ; 1100 pesos

Centro - Mamonal, Pasacaballos	; 2000 pesos
Centro - La Boquilla	; 1500 pesos
Services per an hour in daytime	; 1400 pesos
Services per an hour in nighttime	; 1600 pesos

(2) Special Services

1) from the inter-municipal Bus Terminal

to Hotels in Marbella	; 610 pesos
to Hotels in Bocagrande	; 750 pesos

2) from the Airport

to the Centro area	; 800 pesos
to Bocagrande, Manga, Pie de la Popa Pie del Cerro	; 1300 pesos
to Laquito, Castillo	; 1500 pesos
to intermediate area in the City	; 1500 pesos
to the outskirts of the City	; 1700 pesos
to Mamonal	; 2600 pesos

3) from Tourist Pier

to the Centro	; 1800 pesos
to the inside of the outskirts of Urban Area	; 2300 pesos
Services per hour	; 3700 pesos

4.6 Existing Issues on Public Bus Transport

367. Existing issues on public bus transport in Cartagena are summarized from the view points of bus route, operation and facilities as follows (details refer to Appendix 4.6);

368. Bus routes concentrate into Centro and Mercado de Bazurto in relation to the concentration of the socioeconomic functions in these areas. As road network into these areas is restricted by the topographic conditions and limited as to its density, major bus routes gather on specific roads as Av. Pedro de Heredia and Calle 30. This bus traffic concentration into Centro and Mercado introduce the bus operation difficulties and passenger time losses as well as traffic jam on private vehicle flow. In order to improve these circumstances, it will be necessary to construct additional road network around these areas as well as to decentralize the functions of these areas.

369. There are few bus facilities such as terminal, bus-stop and exclusive bus lane in the Study Area. Only bus terminals for

the maintenance work at the end of each bus route are available, not necessarily for the passenger's sake. People have no idea about bus-stop, because they are used to get on and off the buses at any place they choose. However, this bus passenger's behavior makes the bus operations poor in safety and also in punctuality.

370. In suburban area, the development of the residential zones is rapid. However, the road improvement cannot follow the specific developed areas and public bus service tend to ignore the provision of services to such area due to the lack of interest of the bus companies. The licensing of the bus route is done by DATT, however, DATT lacks the function to guide and control the public bus operation of bus companies.

371. Average ages of bus vehicles used are very old, about 18 years for bus and 12 years for buseta, respectively. These are not comfortable for the passengers and require considerable maintenance for proper bus operation. The depreciation period for bus vehicles should be considered in the evaluation of bus fare system.

CHAPTER 5 TRAFFIC MANAGEMENT

5.1 Traffic Regulation

372. Traffic regulation in Cartagena, such as parking restriction, one-way regulation, speed limit and heavy vehicle restrictions are being practiced.

373. One-way regulation is widely employed in the Central area and its surrounding areas such as Bocagrande or Manga where the traffic concentrates. Figure 5.1-1 shows the one-way system in the Central area where the widths of most roads are very narrow. The major roads of the area, Av. Venezuela and Av. del Concejo, which have six (6) traffic lanes, are also one-way roads. Only Av. Blaz de Lezo, Av. Santander and Calle 41 are two-way roads in the Central area.

374. Speed limit in the urban area is specified as 50 km per hour with the exception of 30 km per hour in the areas around the schools, hospitals, military base, etc. Speed limit sign is indicated in the appropriate road sections of 30 km/h.

375. Heavy vehicles (three axles or more, or capacity heavier than 6 tons) are restricted from entering into the Central area during the period of 7 to 9 am, 12 am to 2 pm and 5 to 7 pm in order to relieve the traffic congestion. In the historical areas such as the Bairros of Centro and San Diego, the operation of heavy vehicle is not allowed due to the road condition as well as for maintaining its circumstances.

376. Parking on road side is restricted on the major roads such as Av. Pedro de Heredia, Av. Venezuela and Av. del Concejo and narrower roads less than 5 meters in the Central area (refer to Figure 5.1-2, 5.1-2(B)). For the cargo loading and unloading of trucks, the following periods of 9 to 11:30 am, 3 to 5:30 pm and 8 pm to 6 am are allowed for freight vehicles' parking on the road-side. However, by lack of enforcement, many vehicles park on the restricted road sections. Few sign on parking restriction were found in the Study Area. DATT is now undertaking the review of road classification such as artery, collector and local road. After this classification parking restriction will be rearranged.

377. Parking facilities for public use are only nine (9) in Central area. Their parking capacity ranges from 20 to 100 vehicles totaling some 500 vehicles. Parking fees are around 100 to 250 Pesos per hour. Two of them are temporary type. The largest facility of Plaza de Marina is now, however, slightly used by public despite the free parking charge because of its location (refer to Figure 5.1-3).

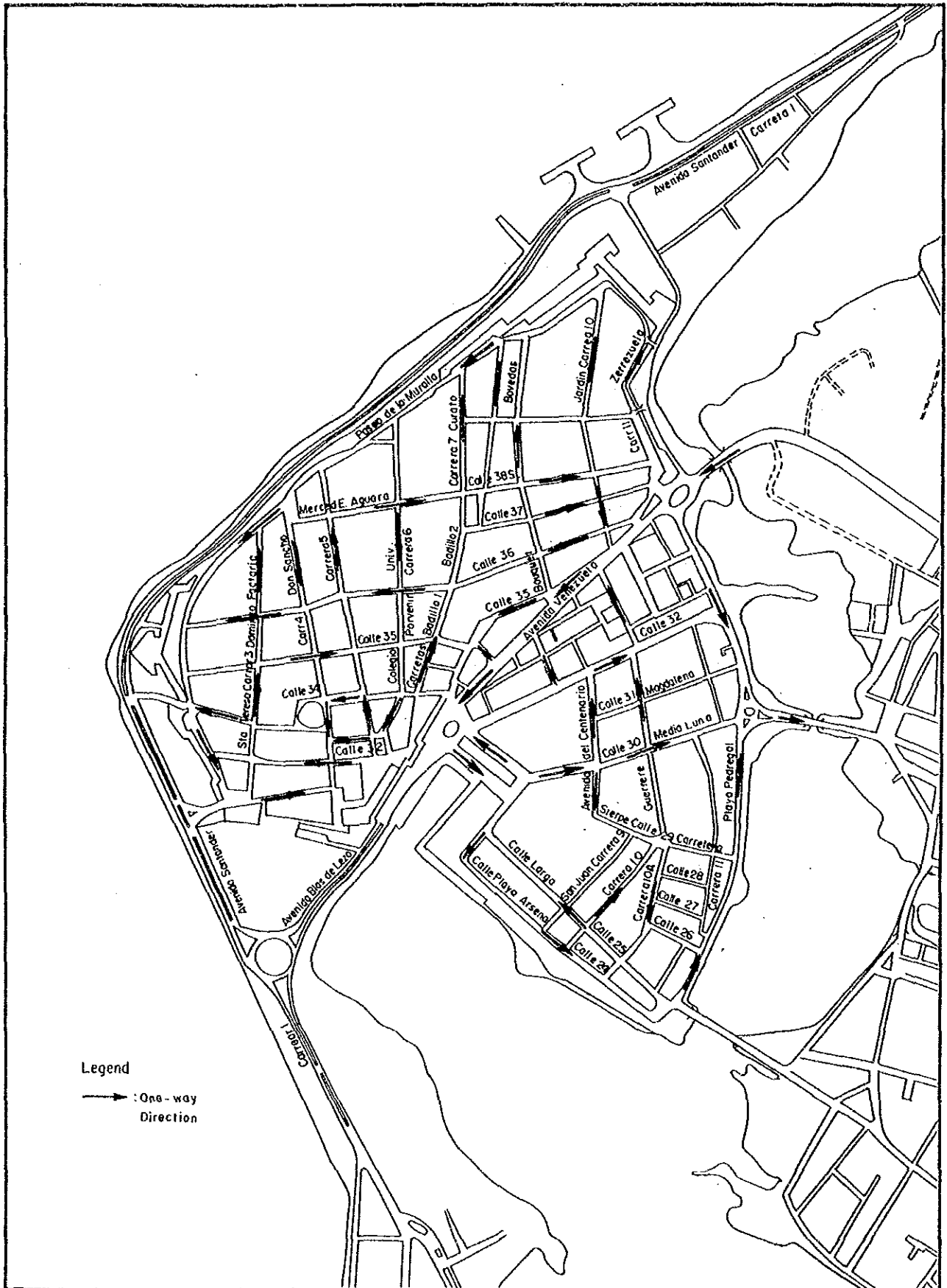


Figure 5.1-1 One-Way Regulation in Central Area

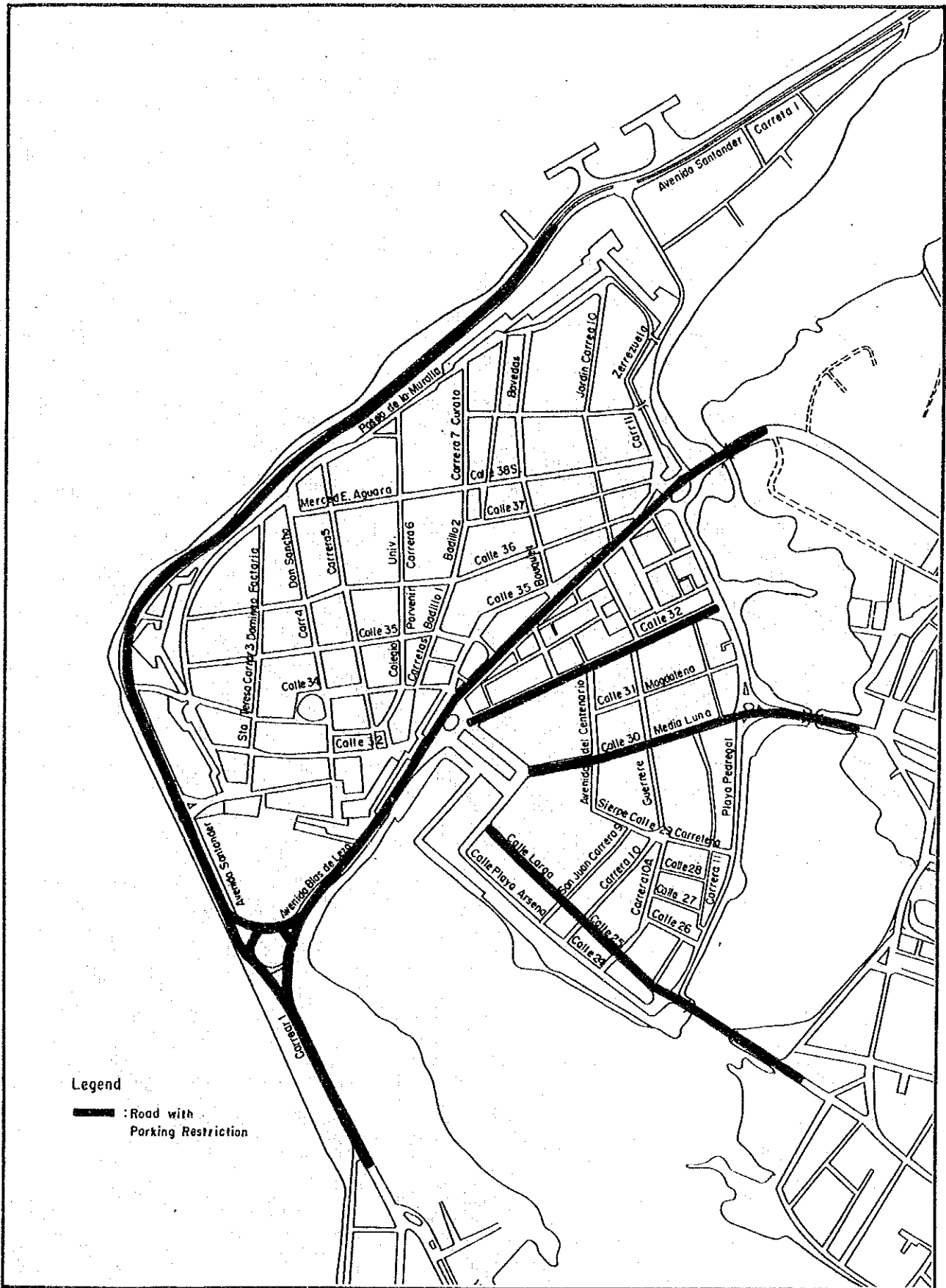
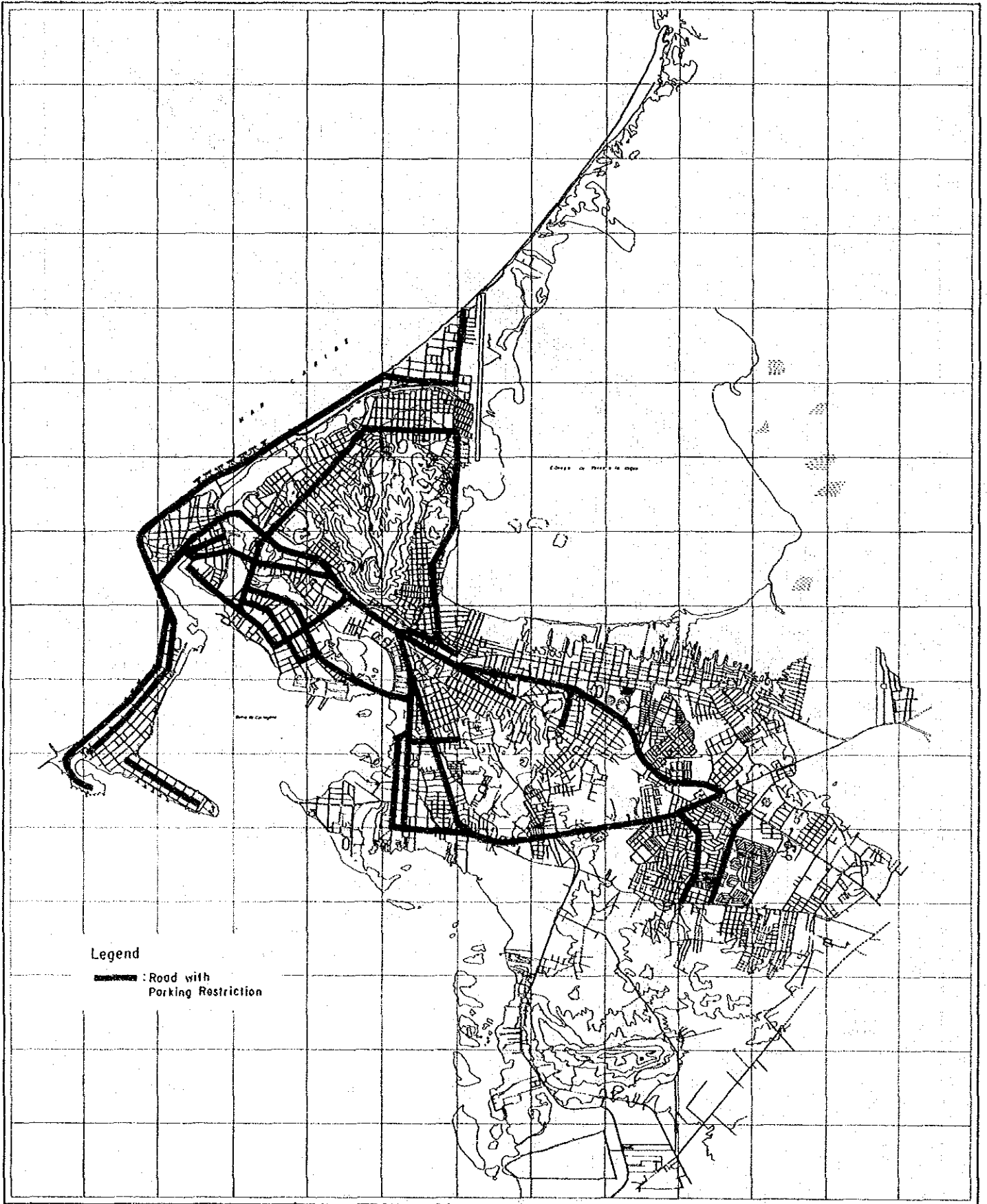


Figure 5.1-2(A) Parking Restriction in Central Area



Legend

— : Road with
Parking Restriction

Figure 5.1-2(B) Parking Restriction

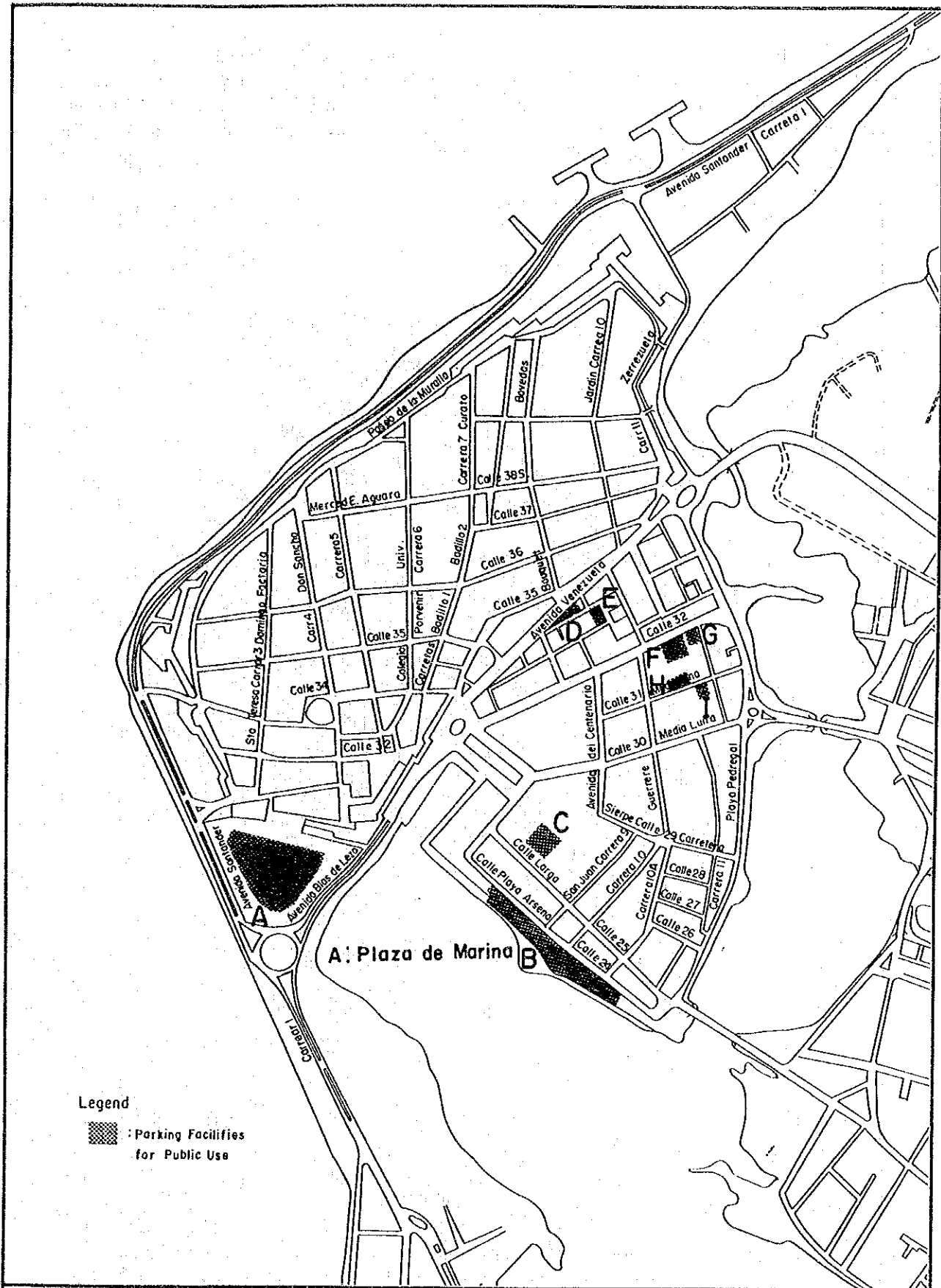
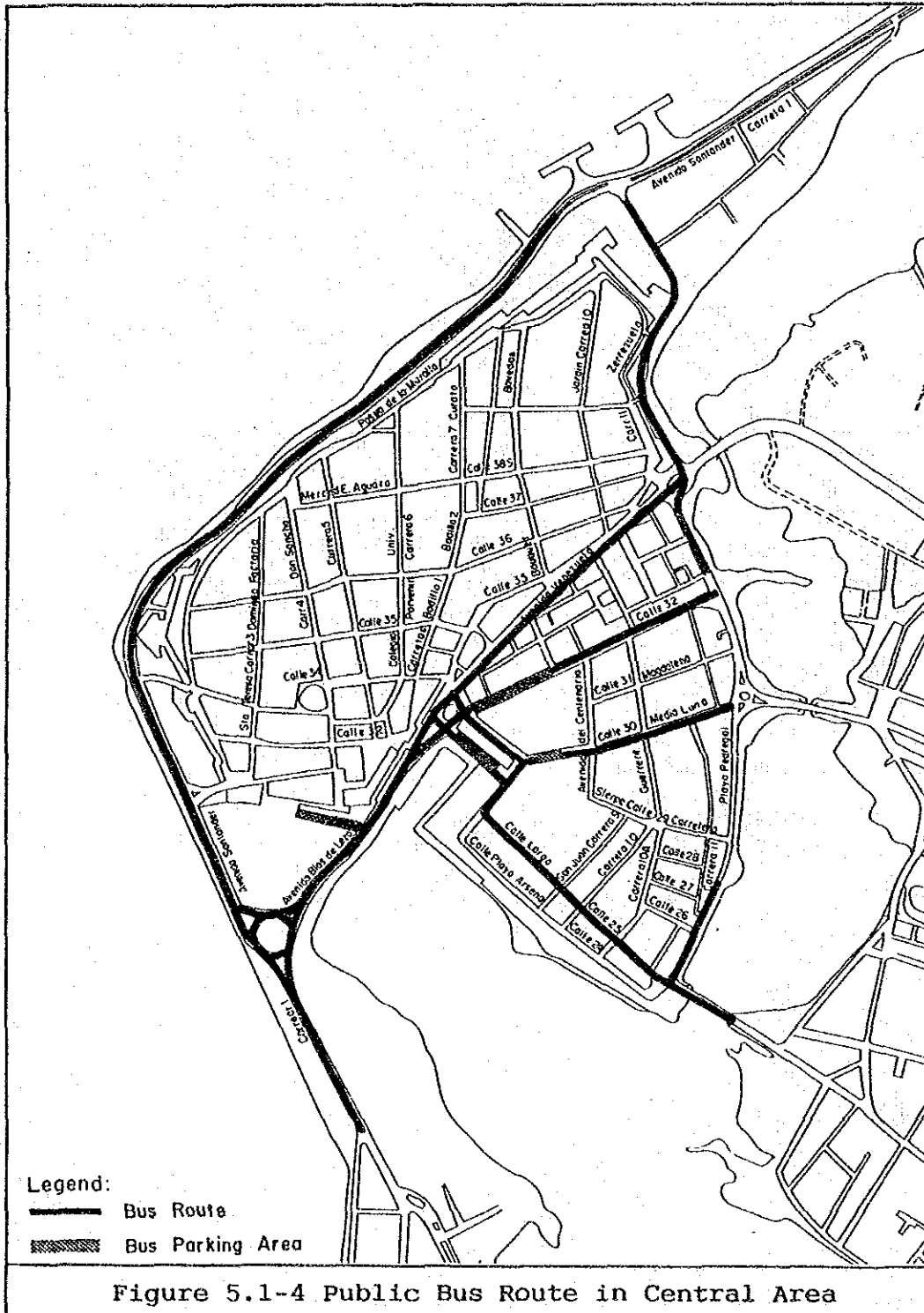


Figure 5.1-3 Location of Parking Facilities (Public Use)

378. Public bus is operated on the limited number of roads in the Central area (refer to Figure 5.1-4). Many bus routes concentrate in these roads without any bus operation facilities, therefore, buses use the road side space shown in Figure 5.1-4 as terminals for the passenger movements.



5.2 Sign and Signal

5.2.1 Current System

379. There are a few signs, markings and signals installed in the urban area of the Study Area. One-way signs in the areas of the Central area and Bocagrande are well installed, however, it is difficult for the visitor to drive in those areas because of insufficient signs visible from the car.

380. Other signs and markings such as stop sign, warning sign for pedestrian crossing, speed limit, direction guide, pedestrian crossing, etc. are very scarce.

381. Traffic signals are installed at twenty one (21) intersections in the Study Area (refer to Figure 5.2-1). There locations are mostly along the main traffic corridors of Av. Pedro de Heredia and Diagonal 22. They are electromechanic type and are set on two to four (2-4) phases control system. They are independently operated except for two signals installed recently.

382. The distribution of the cycle length is shown in Table 5.2-1. The cycle length is fixed and does not respond to the traffic volume change.

Table 5.2-1 Cycle Length of the Signal

Sq. No.	Phase	Cycle Length(sec)	Green Time
1	2	56	23/23
2	2	46	25/16
3	2	78	43/20
4	2	80	44/18
5	2	59	31/24
6	3	92	36/26/18
7	3	92	30/26/20
8	2	52	31/18
9	-	-	-
10	2	70	42/27
11	2	39	20/15
12	2	70	41/26
13	4	116	29/27/24/16
14	3	86	66/42/14
15	3	116	37/42/21
16	3	89	60/36/26
17	2	68	32/15
18	3	90	67/46/16
19	2	55	29/23
20	4	110	34/18/10/32
21	4	110	32/34/18/10

note: No.9 not working at the survey time.

383. The cycle lengths of the three phases signals or more are generally longer than 90 seconds. Traffic flow is not suffering from these long cycle length now due to the relatively low traffic volume on the corridors. However, it can be foreseen that these situation will introduce traffic flow disturbances around the intersections as traffic volume increases.

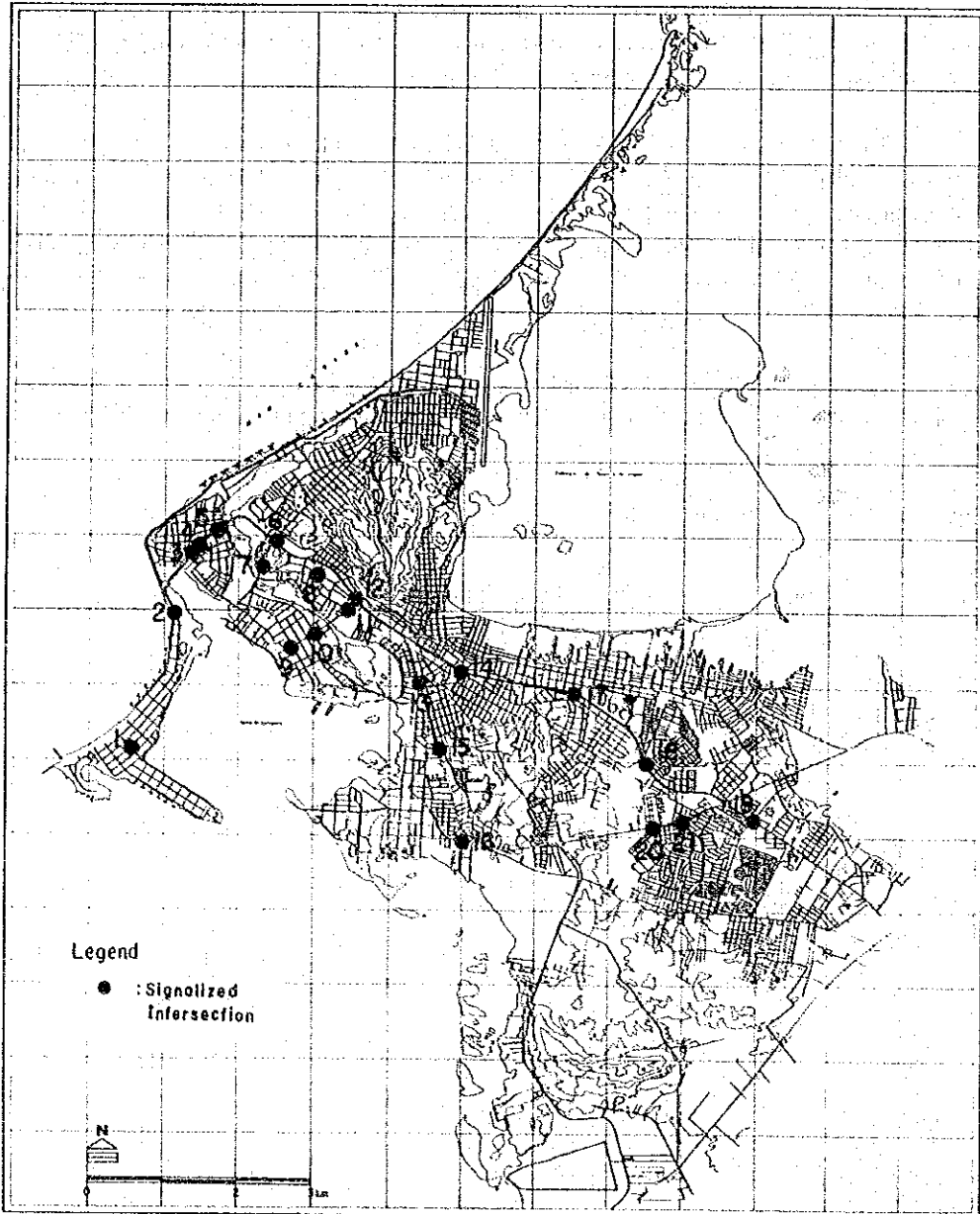


Figure 5.2-1 Location of Traffic Signal

5.2.2 Signal Condition to Traffic

384. In order to examine the compatibility of traffic signals with the traffic flow, traffic volume count at each signal phase was carried out at major traffic corridor intersections in September 1991 (refer to Figure 5.2-2).

385. The survey was carried out to count the number of vehicles passing without stop at intersection, and those stopped, for five (5) signal cycles. Table 5.2-2 shows the result of the survey.

Table 5.2-2 Survey Result of Signal Intersection

Intersection	Survey Time					
	7:00		11:00		17:00	
	w stop	w/o stop	w stop	w/o stop	w stop	w/o stop
*No. 5						
Av.Venezuela	10.8	6.0	10.6	6.6	14.4	9.8
from Matura	1.7	0.6	26.8	0	12.8	0
*No. 6						
Av.P.Heredia	41.0	0.8	34.6	10.0	44.0	0
Cra. 17(S)	11.6	0	8.6	1.0	9.4	0
Cra. 17(N)	11.0	0	11.0	0	12.2	0
*No. 12						
Cll. 30	8.2	8.4	11.6	7.8	11.6	9.0
Cra.22(N)	2.6	5.0	2.2	4.8	3.0	2.4
Cra.22(S)	4.6	3.8	1.2	3.2	2.4	2.6
*No. 15						
Diag. 22(N)	12.2	3.6	8.4	7.2	14.2	3.4
Diag. 22(S)	10.0	9.8	14.6	0	9.4	7.2
Transv.45(W)	2.8	0.4	3.6	1.2	1.8	1.0
Transv.45(E)	3.8	1.4	6.2	0	3.6	0
*No. 18						
Av.Heredia(E)	13.6	16.1	9.9	10.4	11.5	8.6
Av.Heredia(W)	10.5	15.3	7.0	16.6	6.3	18.7
Transv.58	5.5	0.6	3.2	0.6	2.6	1.4

note: The numbers of the table indicate average number of vehicle per one cycle.

386. The traffic flow condition is not serious yet due to the relatively low traffic volume compared with road traffic capacity. However, at all intersections except No. 18, a large part of vehicles cannot pass intersection without stop. This indicates the necessity for improvement of signal cycle length.

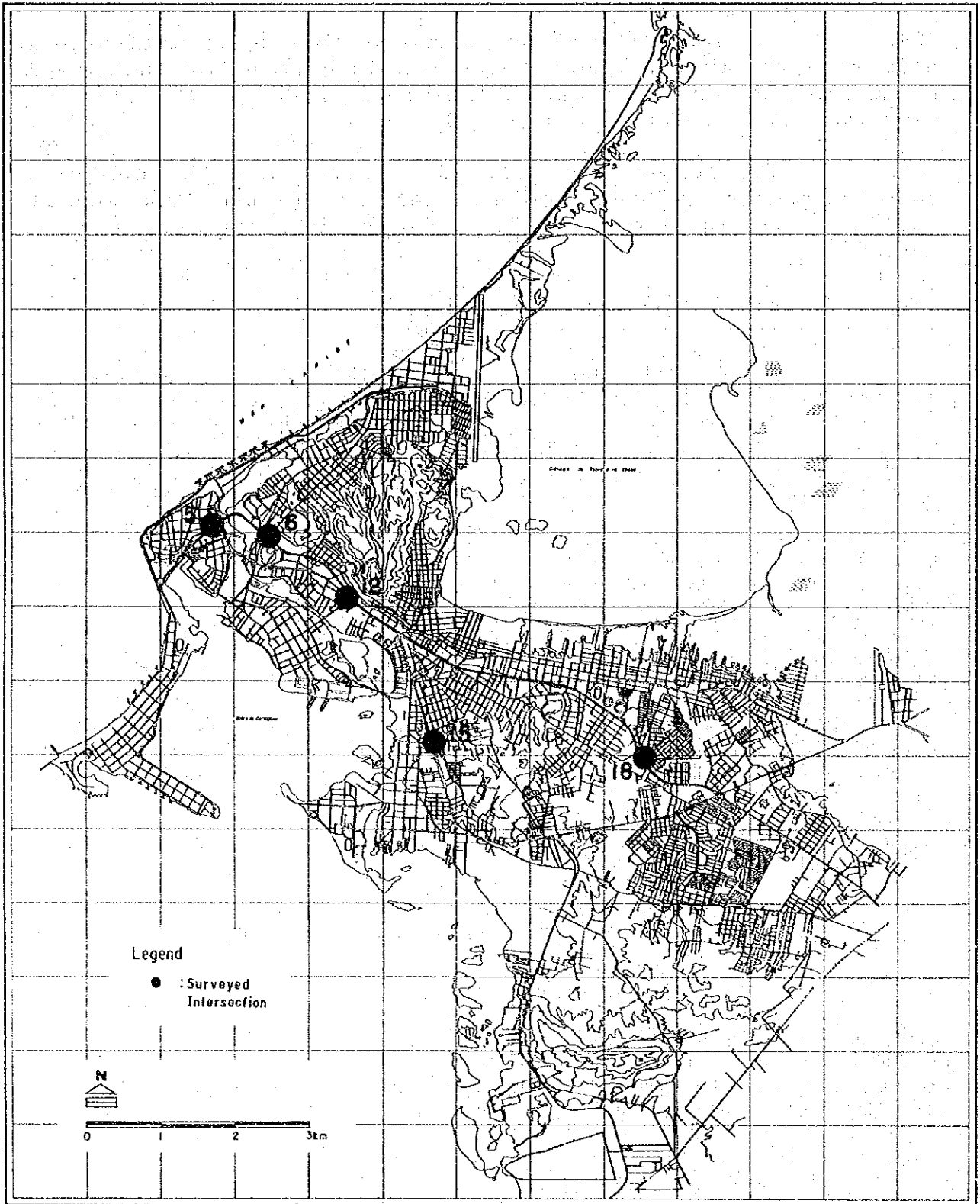


Figure 5.2-2 Traffic Signal Conditions Survey

5.3 Parking Demand and Capacity

5.3.1 Parking Condition and Facilities

387. In order to obtain the information on parking demand and its characteristics, roadside parking survey and parking facilities survey in Central area were carried out in August and September 1991. Roadside parking vehicle count survey was conducted at five (5) sub-zones of the Central area, while at sub-zones of No.2 and No.5, an interview survey for vehicle drivers was carried out simultaneously (refer to Figure 5.3-1). Parking demand and its characteristics for three parking facilities in Central area for public use was investigated.

388. Location of parking facilities surveyed is shown in Figure 5.3-1. Their capacities and parking fees, etc. are indicated in Table 5.3-1.

Table 5.3-1 Characteristics of Parking Facility

Facility	A	B	C	Note
Capacity	80	40	40	vehicle
Fee	100	250	200	Peso/h
Type	P.	P.	P.	Permanent
Demand	50	80	90	Average
Ownership	Public	Private	Private	

source: Study Team survey result

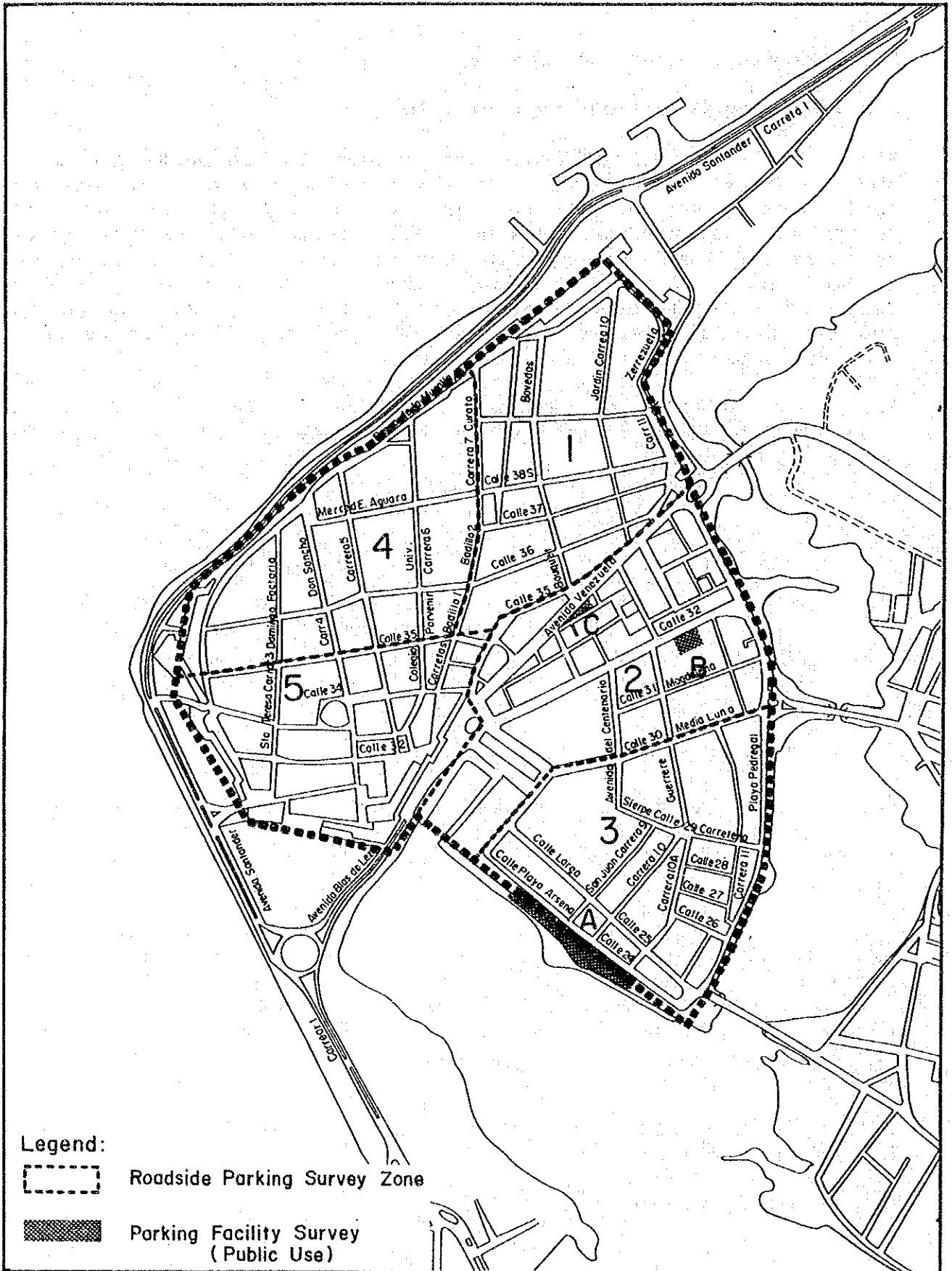
389. Facility A is located at south end of the Central area and is prepared for the parking of the Convention Center. Therefore its demand is comparatively lower than those for the other two.

390. Figure 5.3-2 shows the parking characteristics of the users of these parking facilities. As for the parking purpose, "office" has a large share and "school" is very low. This is the reason why parking duration more than three hours has high share. People coming to the office use the parking space twice a day, in the morning and in the afternoon with lunch time break. Parking time (starting time) shows this pattern.

391. The walking distance is fairly long due to the scarcity of the parking facilities.

5.3.2 Parking Demand

392. Location of roadside parking survey is shown in Figure 5.3-1. Table 5.3-2 shows the parking demand during the day time of each survey zone of the Central area.



Legend:
 [Dashed Line] Roadside Parking Survey Zone
 [Hatched Area] Parking Facility Survey (Public Use)

Figure 5.3-1 Parking Survey

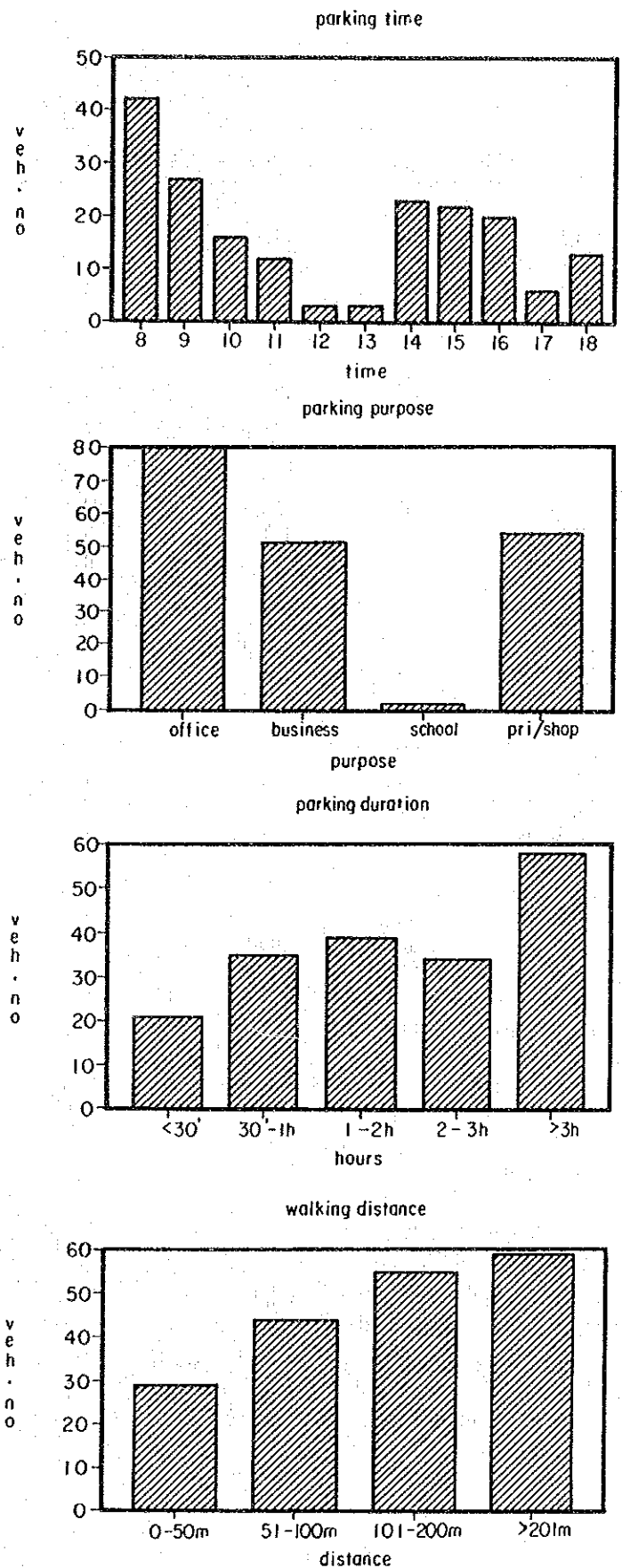


Figure 5.3-2 Parking Facilities Survey Results

Table 5.3-2 Parking Demand in the Central Area

Zone	Time	Vehicle type				total
		pass. car	taxi	light truck	truck	
1	8- 9	105	4	1	8	118
	11-12	182	5	0	5	192
	14-15	117	3	4	8	132
	17-18	120	7	4	3	184
2	8- 9	453	35	9	28	525
	11-12	427	26	7	28	488
	14-15	369	28	19	11	427
	17-18	386	23	10	3	422
3	8- 9	42	3	5	7	56
	11-12	75	4	7	12	98
	14-15	50	4	10	7	71
	17-18	60	2	6	4	72
4	8- 9	235	5	6	2	248
	11-12	323	4	5	2	334
	14-15	246	7	3	2	258
	17-18	281	4	4	1	290
5	8- 9	225	19	6	2	252
	11-12	315	21	6	1	343
	14-15	223	12	2	3	239
	17-18	288	6	2	1	297
all	8- 9	1060	65	28	46	1199
	11-12	1322	59	26	48	1455
	14-15	1005	54	38	39	1136
	17-18	1185	42	27	11	1265

source: Study Team survey result

393. Almost all parking demand is by passenger cars and demand level has a little fluctuation during day time. Demand for zone 2 is largest because of the business center of the Area, followed by zones 4 and 5.

394. Parking demand characteristics at zones 2 and 5 are shown in Table 5.3-3. Parking purpose with the highest demand rate is "business", followed by "to office" and "shopping/private matter". "To school" purpose shows a very low rate. Parking duration is relatively short compared with that of parking facility. Walking distance is also short. Three fourths of the vehicles tend to park within 100 m from the place to visit.

Table 5.3-3 Roadside Parking Demand Characteristics

1) Purpose				
to office	business	to school	shopping/private	
32.7%	39.3%	0.5%	27.5%	
2) Parking hour				
<30 minutes	30-60 m.	1-2 hours	2-3 hours	>3 hours
45.7%	19.9%	11.2%	9.6%	13.6%
3) Walking distance				
<50 m	51-100 m	101-200 m	>201 m	
60.1%	16.2%	8.7%	15.0%	

source: Study Team survey result

395. Table 5.3-4 shows the percentage of number of vehicles by parking duration and purpose. For "business" or "shopping/private matter" purpose, the rate decreases with the increase of parking duration. However, for "to office" purpose, no apparent tendency is indicated.

Table 5.3-4 Percentage of number of Vehicles by Purpose and Parking Duration

duration	Purpose			
	to office	business	to school	shopping
<30 m	6.2	22.6	0.1	16.7
30-60 m	4.5	8.8	0.1	6.5
1-2 hours	3.8	4.5	0.1	2.8
2-3 hours	6.1	2.5	0.1	1.0
>3 hours	12.1	0.9	0.1	0.5
total	32.7	39.3	0.5	27.5

note: unit %

source: Study Team survey result

5.3.3 Parking Capacity

396. As for the public use parking facilities (whether privately owned or publicly owned), there is lack of availability in the Central area and Bocagrande where parking demand concentrates. As before mentioned, there are nine (9) parking facilities for the Central area. Total capacity is estimated at some 500 vehicles. In Bocagrande there are several temporary parking spaces using the open spaces in vacant lots awaiting building construction. They are used mostly in the tourist season. The total capacity seems to be about three (3) hundred vehicles. In such "tourist" seasons many cars and buses gather in Bocagrande and park on road sides and even on sidewalks. It is very difficult to provide the parking space for only a few weeks in a year. Therefore,

temporary imbalance between parking demand and capacity in Bocagrande shall be allowed.

397. Curb parking is common way of parking in the Study Area to fulfill the capacity gap between the demand and capacity of the parking facilities. Although effective enforcement for the curb parking on the major streets in the Central area is not yet realized, curb parking shall be excluded from roadsides of the major streets in order to maintain the smooth traffic flow.

398. In order to estimate the curb parking capacity in the Central area, following road sections are assumed to be restricted for curb parking;

- a. Av. Blas de Lezo,
- b. Av. Venezuela,
- c. Calle 32,
- d. Calle 30,
- e. Calle 24,
- f. Calle 25,
- g. Cra.11,
- h. Av. Santander,
- i. Calle 41, and
- j. Calle 35,36 and Cra. 5

And also the road sections less than 5 meters carriage way width are excluded. The capacity available for curb parking is calculated as one (1) parking space for each 5 meters road length exclusive of garage entrances.

399. Results are shown in Table 5.3-5. Available spaces concentrate in Centro and other sub-areas with relatively small numbers of available spaces. Assuming the average parking period of 45 minutes and occupancy rate of 70 %, then curb parking capacity per one (1) day will be about 9,300 (1000 x 0.7 x 10 hrs/o.75 hrs).

Table 5.3-5 Available Curb Parking Capacity In Central Area

Sub-area	San Diego	Centro	Matura	Getsemani	Total
Capacity (Vehs)	200	560	80	160	1000

source: Study Team estimation

400. As for the parking demand capacity balance in the Central area, it appears there is not so much imbalance considering the capacity of public use parking facilities regardless of the location.

CHAPTER 6 FUTURE SOCIOECONOMIC FRAMWORK AND LAND USE PLAN

6.1 Future Socioeconomic Framework

6.1.1 Socioeconomic Framework of Colombia

(1) Population

401. DANE made public a future population projection as shown in Table 6.1-1, based on the results of 1985 National Census of Population and Housing. This is adopted as a premise.

Table 6.1-1 Future Population Projection
Colombia, 1985-2015

Year	Population	Annual Average Increase Rate (%)
1985	29,879,831	
1990	32,978,785	1.99
1995	36,181,730	1.87
2000	39,397,403	1.72
2005	42,559,316	1.56
2010	45,721,677	1.44
2015	48,722,925	1.28

source: DANE-Proyecciones Nacionales de Poblacion, jurio, 1989

402. Future change of population aged 12 years and over (working age population) is estimated as shown in Table 6.1-2, based on the projected age composition. If future refined labor force participation rates (ratio of labor force to population aged 12 years and over) and unemployment rates will be the same as present, the increase rates can be considered as future increase rates of employment.

Table 6.1-2 Future Change of Working Age Population
Colombia, 1985-2015

Year	Population 12 years and over	Ratio to Total Population (%)	Annual Average Increase Rate (%)
1985	20,652,174	69.1	
1990	23,380,589	70.9	2.51
1995	26,241,038	72.5	2.34
2000	29,136,132	74.0	2.12
2005	32,123,259	75.5	1.97
2010	35,129,278	76.8	1.81
2015	38,050,283	78.1	1.61

source: Study Team estimated, based on DANE data.

(2) Economic Growth

403. According to the Economic and Social Development Plan, 1990-1994, which was recently announced as the official development plan of present Gaviria Administration, target of economic growth rate is set at 4.0% in 1992, 4.7% in 1993 and finally 5.0% in 1994 (refer to Table 6.1-3). An estimation made by FEDESARROLLO, however, tells that the economy will not grow at more than 2.2% in 1992.

Table 6.1-3 Target Economic Growth Rates
in National Plan, 1992-1994

Year	GDP Growth Rate (%)
1992	4.0
1993	4.7
1994	5.0

source: Plan de Desarrollo Economico y
Social, 1990-1994

404. On the other hand, a large-scale oil field was discovered in the llanos Orientales (east plains). Its exploitation will start in earnest in 1995 and is expected to become a driving force to double the exports of crude oil in place of Cano Limon oil field which is playing an important role in supporting the present economic growth. The exports of miscellaneous goods have also been increasing in these years, while coffee is losing its traditional predominance.

405. These facts will contribute to Colombia's accumulation of foreign reserves. Judging from this, it is possible to expect that the policies of refinancing for foreign debts and of introduction of foreign capital will favorably continue to function for the country's economic growth in future.

406. Therefore, the following three cases of Colombia's future economic growth are assumed, and the anticipated future situation of the Study Area in the respective cases are studied;

- a. Case 1: The government target of economic growth rate will be realized, and afterwards a 5 % growth will continue from 1995 to 2010 (Optimistic case) (refer to Table 6.1-4(a)).

Table 6.1-4(a) Future Annual Increase Rates (%) of Economic Indices in Case 1

Period	GDP Increase Rate (%/annum)	Employment Growth(%)		Labor Pro-ductivity	Per Capita
		1)	2)	2)	1)
1990/1995	4.3	2.3 - 2.5		1.75 - 1.95	2.4
1995/2000	5.0	2.1 - 2.4		2.5 - 2.8	3.2
2000/2010	5.0	1.9 - 2.2		2.75 - 2.05	3.45

note: 1) Case that refined labor force participation rate and unemployment rate will maintain the existing level.
2) Case that refined labor force rate will not change but unemployment rate will decline to a half level.

b. Case 2: In 1991 and 1992, the economic growth will be as low as FEDESARROLLO's estimates and will recover gradually to a level of 4.0% in 1995. From 1995 to 2010, a constant growth of 4.0% will be maintained (Pessimistic case) (refer to Table 6.1-4(b)).

Table 6.1-4(b) Future Annual Increase Rates (%) of Economic Indices in Case 2

Period	GDP Increase Rate (%/annum)	Employment Growth(%)	Labor Pro-ductivity	Per Capita
1990/1995	3.3	2.3 - 2.5	0.8 - 1.0	1.4
1995/2000	4.0	2.1 - 2.4	1.55 - 1.85	2.2
2000/2010	4.0	1.9 - 2.2	1.75 - 2.05	2.45

c. Case 3: From 1991 through 1992, an average growth of 3% will be achieved. The growth rate will rise to 4.0% in 1993 and will be kept at 4.5% after 1995 (Medium case) (refer to Table 6.1-4(c)).

Table 6.1-4(c) Future Annual Increase Rates (%) of Economic Indices in Case 3

Period	GDP Increase Rate (%/annum)	Employment Growth(%)	Labor Pro-ductivity	Per Capita
1990/1995	3.3	2.3 - 2.5	1.3 - 1.5	1.9
1995/2000	4.5	2.1 - 2.4	2.05 - 2.35	2.7
2000/2010	4.5	1.9 - 2.2	2.25 - 2.55	2.95

(3) Assumed Socioeconomic Framework of Colombia

407. Through a study on the relationship between the national economic growth and the planned population of the Study Area as

described in detail in the following section, the socioeconomic framework of Colombia is assumed as shown in Table 6.1-5. The basic considerations for setting the framework are that a long-term economic growth rate of 5% may be too high to be realized and that economic growth dependent too much on higher labor productivity will not be desirable.

408. In case 1, if refined activity rate and unemployment rate will maintain the existing level, labor productivity should rise at a very high rate as shown in Table 6.1-4(a). At present Colombia is suffering from high unemployment rate, therefore, economic growth is expected to generate job opportunities as much as possible.

Table 6.1-5 Socioeconomic Framework of Colombia, 1990-2010 (%)

Year	Population (1000 psn)	Population Growth Rate	Working Pop. Rate	GDP Growth Rate	Labor Produ- ctivity Inc- crease Rate
1990	32,979	1.87	70.5	3.8	1.3
1995	36,182	1.72	72.5	4.5	2.2
2000	39,397	1.50	74.0	4.5	2.4
2010	45,722		76.8		

source: Study Team

6.1.2 Socioeconomic Framework of the Study Area

(1) Population

409. The population of the Study Area in 1990 is estimated at 660,200 based on the data of DEPLAN and that in 1985 at 561,400, after deducting 2,500 persons in the island parts outside the Study Area from 563,900 of Cartagena, indicated in revised Census population by DANE. From aforesaid estimates, the annual average population increase rate between 1985 and 1990 is calculated at 3.30%. Compared with the population growth rate during the same period of Colombia as a whole (1.99%), the Study Area's is 1.66 times the national rate, and the difference, 1.31 points.

410. As the population growth rate at the national level can be considered to be almost the same as the natural growth rate, the fact that the Study Area has a higher one indicates a considerable net in-migration to Cartagena from rest of the country (although the natural increase rate of the Study Area is different from that of the national total, because of the differences of age composition, education level and condition of medical and public health facilities).

411. For the determination of future population increase

pattern of the Study Area, it is important to consider what Cartagena could be in future from standpoint of rural-urban migration in connection with the economic growth and social conditions. Typical population growth pattern made up from recent trend of the Study Area and the future prospect of Colombia are as follows;

- a. Pattern 1: Increase rate of recent 3.30% will be constant.
- b. Pattern 2: Difference of 1.31 points over the national level will be constant.
- c. Pattern 3: Ratio of 1.66 times to the national level will be constant.
- d. Pattern 4: average of Pattern 2 and 3. (refer to Table 6.1-6)

Table 6.1-6 Future Population Projection by Increase Pattern

Year	Pattern 1		Pattern 2		Pattern 3		Pattern 4	
	Increase Rate (%)	Population	Increase Rate (%)	Population	Increase Rate (%)	Population	Increase Rate (%)	Population
1990		660,200		660,200		660,200		660,200
1995	3.30	776,600	3.18	772,100	3.10	769,100	3.14	770,600
2000	3.30	913,500	3.03	896,400	2.86	885,600	2.95	891,000
2010	3.30	1,263,900	2.81	1,182,600	2.49	1,132,500	2.65	1,157,600

412. Pattern 1 requires that the net in-migration rate to the Study Area will continue to rise while the natural population growth rate will gradually decline in future. In order to realize this pattern, the regional economy should grow at a remarkably rapid pace in comparison with the national economy and job opportunity should continue to amplify considerably. It is considered to be difficult to expect such a high development for Cartagena.

413. Pattern 2 means that the net in-migration rate to the Study area will be maintained almost at the same level as at present. Roughly speaking, the current economic growth gap between Cartagena and the country as a whole is assumed to be kept in future.

414. Pattern 3 assumes that the net in-migration rate to the Study Area will decline in proportion to the descending tendency of natural growth rate. This pattern requires that the creation of job opportunities, rise of the education level, improvement of social infrastructures and restoration of security will be realized in the "sender" areas like rural communities and small- and medium-scale cities. From experiences in the industrialized countries, public and private investments sufficient to achieve the above-mentioned purposes could not be expected and rural-urban movement will continue obstinately at a considerably high rate.

415. Pattern 4 means that the net in-migration rate to the Study Area will moderately decline in future due to the descent of natural growth rate and to the improvement in the socioeconomic standard in the "sender" areas.

416. As stated above, Patterns 2 and 4 show probable future courses of population change and serve as a reference for setting the planned population. Considering that the population of the Study Area will probably reach a size from 1,150 thousand to 1,200 thousand in 2010, the differences of future economic conditions between the lower limit and the upper limit cases are studied in connection with the 3 cases of national economic growth.

(2) Regional Economy

417. The size of regional economic activity as a whole is expressed in Gross Regional Products (GRP). GRP of the Study Area is not available. However, GRP of the Departamento de Bolivar for 1985 was estimated by DANE, and its growth rate was 1.22 times the national total.

418. On the other hand, comparison of the value added of manufacturing industries in Cartagena and national total is possible by using the data shown in the "Yearbook of Manufacturing Industries". According to this statistics, the average annual growth rate of value added in real terms of Cartagena's industries was 1.43 times the national level during the period between 1985 and 1988.

419. The economic growth rate of the Study Area should be higher than that of the Departamento de Bolivar which includes the low growing primary sector and the stagnant tertiary sector in small- and medium-scale local cities, while it should be lower than the high growth rate (9.9% in 1985-1988) of the manufacturing industries located at the Mamonal Industrial Zone.

420. Based on the above-mentioned considerations, the economic growth rate of the Study area is assumed to be 1.3 times the national total. Applying this ratio to the 3 cases of the future national economic growth, the future regional economy of the Study Area will develop as shown in Table 6.1-7.

Table 6.1-7 Future Annual Economic Growth Rate
of the Study Area by Case (%)

Period	Case 1		Case 2		Case 3	
	Colombia Study A.	Colombia Study A.	Colombia Study A.	Colombia Study A.	Colombia Study A.	Colombia Study A.
1990/1995	4.3	5.6	3.3	4.3	3.8	4.95
1995/2000	5.0	6.5	4.0	5.2	4.5	5.85
2000/2010	5.0	6.5	4.0	5.2	4.5	5.85

421. If the increase rate of labor productivity by case shown in Table 6.1-4(a) to (c) are applicable to the Study Area, increase rate of labor demand by case will be as shown in Table 6.1-8. It can be pointed out from this table that the differences of the labor force demand by case are not as large as those of economic growth rate.

Table 6.1-8 Increase Rate of Labor Force Demand by Case (%)

Period	Case 1			Case 2			Case 3		
	GRP	Labor Pro- ductivity	Labor F. Demand	GRP	Labor Pro- ductivity	Labor F. Demand	GRP	Labor Pro- ductivity	Labor F. Demand
1990/1995	5.6	1.75-1.95	3.60-3.80	4.3	0.80-1.00	3.30-3.50	4.95	1.30-1.50	3.40-3.60
1995/2000	6.5	2.50-2.60	3.60-3.90	5.2	1.55-1.85	3.30-3.60	5.85	2.05-2.35	3.40-3.70
2000/2010	6.5	2.75-3.05	3.35-3.65	5.2	1.75-2.05	3.10-3.40	5.85	2.25-2.55	3.20-3.50

(3) Supply and Demand of Labor Force

422. At present the ratio of the population aged 12 years and over (working age population) to the total population is 72.5% in the Study Area, which is the same level as the ratio of Colombia in 1995. It is assumed that the ratio of the working population will also rise in the Study Area, at a pace of about 5 years ahead of the national level.

423. The ratio of labor force (economically active population, that is, employed persons and persons who are looking for but out of work) to the working age population is 49.2% in 1990. This ratio (refined labor participation rate) is recently fluctuating around 50%, according to the National Household Survey, and it is not apparent which the trend is ascending or descending. Therefore, it is assumed that the refined activity rate will be constant in future.

424. Applying these assumptions to two (2) cases of planned population in 2010: one, 1.2 million; the other, 1.15 million, future labor force supply is calculated as shown in Table 6.1-9.

Table 6.1-9 Labor Force Supply by Case of Planned Population

Year	Ratio of Pop.	Crude Activity	1.2 Million Case		1.15 Million Case	
	12 Years and Over to Total Population(%)	Ratio(Ratio of Labor Force to Total Pop.)(%)	Popula- tion	Labor Force	Popula- tion	Labor Force
1990	72.5	35.7	660,200	235,570	660,200	235,570
1995	74.0	36.4	773,000	281,400	770,000	280,300
2000	75.5	37.1	900,000	333,900	890,000	330,200
2010	78.0	38.4	1,200,000	460,800	1,150,000	441,600

note: Crude activity rate = 0.492 x Ratio of population 12 years and over

425. Table 6.1-10 shows supply-demand balances of labor force in 2010 by cases of planned population and economic growth. Unemployment rate in 1990 is 9.7%, so the cases in which unemployment rate will rise in future are not desirable (1.2 million case under low- and medium-economic growth by productivity increase). If the planned population is 1.15 million and national economy will grow at a rate of more than 4%, the employment situation of the Study Area will possibly improve. In the 1.2 million case, 4% economic growth by employment increase and 5% economic growth by productivity increase will have almost the same effect on supply-demand balance of labor force, and 4.5% and 5% economic growth by employment increase type will improve an employment situation considerably.

Table 6.1-10 Supply-Demand Balance of Labor Force by Case of Planned Population and Economic Growth, 2010

Case	Economic Growth					
	Case 1: High, 5%		Case 2: Low, 4%		Case 3: Medium, 4.5%	
	Productivity Increase Type	Employment Increase Type	Productivity Increase Type	Employment Increase Type	Productivity Increase Type	Employment Increase Type
Labor Force Demand (A)	412,100	444,100	399,400	421,200	407,100	429,400
<u>1.2 Million Case</u>						
Labor Force Supply(B)	460,800	460,800	460,800	460,800	460,800	460,800
Over Supply (C = B-A)	39,700	16,700	61,400	39,600	53,700	31,400
Unemploy. Rate (C/B)	8.6	3.6	13.3	8.6	11.7	6.8
<u>1.15 Million Case</u>						
Labor Force Supply(D)	441,600	441,400	441,400	441,400	441,400	441,400
Over Supply (E = D-A)	20,500	-	42,200	20,400	34,500	12,200
Unemploy. Rate (E/D)	4.6	-	9.6	4.6	7.8	2.8

note: Labor force demand is for the economically active population living in the Study Area, including demand for commuting to outside the Area. On the contrary, it does not include demand for commuting from outside the Area.

Unemployment ratio: %

(4) Planned Socioeconomic Framework of the Study Area

426. Considering future economic growth patterns of Colombia as a whole and of Cartagena, a growth dependent too much on higher labor productivity will not be desirable and in fact difficult to attain. The industries located in Cartagena are mainly of capital intensive type which supply comparatively small job opportunities. In future it is necessary to promote manufacturing industries of labor intensive type, as well as construction activities and tourism-related tertiary industries.

427. For setting a future framework, it is necessary to keep in mind the following facts: in relation between plan and implementation, a restrained planned population is often exceeded and a wished economic growth rate is fallen short of. Here, the planned population of 1.15 million will possibly be exceeded and the long-term economic growth rate of 5% will likely fall short.

428. For the reasons stated above, the goal in this Study is set so as to build an urban structure and socioeconomic system which can accommodate 1.2 million people in 2010. A growth process shown in Table 6.1-11 is established as the future framework.

Table 6.1-11 Socioeconomic Framework of the Study Area

Year	Population	Labor Force	Resident Employed Persons	Total Employed Persons Working within S. A.	Labor Force Demand Growth Rate (%)	GRP Growth Rate(%)	GDP Growth Rate(%)
1990	660,200	235,570	212,670	215,670			
1995	773,000	281,400	253,800	257,400	3.6	4.95	3.8
2000	900,000	333,900	302,900	307,200	3.6	5.85	4.5
2010	1,200,000	460,800	421,100	427,100	3.35	5.85	4.5

note: 1) "Resident employed persons" means employed labor force living within the Study Area, including persons who commute to outside the Area.
 2) "Total employed persons working within the Study Area" means sum of the residents and non residents employed persons working within the Area.
 3) GRP and GDP growth rates are based on Case 3 economic growth (medium; long-term growth rate, 4.5%), but labor force demand growth rates are adjusted in order to follow almost same course as Case 1 by productivity increase or Case 2 by employment increase. In other words, labor productivity is assumed to increase as shown in Table 6.1-5.

429. Number of employed persons by economic sectors is assumed as follows;

a. Primary Sector (Agriculture, Livestock and Fisheries)

430. The number of employed persons in this sector in 1990 is estimated at 7,610, whose work places are distributed as follows: Urban Area (Traffic Zone 1 to 40), 11%; Suburban Area

(Traffic Zone 41 to 47), 48%; outside the Study Area, 41%.

431. It is assumed that in 2010 the work places in the urban area will disappear and about 10% of agricultural land will be urbanized in the suburban area and outside the Study Area. Therefore, the number of employed persons in this sector in 2010 is assumed to be 6,000, about 90% of 6,770 who are working in the suburban area and outside the Study Area in 1990.

432. However, as to Tierra Bomba Island and Baru Island where many people are engaged in fisheries, it is planned to maintain the existing level, considering that tourism development in future will rather provide demand for fishery products and that there will be a possibility of culture fishing development (for example, shrimp culture at Santa Ana in Baru Island).

b. Secondary Sector (Mining, Manufacturing and Construction)

433. The manufacturing industry of Cartagena is recently growing at a high pace led by oil refining and the chemical industry located at the Mamonal Industrial Zone. According to the industrial statistics, the annual average growth rate was 9.9% during the period from 1985 to 1988.

434. The mining of the Study Area is mainly digging of limestone for construction material and cement. The construction industry of Colombia has been stagnant in these years and Cartagena is not an exception. It is necessary to recover its growth and also contribute to the absorption of labor force by carrying out projects like purification of canals and lagoons, improvement of roads and urban utilities, housing for medium- and low-income groups and tourism development through raising public and private funds, including the introduction of foreign capital.

435. For the secondary sector as a whole, the annual average growth rate is assumed as follows; from 1990 to 1995, 8.5%; after 1995, 9.0%.

436. The assumed growth rates are broken into labor productivity increase rate and employment increase rate as shown in Table 6.1-12, referring to the breakdown of 9.9% growth between 1985 and 1988: labor productivity increase rate, 5.6%; employment increase rate, 4.1%.

Table 6.1-12 Assumed Growth Rates of Secondary Sector (%)

Period	Value Added	Labor Prod.	Employment
1990/1995	8.5	4.8	3.5
1995/2000	9.0	4.8	4.0
2000/2010	9.0	5.25	3.35

437. Until 1995, the relation between the increase rates of labor productivity and employment will be kept as they are, after that the employment increase rate will rise until 2000. From 2000 onwards, reflecting the labor productivity rise, labor force employment will slow down.

c. Tertiary Sector

438. The number of employed persons in the tertiary sector is obtained by deducting the employed persons in the primary and secondary sectors from the total employed persons shown in Table 6.1-11. As a result of the above-mentioned assumptions, future employed persons by sector are as shown in Table 6.1-13.

Table 6.1-13 Future Resident Employed Persons by Sector

Year	Primary S.	Secondary S.	Tertiary S.	Total
1990	7,610	60,590	164,470	212,670
1995	7,200	48,200	198,400	253,800
2000	6,800	58,600	237,500	302,900
2010	6,800	83,100	332,000	421,100

439. Future total employed persons by sector who work within the Study Area (deducting persons who commute to outside the Area from the total resident employed persons, and adding nonresident employed persons who work within the Area) is assumed as shown in Table 6.1-14. The ratios of employed persons who commute to outside the Study Area in the secondary and tertiary sectors are assumed to decline in future: secondary sector, from 2.46% in 1990 to 2% in 2010; tertiary sector, from 3.65% in 1990 to 3% in 2010.

Table 6.1-14 Future Total Employed Persons by Sector
Working within the Study Area

Year	Primary S.	Secondary S.	Tertiary S.	Total
1990	4,510	42,190	168,970	215,670
1995	4,200	50,100	203,100	257,400
2000	3,900	61,000	242,300	307,200
2010	3,300	86,500	337,300	427,100

6.2 Land Use Plan

6.2.1 Goals and Basic Policies of Land Use Plan

(1) Role of Cartagena in Bolivar and Costa Atlantica

440. The population of the Departamento de Bolivar will increase from 1,467 thousand in 1990 to 2,170 thousand in 2010 at a rate of 2.0% per annum and that of the Costa Atlantica from 7 million in 1990 to 10 million in 2010 at a rate of 1.8% per annum. Cartagena will grow at a considerably higher rate of 3% on annual average and will have a population of 1.2 million in the same target year. Migration flow from the rest of the Departamento and the Costa Atlantica will continue in future, although its rate will decline.

441. In Bolivar, the fundamental regional problems are evident in the current large gap of socioeconomic conditions between Cartagena and the interior municipalities. At present only Cartagena is enjoying the results of development. Therefore, what is important is how to extend the development effects from Cartagena to the rest of the Departamento and how to help them raise self-sufficiency.

442. For the relocation of industries or the creation of the agri-industries in the interior, improvement of road network and port facilities are indispensable for collecting raw materials and shipping products.

443. The Regional Development Plan of Costa Atlantica set a goal of "continuous economic growth and social distribution of its benefits". To achieve the proposed goal, a strategic future image of the Region is expressed as an Exporting Region, which will be realized through making use of its natural resources, location advantages and inhabitant's experience in commercial and producing activities.

444. In this plan Cartagena is ranked as the principal sub-regional center of level 2, with features similar to those of Barranquilla (the regional metropolis-level 1), in a proposed urban-regional system.

445. From stand point of coping with the above-mentioned problems and the regional development concept, Cartagena should play a role of international junction and become an Integrated Port City as one of the major Caribbean ports. This means that Cartagena should be developed into a balanced growth pole of export-oriented industry and international tourism.

(2) Goals and Basic Policies of Land Use Plan

446. Considering the role of Cartagena in future, the land use plan is prepared under the following goals.

- a. to build an urban space equipped with facilities and system sufficient for development demand of industry and tourism, and
- b. to provide a proper as urban environment to accommodate the planned population of 1.2 million in 2010, with an outlook for ultra-long-term development direction towards the middle of 21st century.

447. To achieve these goals, the following points are given as basic policies;

- a. to plan to form a compact urban area with an improved transportation network,
- b. to accommodate about 900 thousand persons in the urban area (traffic zone 1 to 40) and about 300 thousand persons in the suburban area (traffic zone 41 to 47),
- c. to respect, for the urban area, the actual official zoning prepared and promulgated by the Municipal Planning Department (DEPLAN) (Plan de Desarrollo del Distrito Turístico y Cultural de Cartagena, Código de Urbanismo), and
- d. to plan, for the suburban area, a necessary and sufficient area for the projected industries', tourism and residential space requirements, by studying the draft zoning of DETRAN and the development scheme of the private sector.

6.2.2 Land Use Plan

(1) Urban Area

448. For the urban area, DEPLAN promulgated a zoning plan as shown in Figure 6.2-1. Table 6.2-1 shows a result of measurement of use zoning areas by traffic zone. According to this table, 51% of the total area are designated as a residential zone (2,751 ha). The industrial zone is 643 ha (11.9%) and the tourism/historic zone (historic zone is 83.7 ha of traffic zone 4) is 311 ha (5.8%). There are some unique land uses such as the integrated project zone, special activity zone and special treatment zone. The integrated project zone is designated to the Navy Base, Maritime Terminal, Crespo Airport and Chambacu area as urban renewal sites for complex development.

449. The special activity zone is for the bus terminal, truck terminal and other large-scale commercial facilities and is designated to the east suburbs of the city. The special treatment zone is to devise some measures for the extension of low standard

Table 6.2-1 Use Zoning by Traffic Zone (Urban Area)

Zone no.	Zone area	Residential	Commercial	Industrial	Institutional	Tourism/historic*1	Recreational*2	Integrated project*3	Special activity	Special treatment	Conservation
1	18.4					18.4					
2	38.1				5.0	31.1	2.0				
3	111.6		3.0		3.4	62.9	15.9	26.4			
4	117.1		6.2			83.7	27.2				
5	310.4					114.5	17.3	178.6			
6	67.7	63.7			2.9		1.1				
7	105.1	84.1									21.0
8	95.0	46.2									48.8
9	121.0	97.2	5.6		9.7						8.5
10	159.6	44.7	11.6		2.7		28.9	14.1			57.6
11	51.3	47.4					3.9				
12	152.4	95.0	3.2		1.3		4.7	39.5	8.7		
13	87.4	53.5	25.6		2.8		5.5				
14	74.1	49.6	3.7								20.8
15	80.9	54.5									26.4
16	94.3	82.4	8.4				3.5				
17	72.2	64.6	7.6								
18	127.8	110.8	6.3				10.7				
19	57.4	53.9	1.7				1.8				
20	270.9	89.7							12.0	90.3	78.9
21	106.9	99.4	7.5								
22	100.5	96.0	4.5								
23	79.8	52.2			4.6		23.0				
24	89.2	84.2	2.2		2.8						
25	89.8	74.3	9.2		6.3						
26	117.6	101.4	4.8		11.4						
27	90.0	84.9	2.2		2.9						
28	69.3	63.1	3.8		2.4						
29	83.5	75.9	4.2		3.4						
30	206.8	67.1	18.0	121.7							
31	68.8				68.8						
32	342.0	190.1	34.2	60.5	49.8					7.4	
33	622.8			460.8							162.0
34	86.9	66.7	1.0		10.0		9.2				
35	44.0	44.0									
36	77.5	77.5									
37	90.4	67.8	1.2		21.4						
38	435.4	200.8	7.2		10.9			156.4	60.1		
39	178.9	125.2	5.7		10.2						37.8
40	206.7	143.4									63.3
Total	5399.5	2751.3	188.6	643.0	232.7	310.6	154.7	258.6	177.1	157.8	525.1

- *1: In Zone 4, 5.2 ha is the area of institutional facilities like the city hall and tourist wharves.
- *2: Including nondesignated beach zones of 13.4 ha in Zone 3 and 15.8 ha in Zone 5.
- *3: Including nondesignated land of 58.0 ha adjacent to the airport in Zone 5.
Only Zone 11 (residential especial) of the Chambacu Project Area is shown in Zone 10.

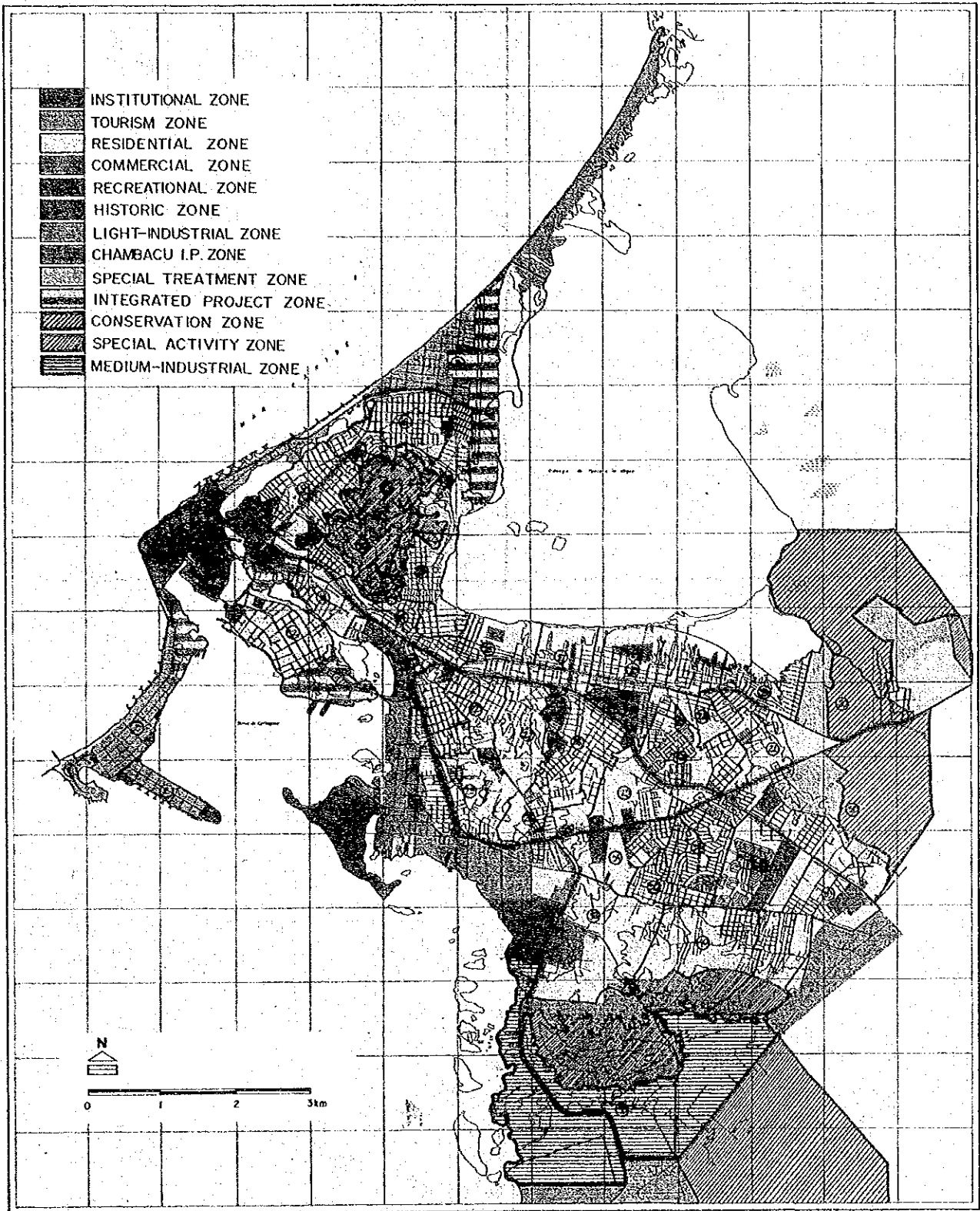


Figure 6.2-1 Urban Land Use by DEPLAN

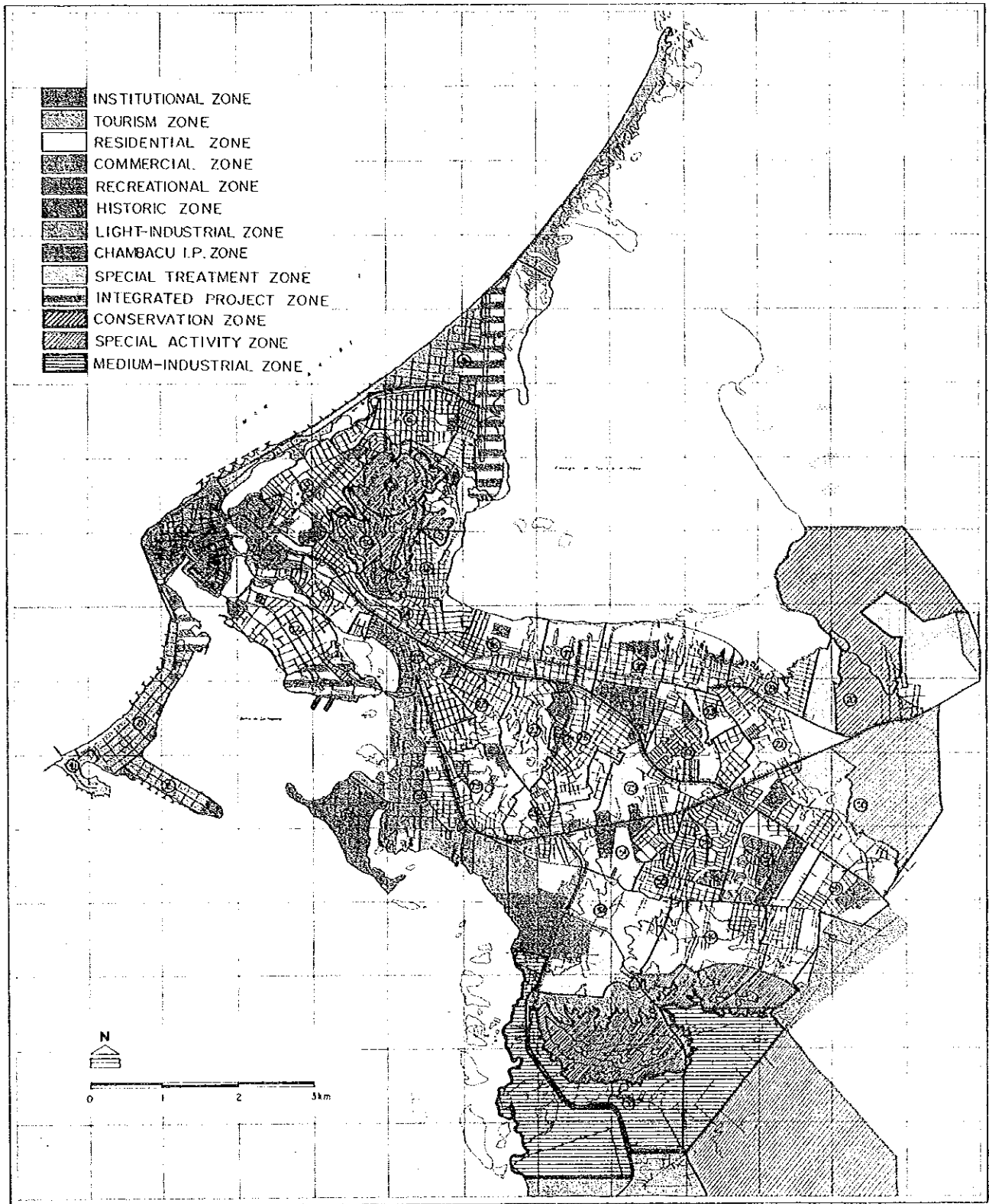


Figure 6.2-1 Urban Land Use by DEPLAN

residential areas. The conservation zone is designated to the Popa Hill, the Arbornoz Hill and the Tesca Lagoon totaled 525 ha.

450. Following the basic policy, the land use zoning is not changed. However, in order to assume the distributions of population and employment, some specifications of land use and assumptions of population density are made. Main points are as follows;

- a. to consider the fact that in the central part and its vicinity verticalization of housing is proceeding and high-income classes are moving into it, forming high density residential areas in the actual upper-class residential areas (Castillo Grande, part of Crespo and Manga),
- b. to assume the population densities of the residential areas as shown below, corresponding to the economic level of inhabitants and typical housing type,
 - i) upper-class residential area
high-rise apartment house, 500 persons per ha
 - ii) middle-class residential area
mixture of medium-rise apartment house and detached house, 250-300 persons per ha
 - iii) lower-class residential area
small-scale detached house, 200 persons per ha
- c. to remove inhabitants from the part of Popa Hill designated as the conservation zone and the canal bank or lake shore and to accommodate them in the new residential area of southeast suburbs,
- d. to use the special treatment zone as lower-class residential area,
- e. to use the Navy Base, Chambacu area and Maritime Terminal as residential, commercial and business areas and to specify the land use and density,
- f. to expand the airport at current Crespo area, and
- g. to remove the wholesale function from the Bazurto Public Market.

(2) Suburban Area

451. For the suburban area except the Mamonal Industrial Zone (traffic zone 44), official zoning is not yet designated. At the moment, coastal lots are being acquired by private individuals and companies for recreational use, tourism development or only speculation. According to the recent investigation by the National Justice Office, many national properties are occupied or made object of transaction illegally.

452. The most controversial point of future land use in the

suburban area is to what extent the Tierra Bomba and Baru Island should be developed. The greater part of Tierra Bomba Island is hilly and of military use. On the other hand, Baru Island, especially the southwestern part, is covered with the mangrove and is subject to the conservation of nature.

453. There are proposals to develop large-scale tourism zones and port facilities in the two islands, however, the recent opinion which seems to be prevailing is that the development of the two islands should be limited except the part near Playa Blanca of Baru Island. DEPLAN is preparing a plan which gives priority to the development of the coastal area extending from La Boquilla to Galerazamba.

454. In this study, following the draft zoning plan for the northern area (traffic zone 41, 42 and 43) by DEPLAN, most of the space requirements until 2010 except industrial land are located in this area. The contents of plan are summarized as follows;

- a. The coastal area of traffic zone 41 and 42 should be developed as the high density tourist zone, the width of which varies from 200 m to 800 m depending on the topography. The facilities located in this zone are: high-rise hotel, medium-rise hotel, high-rise tourist apartment house, medium-rise tourist apartment house, sophisticated shops and restaurants, kiosks, high-rise residential apartment house, medium-rise residential apartment house, etc.
- b. Next to high density tourism zone, belts of medium density residential tourism zone and the low density residential tourism zone are designated in that order toward the inland. The facilities located in these zones are: in the medium density residential tourism zone; medium-rise hotel, residencia, medium-rise tourist apartment house, cottage, neighborhood type shops and restaurants, sports facility, medium-rise residential apartment house, medium-size detached house, school, hospital, etc., in the low density residential tourism zone; villa, outdoor sports club, forest park, large-size detached house, etc.
- c. In traffic zone 42, a new town with a population of about 100,000 (including the medium and low density residential tourism zones) is planned. The town center aims to function as the north sub-center.
- d. In traffic zone 43, the low density residential zone and the light industrial zone are located adjacent to the existing settlement of Bayunca.
- e. Most of the industrial space requirement is absorbed in the vacant lots along the planned Cartagena By-pass (C-3) in the already designated industrial zone of Mamonal (traffic zone 44). On the east side of the Cartagena By-pass, a truck termi-

nal and a wholesale market are planned. Next to the Pasacaballo settlements a new middle- and lower-class residential area is planned.

- f. In the Tierra Bomba Island (traffic zone 45), a small-scale high density tourism zone is planned mainly along the west coast.
- g. In the Baru Island, only traffic zone 46 is developed and traffic zone 47 is planned to be conserved except for the construction activity to improve the living standard of the existing settlements of Baru. Playa Blanca and its vicinity is planned as the tourism zone including tourism free zone. Next to the tourism zone, a middle-class residential area is planned. On the other hand, adjacent to the shrimp culture zone, a middle- to lower-class residential area is developed.

455. Figure 6.2-2 shows the above-mentioned matters together with the land use of the urban area. In traffic zones 41 and 42, the development area designated in the draft zoning plan by DEPLAN is wider than the area shown in this figure. However, what this figure illustrates is the land requirements until 2010. Therefore, from 2010 onwards, it is necessary to prepare more land for urban area. Since additional urbanized land will scarcely be available in 2010 in the south area, further urbanization will be obliged to extend in the north area. Therefore, the part of the city should be planned and controlled carefully from the standpoint of an ultra-long-term land use plan.

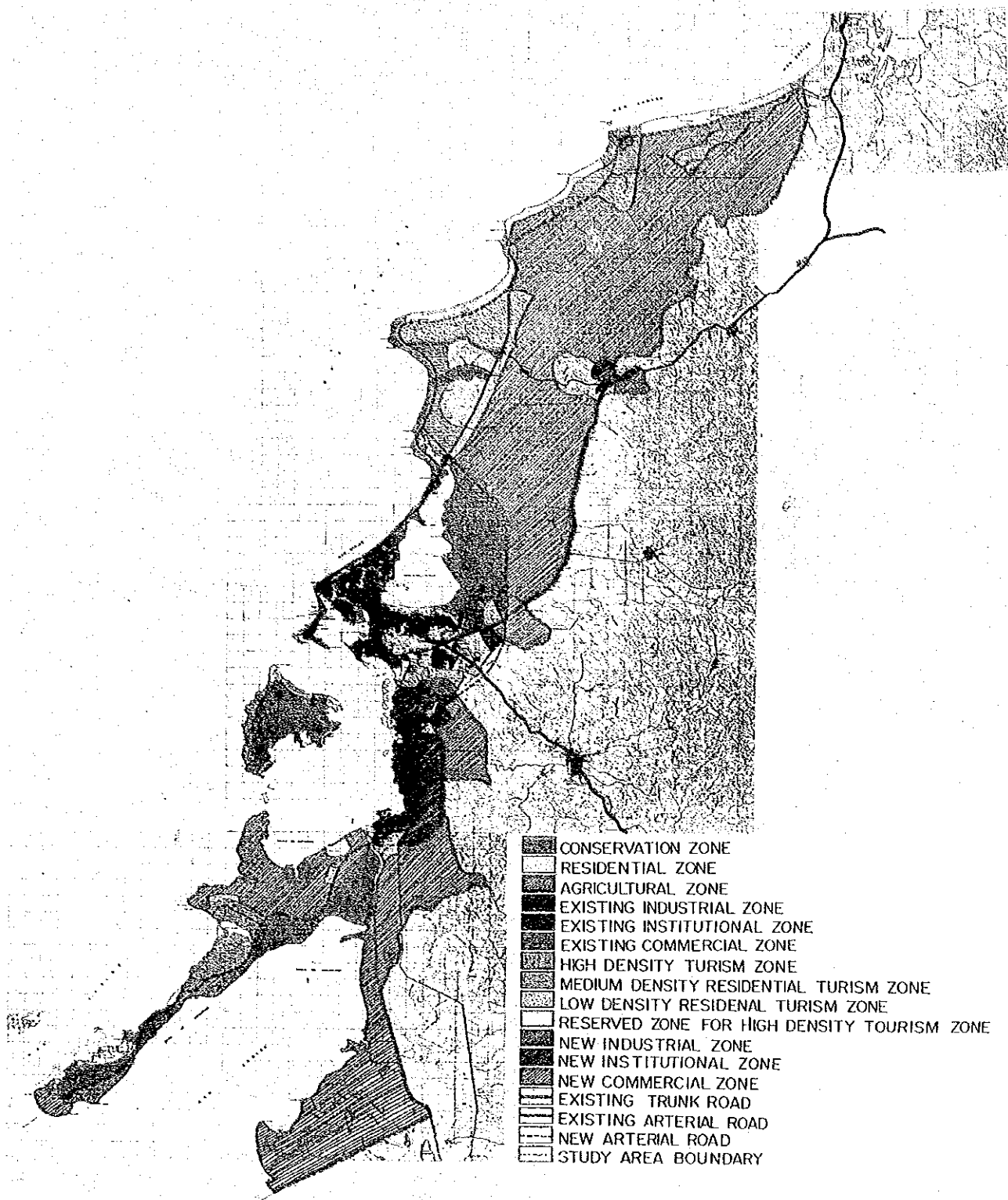


Figure 6.2-2 Land Use Plan of the Study Area in 2010

Table 6.2-2 Population Distribution Plan, 2010 (continued)

Zone	Remarks
16-18	A new road along Tesca de La Virgen and recreational parks will be constructed. Some commercial activities will be located along the road. The conditions of residential areas will not be changed much. Planned density: 250 psn/ha.
19	Except for the high population density of 380 psn/ha, the situation of the future change is almost same as the zones 16-18.
20	Existing residential zone (89.7 ha) and the special treatment zone (90.3 ha) will be developed as a lower- to middle class residential area with a population density of 200 psn/ha.
21-22	Not much changes. Planned density: 200 psn/ha
23	Not much changes. Planned density: 300 psn/ha
24	Not much changes. Planned density: 200 psn/ha
25	Densification will proceed to some extent. Planned density: 200 psn/ha
26-28	Densification will proceed to some extent. Planned density: 250 psn/ha
29	Unused hilly land will be developed as residential areas. Planned density: 250 psn/ha
30	The habitable area is 148.3 ha (residential zone: 67.1 ha, existing industrial/residential mixed area: 63.2 ha, commercial zone: 18 ha). Planned density: 200 psn/ha
31	Same as at present
32	The container terminal will be brought into full operation. A public market is planned along the road to Mamonal. the habitable area is 208.9 ha (residential zone: 190.1 ha, special treatment zone: 7.4 ha, one third of the commercial zone: 11.4 ha). Planned density: 200 psn/ha
33	In addition to the existing residential area of 40.4 ha, newly developed industrial/residential mixed area of about 50 ha is considered to be habitable area. Planned density: 200 psn/ha
34	Densification will proceed to some extent. Planned density: 350 psn/ha
35-36	Not much changes. Planned density: 250 psn/ha
37	Not much changes. Planned density: 300 psn/ha
38	The inter-municipal bus terminal will be brought into full operation. The special treatment zone will be developed as residential area. Some vehicle-related facilities like repairs shops, show-rooms and dealers, oil stations and drive-in restaurants will be located. The habitable land is 268.1 ha (residential: 200.8 ha, special treatment 60.1 ha, commercial: 7.2 ha). Planned density: 200 psn/ha
30-40	Densification will proceed to some extent. Planned density: 200 psn/ha
41	Total population in 2010: 43,200 a. Existing settlements : 2,200 b. Newly planned area : 41,000 b-1 High density tourism zone : 10,000 Medium-rise residential apartment house area: 50 ha, 200 psn/ha b-2 Medium density residential/tourism zone : 25,000 Medium-size detached house area : 500 ha, 50 psn/ha b-3 Low density residential tourism zone : 6,000 Large-size detached house area : 400 ha, 15 psn/ha

6.2.3 Population and Employment Distribution

(1) Population Distribution

456. Based on the land use plan, a population accommodation plan by zone is made as shown in Table 6.2-2. The result of zone distribution of the planned 1.2 million population in 2010 is shown in Table 6.2-3.

Table 6.2-2 Population Distribution Plan, 2010

Zone	Remarks
1	Several high-rise apartment houses will be constructed, but there is not so much space left for densification. Planned density: 400 psn/ha
2	At present, there are many detached houses with one or two floors. In future, it is assumed that about half of the zone will be covered by medium-rise apartment houses with a population density of 250 psn/ha. The average density is planned to be 200 psn/ha.
3	The present naval base (26.4 ha) will be removed and an urban development project for commercial-residential complex will be realized. It is assumed that 10 ha will be used for upper-class residential apartment houses. The habitable area of the zone is considered to be 47.5 ha (present commercial/residential mixed area of 37.5 ha and new development area of 10 ha). Planned density: 500 psn/ha.
4	Some schools will be removed, and their buildings or lots will be used for tourism or cultural activities. Old unused buildings will be restored and used also for the above-mentioned activities. The population will not be changed. Planned density: 300 psn/ha.
5	The future habitable area is considered to be the present residential area of 61.0 ha and about half of the new Marbella beach tourism area of 53.5 ha (24 ha) totaled to 85 ha. Half of the existing residential area and the new development area will have a density of 500 psn/ha. Average density: 350 psn/ha.
6 & 7	An environmental condition will be improved through the water front improvement project carried out by EDURBE. Densification will proceed to some extent. Planned density: 300 psn/ha.
8	The habitable area is considered to be designated residential zone 46.2 ha. From the already urbanized part of the conservation zone, inhabitants will be removed. Planned population: 350 psn/ha.
9	The habitable area is considered to be the residential zone (97.2 ha). the commercial zone (5.6ha) totaled 102.8 ha. Verticalization will proceed in this zone and the stratum of residents will be changed to an upper level. Planned density: 500 psn/ha.
10	The Chambacu and Papayal project will be completed. the habitable area is 70.4 ha (residential zone; 44.7 ha, commercial zone; 11.6 ha, Chambacu project area; 14.1 ha). Planned density: 500 psn/ha.
11	Densification will proceed. Planned density: 500 psn/ha.
12	The urban redevelopment project of the Maritime Terminal site (39.5 ha) will be completed. it is assumed that 10 ha of the project site will be used for residential development. The habitable area is 108.2 ha (residential zone; 95 ha, commercial zone; 3.2 ha, new residential development site; 10 ha). Half of the designated residential zone, the commercial zone and the new residential development site will have a density of 500 psn/ha. Average planned density: 350 psn/ha.
13-15	Densification will proceed to some extent. Planned density: 300 psn/ha

Table 6.2-2 Population Distribution Plan, 2010 (continued)

Zone	Remarks
42	Total population in 2010: 116,700
	a. Existing settlements : 9,200
	b. Newly planned area : 107,500
	b-1 High density tourism zone : 22,000
	High-rise residential apartment house area : 30 ha, 400 psn/ha
	Medium-rise residential apartment house area: 50 ha, 200 psn/ha
	b-2 Medium density residential tourism zone : 20,000
	Medium-size detached house area : 400 ha, 50 psn/ha
	b-3 Low density residential tourism zone : 10,500
	Large-size detached house area : 700 ha, 15 psn/ha
	b-4 Medium density residential zone : 20,000
	Mixture of medium-rise apartment house and detached house : 200 ha, 100 psn/ha
	b-5 Low density residential zone : 35,000
	Medium-size detached house area : 700 ha, 50 psn/ha
43	Total population in 2010: 29,600
	a. Existing settlements : 8,600
	b. Newly planned area : 21,000
	b-1 Low density residential zone : 21,000
	Medium-size detached house area : 420 ha, 50 psn/ha
44	Total population in 2010: 48,000
	a. Existing settlements : 8,000
	b. Newly planned area : 40,000
	b-1 Medium density residential zone : 40,000
	Small-size detached house area : 200 ha, 200 psn/ha
45	Total population in 2010: 12,400
	a. Existing settlements : 6,400
	b. Newly planned area : 6,000
	b-1 High density tourism zone : 6,000
	Medium- to high-rise residential apartment house area : 20 ha, 300 psn/ha
46	Total population in 2010: 17,400
	a. Existing settlements : 2,400
	b. Newly planned area : 15,000
	b-1 Medium density residential zone : 5,000
	Mixture of medium-rise apartment house and detached house : 50 ha, 100 psn/ha
	b-2 medium density residential zone : 10,000
	Small-size detached house area : 50 ha, 200 psn/ha
47	Total population in 2010: 1,900
	a. Existing settlements : 1,900

Table 6.2-3 Planned Population of Study Area in 2010

	Zone no.	Zone name	1990			2010				
			Habitable area (ha)	Population	Semigross density (psn/ha)	Residential zone (ha)	Commercial zone (ha)	Habitable zone total (ha)	Planned density (psn/ha)	Population
Urban Area	1	Laguito	18.4	6,080	330.4	18.4		18.4	400	7,400
	2	C. grande	31.1	5,110	164.3	31.1		31.1	200	6,200
	3	B' grande	37.5	8,910	237.6	47.5		47.5	500	23,800
	4	Centro	84.7	25,320	298.9	78.5	6.2	84.7	300	25,400
	5	Marbella	61.0	7,560	123.9	85.0		85.0	350	29,800
	6	Cosuna 3	64.8	15,940	246.0	63.7		63.7	300	19,100
	7	Cosuna 4	84.1	23,890	284.1	84.1		84.1	300	25,200
	8	Cosuna 5	69.3	21,040	303.6	46.2		46.2	350	16,200
	9	Cosuna 6	111.3	19,570	175.8	97.2	5.6	102.8	500	51,400
	10	Cosuna 7	62.2	13,190	212.1	58.8	11.6	70.4	500	35,200
	11	P. d. Popa	50.7	10,840	213.8	47.4		47.4	500	23,700
	12	Manga	93.2	9,880	106.0	105.0	3.2	108.2	350	37,900
	13	Cosuna 9	84.6	15,090	178.4	53.5	12.8	66.3	300	19,900
	14	Cosuna10	53.3	14,120	264.9	49.6	3.7	53.3	300	16,000
	15	Cosuna11	54.5	12,680	232.7	54.5		54.5	300	16,400
	16	Cosuna12	94.3	20,980	222.5	82.4	8.4	90.8	250	22,700
	17	Cosuna13	72.2	15,340	212.5	64.6	7.6	72.2	250	18,100
	18	Cosuna14	108.2	27,120	250.6	110.8	6.3	117.1	250	29,300
	19	Cosuna15	49.0	18,290	373.3	53.9	1.7	55.6	380	21,100
	20	Cosuna16	163.3	21,240	130.1	180.0		180.0	200	36,000
	21	Cosuna17	76.3	16,030	210.1	99.4	7.5	106.9	200	21,400
	22	Cosuna18	86.1	16,730	194.3	96.0	4.5	100.5	200	20,100
	23	Cosuna19	48.6	14,130	289.5	52.2		52.2	300	15,700
	24	N. Bosque	72.8	15,000	219.8	84.2	2.2	86.4	200	17,300
	25	V. Sandra	83.5	12,140	145.4	74.3	9.2	83.5	200	16,700
	26	Cosuna21	105.4	21,970	208.4	101.4	4.8	106.2	250	26,600
	27	Cosuna22	64.5	12,630	195.8	84.9	2.2	87.1	250	21,800
	28	Cosuna23	66.9	9,990	149.3	63.1	3.8	66.9	250	16,700
	29	Cosuna24	59.3	16,410	276.7	75.9	4.2	80.1	250	20,000
	30	Bosque	121.8	22,290	183.0	130.3	18.0	148.3	200	29,700
	31	M'nillo	0.0	880		0.0	0.0	0.0		900
	32	Ceballos	170.8	19,240	112.6	197.5	11.4	208.9	200	41,800
	33	A. Barato	40.4	5,930	146.8	90.0		90.0	200	18,000
	34	Cosuna27	67.7	21,070	311.2	66.7	1.0	67.7	350	23,700
	35	Cosuna28	44.0	11,000	250.0	44.0		44.0	250	11,000
	36	Cosuna29	77.5	19,350	249.7	77.5		77.5	250	19,400
	37	Cosuna30	69.0	19,580	283.8	67.8	1.2	69.0	300	20,700
	38	Cosuna31	157.4	22,650	143.9	260.9	7.2	268.1	200	53,600
	39	Cosuna32	139.1	22,910	164.7	125.2	5.7	130.9	200	26,200
	40	Cosuna33	122.4	19,780	161.8	143.4		143.4	200	28,700
	U. A. Total	3,121.4	632,900	202.8	3,346.9	150.0	3,496.9	266	930,800	
Sub Urban Area	41	A. Grande		1,600						43,200
	42	P. Canoas		6,540						116,700
	43	Bayunca		6,120						29,600
	44	Mamonal		5,440						48,000
	45	T. Bomba		4,550						12,400
	46	Sta. Ana		1,700						17,400
	47	Baru		1,350						1,900
	S. U. A. Total		27,300						269,200	
Study Area Total				660,200		3,346.9				1,200,000

(2) Employment Distribution

a. Primary Sector

457. It is assumed that in 2010 there will be no employment in the urban area. The number of persons engaged in this sector within the Study Area will be 3,300. Although traffic zones of 45, 46 and 47, where fishery industry will be active to some extent, will maintain almost the same number of employment as in 1990. In other suburban zones the number will decrease to about 90% of existing level.

b. Secondary Sector

458. In this sector construction workers are included. From the 1990 data and future growth prospect, 30% of the increase of employed persons between 1990 and 2010 are assumed to be engaged in the construction industry. Considering that building sites will be located in zones where urbanization will proceed, this portion of employment increase will be distributed proportionally to the population increase.

459. The increase of employed persons in small-scale community service manufacturing industry (for example, bakery) is also distributed proportionally to the population increase. Studying the distribution of population and that of employment in the secondary sector in 1990, the number of employed persons in this type of manufacturing industry is estimated to be 0.002 person per inhabitant.

460. The rest of employment increase are located in the planned industrial zones as described in Table 6.2-4.

c. Tertiary Sector

461. The increase of the tertiary sector employment is classified into three (3) types;

- i) neighborhood service,
- ii) community service, and
- iii) city service.

462. The neighborhood service employment is assumed to be created at a rate of 0.05 persons per inhabitant, as a result of the analysis of the 1990 data. This type of employment is located indistinguishably in the residential zone. The community service type is located in the commercial zone and serves for wider area and higher needs than the neighborhood type. The ratio of employed persons to the population is assumed to be 0.098 persons per

Table 6.2-4 Number of Employed Persons in Large-scale Project

Zone	Project	No. of Employment
3	- Redevelopment of Naval Base shopping center and office building, floor area about 26 ha	9,400
4	- Removal of government offices	-2,000
	- Removal of several schools	- 900
	- Improvement of tourism center	8,500
	By restoration and reuse of current government and school buildings, tourism related employment in the private sector will increase remarkably. In addition to this, total number of employment increase in zone 4 is assumed to be 5,400 persons.	
5	- Promotion of tourism development in Marbella beach area	
	- Expansion of Crespo Airport and related facilities	3,000
10	- Redevelopment of Chambacu area commercial and government office buildings, floor area about 10 ha	3,200
12	- Removal of Maritime Terminal	-2,000
	- Redevelopment of the removed site commercial and office buildings, floor area about 38 ha, school site area 12 ha	12,000
13	- Removal of wholesale function of Bazurto Public Market	- 400
30	- Densification of existing industrial zone	1,150
32	- Full operation of Container Terminal	15,000
	- Construction of Public Market	
33	- Densification of existing industrial zone	960
	- Development of medium- to light-industry estate, 100 ha	3,000
38	- Full operation of Interdepartamental Bus Terminal	
	- Location of vehicle-related facilities	5,000
41	- Development of tourism core zone, 20 ha	2,000
42	- Development of tourism core zone, 30 ha	
	- Development of North Area sub-center city service type. As population increase of this zone is very large in number, neighborhood and community service type employment will be created on a large scale of some 10 thousand. The sub-center will absorb a large part of this increase and will have a total employment of 6,000.	5,000
43	- Development of light- and agri-industrial zone, 200 ha	4,000
44	- Expansion of existing industry, 340 ha	
	- Location of new factories, 700 ha	20,800
	- Construction of Truck Terminal	
	- Construction of wholesale market	5,000
45	- Development of tourism core zone, 12 ha	1,200
46	- Development of tourism core zone, 20 ha	2,000

inhabitant. The city service type involves such activities as are located in traffic zones of 1, 3, 4, 12 and 13. The ratio of employment to population is assumed to be 0.142 persons per inhabitant.

463. The employment increase in neighborhood service type and half the increase in community service type are distributed proportionally to the population increase. The other half is distributed proportionally to the area of community commercial zones. 30% of the increase in the city service type employment is distributed proportionally to the present accumulation of the tertiary sector employment. The rest of the increase will be located in the large-scale project sites shown in Table 6.2-4.

464. The result of zonal distribution of employed persons by sector working within the Study Area is shown in Table 6.2-5.

Table 6.2-5 Planned Distribution of Employment by Sector in 2010

	Zone no.	Zone name	1990				2010			
			Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
Urban Area	1	Laguito	0	180	3,350	3,450	0	140	4,040	4,180
	2	C. grande	0	0	960	960	0	0	1,230	1,230
	3	B' grande	0	560	13,840	14,400	0	960	27,060	28,020
	4	Centro	0	5,490	50,360	55,850	0	5,490	55,790	61,280
	5	Marbella	0	80	2,760	2,840	0	670	8,550	9,220
	6	Comuna 3	0	130	2,780	2,910	0	210	3,570	3,780
	7	Comuna 4	0	130	1,360	1,490	0	170	1,720	1,890
	8	Comuna 5	0	60	960	1,020	0	60	620	680
	9	Comuna 6	0	500	4,400	4,900	0	1,350	9,580	10,930
	10	Comuna 7	0	440	5,120	5,560	0	1,030	13,790	14,820
	11	P. d. Popa	0	360	4,100	4,460	0	700	6,120	6,820
	12	Manga	0	740	5,000	5,740	0	1,490	19,400	20,890
	13	Comuna 9	160	820	10,000	10,980	0	950	13,740	14,690
	14	Comuna10	0	100	3,000	3,100	0	150	4,430	4,580
	15	Comuna11	0	20	430	450	0	120	890	1,010
	16	Comuna12	0	230	2,380	2,610	0	280	4,630	4,910
	17	Comuna13	0	160	2,980	3,140	0	230	5,280	5,510
	18	Comuna14	0	140	3,240	3,380	0	200	5,260	5,460
	19	Comuna15	0	0	140	140	0	0	800	800
	20	Comuna16	0	140	2,350	2,490	0	530	4,290	4,820
	21	Comuna17	0	70	690	760	0	210	2,870	3,080
	22	Comuna18	0	300	2,430	2,730	0	390	4,080	4,470
	23	Comuna19	0	50	1,110	1,160	0	90	1,460	1,550
	24	N. Bosque	240	70	1,080	1,390	0	100	1,830	1,930
	25	V. Sandra	0	70	2,260	2,330	0	190	4,950	5,140
	26	Comuna21	0	180	6,090	6,270	0	300	8,530	8,830
	27	Comuna22	0	110	1,270	1,380	0	350	2,880	3,230
	28	Comuna23	0	170	2,870	3,040	0	350	4,800	5,150
	29	Comuna24	0	850	1,180	2,030	0	950	2,590	3,540
	30	Bosque	210	4,030	9,430	13,670	0	5,380	15,350	20,730
	31	M'nillo	0	0	500	500	0	0	500	500
	32	Ceballos	0	1,000	1,180	2,180	0	2,560	20,740	23,300
	33	A. Barato	230	3,670	2,340	6,240	0	6,990	3,990	10,980
	34	Comuna27	0	130	1,630	1,760	0	200	2,370	2,570
	35	Comuna28	0	20	510	530	0	20	590	610
	36	Comuna29	0	90	2,360	2,450	0	90	2,750	2,840
	37	Comuna30	0	40	1,420	1,460	0	70	2,010	2,080
	38	Comuna31	0	330	4,000	4,330	0	1,150	12,910	14,060
	39	Comuna32	0	300	2,110	2,410	0	390	3,940	4,330
	40	Comuna33	0	60	1,530	1,590	0	390	2,720	3,020
	U.A. Total	840	21,740	165,500	188,080	0	34,810	292,620	327,430	
Sub Urban Area	41	A. Grande	600	0	50	650	540	1,110	6,430	8,080
	42	P. Canoas	940	0	850	1,790	800	2,930	17,570	21,300
	43	Bayunca	640	70	400	1,110	560	4,700	2,930	8,190
	44	Masonal	270	20,000	380	20,650	240	41,930	9,920	52,090
	45	T. Bomba	310	160	1,370	1,840	300	370	3,620	4,290
	46	Sta. Ana	850	0	150	1,000	800	420	3,830	5,050
	47	Baru	80	220	270	550	60	230	370	660
	S.U.A. Total	3,670	20,450	3,470	27,590	3,300	51,690	44,680	99,670	
Study Area Total			4,510	42,190	168,970	215,670	3,300	86,500	337,300	427,100

(3) Physical Images of Urban Redevelopment Project

465. To determine the population and employment distribution, some studies are carried out about the physical image of urban redevelopment projects. Followings are summaries of the results (refer to Figure 6.2-3(1)-(3)).

a. Naval Base (26.4 ha)

a-1 Residential Sector (10 ha) 10 buildings

- for each building

Site area ; 10,000 m²
Building area ; 2,500 m² (building coverage 25%)
Total floor area ; 37,500 m² (total floor area ratio 375%)
Total area of dwelling units; 25,000 m² 66.7% of total

Number of dwelling units; 125 units (200 m² per unit)
Number of inhabitants ; 500 (4 persons per unit)
Net population density ; 500 persons per hectare
Number of garage and parking lots;

250 garages for residents (2 garages per unit)

75 parking lots for visitors (3 lots per each 5 units)

Area of garages and parking lots;

Indoor garages for residents: 7,500 m²

Outdoor parking lots for visitors: 2,250 m²

Area of recreation space for community use; 1,875 m²

(5% of total floor area)

a-2 Commercial Sector (12 ha)

Site area ; 120,000 m²
Building area ; 40,000 m² (building coverage 33.3%)
Total floor area ; 120,000 m² (3 stories on average)
Area of store space; 72,000 m² (60% of total floor area)
Number of persons engaged; 2,400 persons (30 m² per person)
Number of parking lots; 1,440 lots (1 for each 50 m² floor)
Area of parking lots; 43,200 m² (30 m² per lot)

Parking building, capacity 720 vehicles

Total area, 21,600 m², 5 stories

Outdoor parking lot, capacity 720 vehicles, area 21,600 m²

a-3 Business Sector (4.4ha) ... 4 buildings

- for each building

Site area ; 11,000 m²
Building area ; 4,400 m² (building coverage 40%)
Total floor area ; 35,200 m² (8 stories)
Area of office space; 26,400 m² (75% of total floor area)
Number of persons engaged; 7,000 persons (15 m² per person)
Number of parking lots; 528 lots (1 for each 50 m²

office space)

Area of parking lots; 15,840 m² (30 m² per lot)

Indoor parking lots; 3 stories added to the office building
for 450 lots (4,500 m² per story)