TABLE 6-11   NUMBER OF BUS FLEET (1981)

Operator	No. of Cupo (Buses)	No. of Buses Registered	No. of Buses Operated	Operating Ratio	Agerage Age of Buses
SICOTRAC	1,453	1,250	935	74.8%	11.6 years
COMMETRAP	137	80*	77	96.3%	7.4
SACA	34	34	27	79.4%	—
COTUM	136	30	17	56.7%	8.5
MOV. 20 NOV.	9	9	8	88.9%	1.0
Co. E. Indep.	—	42	24	57.1%	—
TOTAL	1,769	1,455	1,088	75.3%	

* Provisional
Source: ESTAMPA

TABLE 6-12   COMBINATION OF ENGINE AND CHASSIS (SICOTRAC SAMPLE)

Engine	Chassis								
	Ford	Chevrolet	Dodge	Intern	Blue Bird	G.M.C.	Fargo	Thomas	Total
Ford	8						1	3	12
Chevrolet		2					1	7	10
Caterpilar	19	2		7		1	6	5	40
Perkins	16	4	5	3	1	1			30
Trader	5				1	1			7
Intern				1					1
M. Benz							1		1
Detroit	5	1			2		2	1	11
Total	53	9	5	11	4	3	11	16	112

Source : ESTAMPA

TABLE 6-13   AGE COMPOSITION OF BUSES (in 1981, SICOTRAC)

AGE	NUMBER	PERCENTAGE
0 — 5 years	309	24.7%
6 — 10	295	23.6%
11 — 15	447	35.8%
16 — 20	85	6.8%
21 — 30	97	7.8%
31 —	16	1.3%
TOTAL	1,250	100.0%

Source : SICOTRAC

(5) Operation

Based on the average daily operation distance of 121 kilometers and the average operation speed of 20 kilometers per hour, daily operation hours is estimated at about 6 hours.

An interview with SICOTRAC drivers indicated that their average working hours (driving time plus recess time) is 11.8 hours. It is interesting to note that their working hours are concentrated in two extremes: Drivers working 4 hours or less accounted for 40%, while, on the other hand, those

working 16 hours or more, 30% (see Table 6-14). The number of drivers on duty reach the maximum in the morning peak hour, and drops to half of it after 18:00 (see Table 6-15).

TABLE 6-14 AVERAGE BUS DRIVER WORKING HOURS

Working Hours	Composition Rate
Less than 4	39.6 %
4.1 – 8	2.5 %
8.1 – 12	6.8 %
12.1 – 16	19.3 %
More than 16	31.8 %

Source : ESTAMPA

TABLE 6-15 THE HOURLY CHANGE IN NUMBER OF DRIVERS

Time	Number of Drivers
– 5 : 59 a. m.	76
5 : 30 – 7 : 29	120
7 : 30 – 9 : 29	133
9 : 30 – 11 : 59	124
12 : 00 – 3 : 59 p. m.	108
3 : 00 – 5 : 59	111
6 : 00 – 8 : 59	61
9 : 00 – 11 : 59	7
0 : 00 – a. m.	7

Source : ESTAMPA

(6) Route Revenue/Expenditure

Here, revenue and expenditure of bus operators on each route are reviewed using apparent cost, disregarding, as the operators seen to do, depreciation and opportunity cost. First, route revenue and expense are obtained from the result of the bus origin-destination survey, and route expense/revenue ratio is calculated. Next, the relationship between this route expense/revenue ratio and passenger density (the number of passengers expected per bus per each kilometer of route) is plotted (see Fig. 6-7), which showed that 4 passenger/kilometers can be conceived of as the break-even point. Then, a comparison of the transport demand/supply ratio and the route expense/revenue ratio is made, which indicates that the bus business will break even when demand is half the level of daily transportation supply capacity (see Fig. 6-8).

Many routes originating from San Miguelito or San Isidro are profitable. Unprofitable routes are those which serve in the Canal Area and Chilibre and Tocumen routes, which originate from an are with no substantial population concentration and are long.

Routes with a large quantity of passengers are those running through a large hinterland, namely those originating from Veranillo or Pedregal. The largest of such routes boasts as many as 38,000 passengers and many others have 30,000 passengers. Their frequency of operation is as high as 200 per day. These high demand routes are all profitable.

The above discussions are true only with regard to apparent cost, and, based on cost including depreciation and opportunity cost, all but a few exceptional routes are unprofitable.
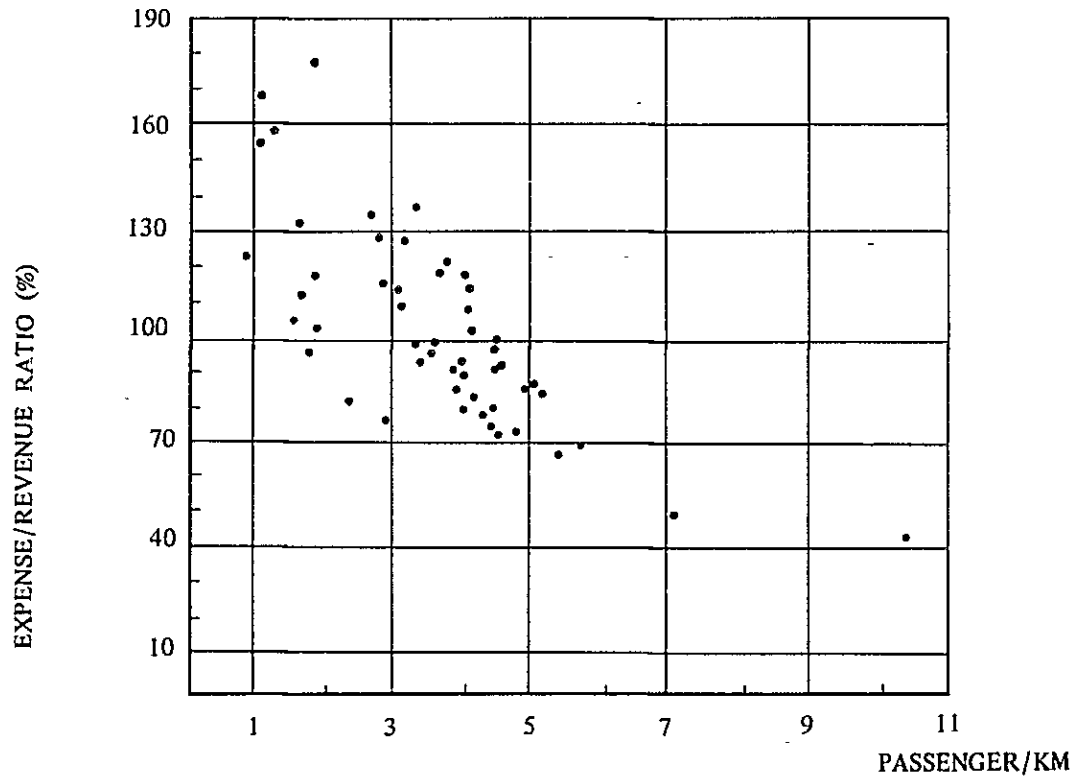
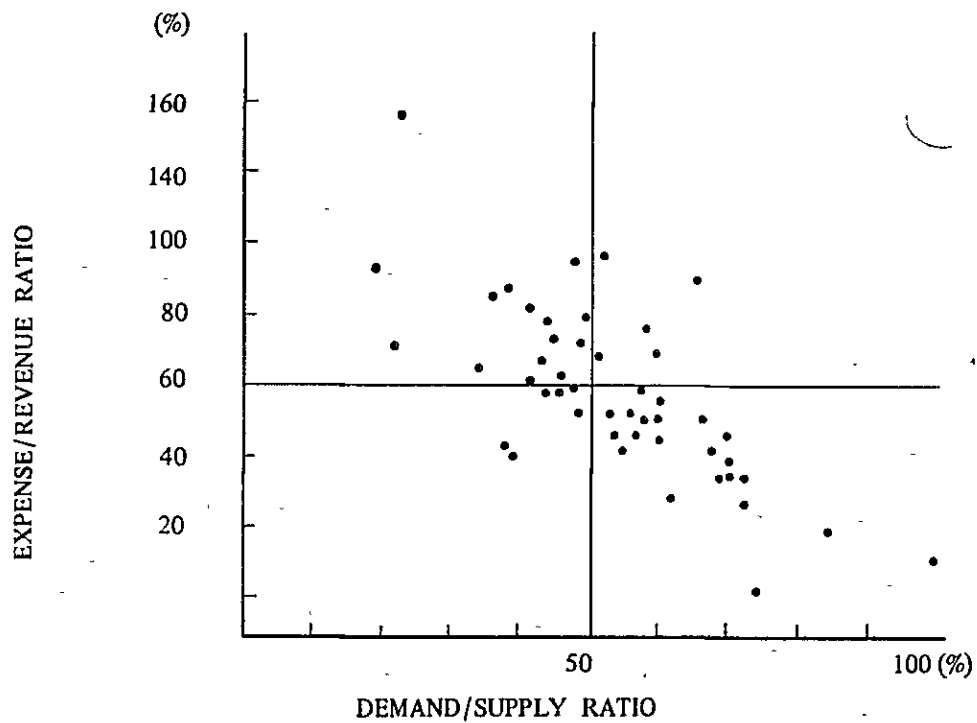FIG. 6-7 PASSENGER DENSITY AND EXPENSE/REVENUE RATIO

Source : ESTAMPA

FIG. 6-8 DEMAND/SUPPLY RATIO AND EXPENSE/REVENUE RATIO

(7) Operation Management and Facilities

The base of bus operation is the piquera (local suburban bus terminal), at which, in the case of SICOTRAC, a man keeps note of the starting time but each driver actually decides when to start and, in the case of COOMETRAP, the bus and the driver are controlled separately and buses are operated according to a schedule.

A distribution map of piqueras is presented in Fig. 6-9, and piquera facilities are summarized in Table 6-16. It is noted that many piqueras have no exclusive parking spaces.
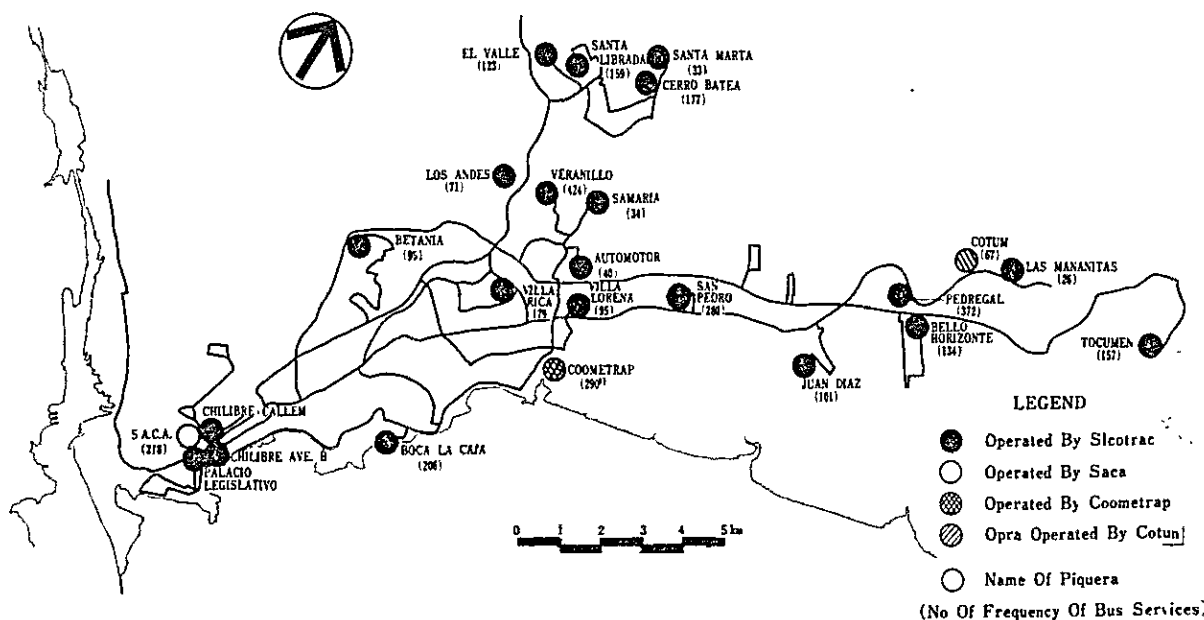
FIG. 6-9 LOCATION MAP OF THE PIQUERAS

(8) Maintenance

In the case of SICOTRAC, the annual maintenance expense is 5,352 balboas per bus, which is about 20% of total operation cost. The operating ratio of the fleet is 75%, as seen in the above.

It has already been pointed out that one of the causes for the high maintenance cost and low operating ratio is the absence of an effective maintenance system. SICOTRAC usually brings buses to corner garages for repair. COOMETRAP has its own garage but with an inadequate stock of repair parts. Periodical mechanical inspection of buses and parts inventory control are accomplished only by SACA.

5) Administration

(1) Major Authorities and Private Organizations

Bus administration is primarily in the hands of the Ministry of Government and Justice (Ministerio de Gobierno y Justica), under which is the National Guard (Guardia Nacional), whose subordinate organization is Traffic Police (Direccion Nacional de Transito Terrestre, DNTT). DNTT's role in bus administration covers bus registration, operation permit, mechanical inspection of the

TABLE 6-16 PHYSICAL CONDITIONS OF THE PIQUERAS

Piqueras		Parkings		Own Parking Surface			Physical Facilities					
		In Public Road	In Own Parking	Concrete	Asphalt	Earth	For Driver	For Cleark	Sanitary Service	Office	Waiting Room	Filling Station
SICOTRAC	Tocumen	O	O		O	O	O	O				
	Pedregal	O	O		O	O	O			.		
	Bello Horizonte	O	O	O		O						
	Juan Diaz	O	O		O	O		O				
	San Pedro**											
	Villa Lorena**									.		
	Villa Rica		O			O						
	Betania	O		O			O	O			.	
	Alcalde Diaz		O			O	O	O				
	Cerro Batea*		O		O		O	O	O	O	O	
	Santa Librada		O			O	O	O				
	El Valle	O	O		O	O	O	O				
	Veranillo	O			O							
	Samaria	O			O		O					.
	Auto Motor**											
	Los Andes	O			O		O					
	Boca La Caja	O			O		O					
	Palacio Legislativo	O		O								
Inde-pendiente	Chilibre Don Bosco	O			O							
	Chilibre El Puente		O			O			\			
COOMETRAP*			O			O	O	O	O	O	O	O
SACA *			O	O			O	O	O	O	O	
COTUM *			O			O	O	O	O	O	O	O
SANTA MARTA			O			O	O	O				

* : All facilities needed for the terminal are available.
** : Has no Piquera.
Source : ESTAMPA

bus, issuance of driver's license, and the exclusion of acts hindering bus operation. The Land Transportation Bureau (Direccion National de Transporte Terrestre, DINTRANT), which is under the same Ministry of Government and Justice, is responsible for the construction and maintenance of bus terminals, advice to the Price Adjustment Bureau upon the decision of bus fares, and the issuance of route franchise.

Central Panama de Trabajadores del Transporte (CPTT), a private organization of bus, truck, and taxi associations, helps to coordinate and adjust between land transportation operators on problems and tries to solve land transportation problems in cooperation with said two government agencies. Major private organizations under CPTTare Federacion Nacional de Conductores de Taxes

(FENACOTA), a taxi drivers' association, COOMETRAP, bus business cooperative, and SICOTRAC, a syndicate of bus owners and drivers.

(2) Route Franchise Procedure

The route franchise procedure followed by SICOTRAC, which has a market share of just under ·90%, is described hereunder.

The action is initiated by the SICOTRAC member who wishes to obtain a route franchise (cupo) by his filing an application for the cupo with SICOTRAC, which, with CPTT consent, submits the application for cupo to DINTRANT. When DINTRANT grants the cupo, it is issued to SICOTRAC for delivery to the applicant member.

Once the cupo is obtained, the member may continue the route operation as long as he wishes to, and with complete freedom with regard to daily operating hours, bus maintenance, and whether the member himself will drive the bus or rent it to a driver. The only limitation is that he may not change the route without the permission of SICOTRAC. The only initiative on the part of the government is the mechanical inspection of buses (lights, brakes, wheels and steering wheel) by DNTTT, but the inspection has little effect.

Thus, the bus transport business is conceived of and actually operates as a private industry, and the government has little tools of supervision over the industry.

CHAPTER 7.

TRAFFIC MANAGEMENT

7. TRAFFIC MANAGEMENT

1) Traffic Regulation

(1) One-Way Streets

One-way streets are limited to Centro and Bella Vista Zones; in particular, half of the streets in Corrgimientos de San Felipe, El Chorrillo, and Santa Ana are designated as one-way. Enforcement of one-way streets in these areas, covered by a network of narrow streets, aims at the expansion of the overall traffic capacity of the network. However, in absence of a strict enforcement against curb parking, the intended effect is not being achieved. Also, one-way street signs are very few in number to the extent that traffic safety is being impaired.

Arterial one-way streets are Ave. Frangipani, Ave. J. F. de la Osa, and Via Jose D. Espinar, all connecting to Via Simon Bolivar. Also, Ave. Central and Ave. Peru, which connect to Via Espana, are a pair of one-way streets serving as the arterial in Corregimiento de Calidonia. In the vicinity of 5 de mayo, they merge into a two-direction 4-lane road due to the network configuration, causing traffic congestion.

A map of one-way streets is presented in Fig. 7-1.
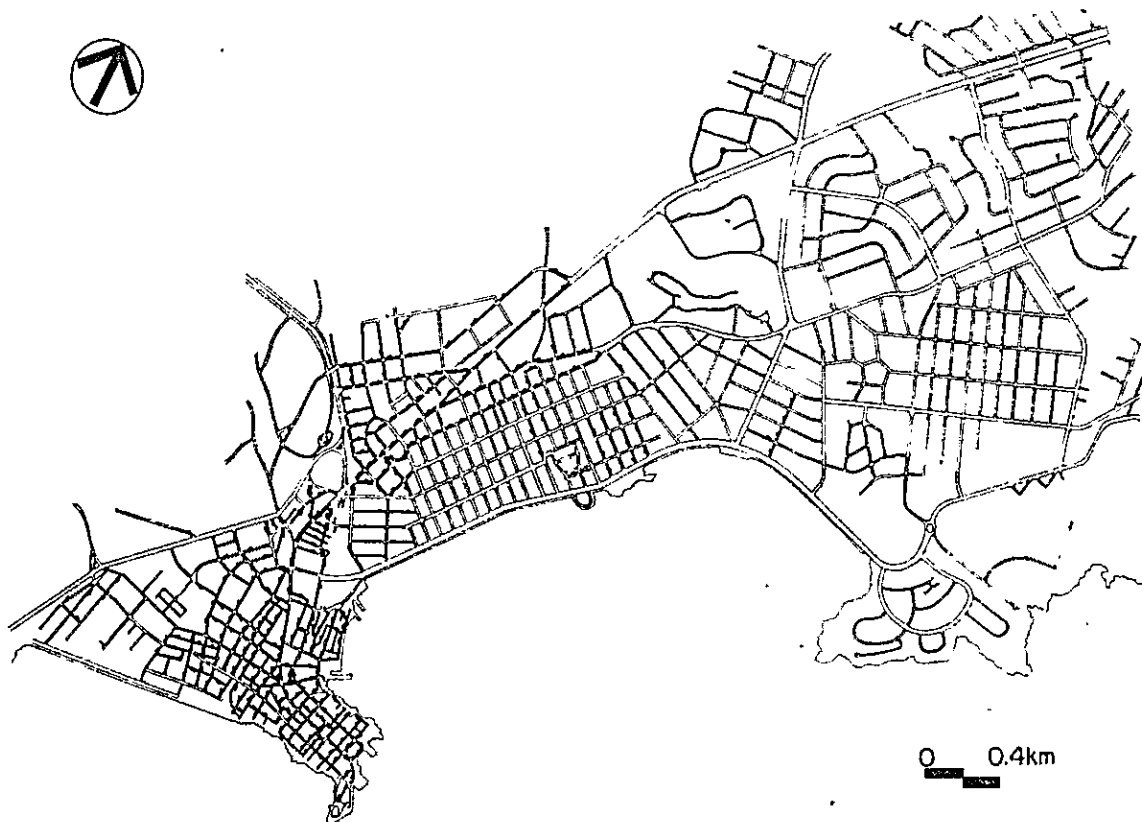
FIG. 7-1 ONE-WAY STREETS

Source : ESTAMPA

(2) Speed Limits

On arterials in Panama Urban Area, speed limits are 30 to 40 kilometers per hour in the central part and 40 to 60 kilometers per hour in the perimeter parts. The speed limit is set at 60 kilometers per hour on roads handling a large quantity of traffic, such as Via Ricardo J. Alfaro, Via Simon Bolivar, and Ave. Balboa. It is designated at 50 kilometers per hour on parts of Via Espana outside the urban center, Calle 50, Via 11 de Octubre and Via Brasil. The limit is set at 40 kilometers per hour in the urban center part of Via Espana and on Ave. Central, Ave. Peru, Ave. Justo Arosemena, Via Federico Boyd, and Via Manuel Espinosa Batista, and it is 30 kilometers per hour on Ave. A and Ave. B. Narrow streets have a limit of 25 kilometers per hour (or 15 miles per hour) (see Fig. 7-2).
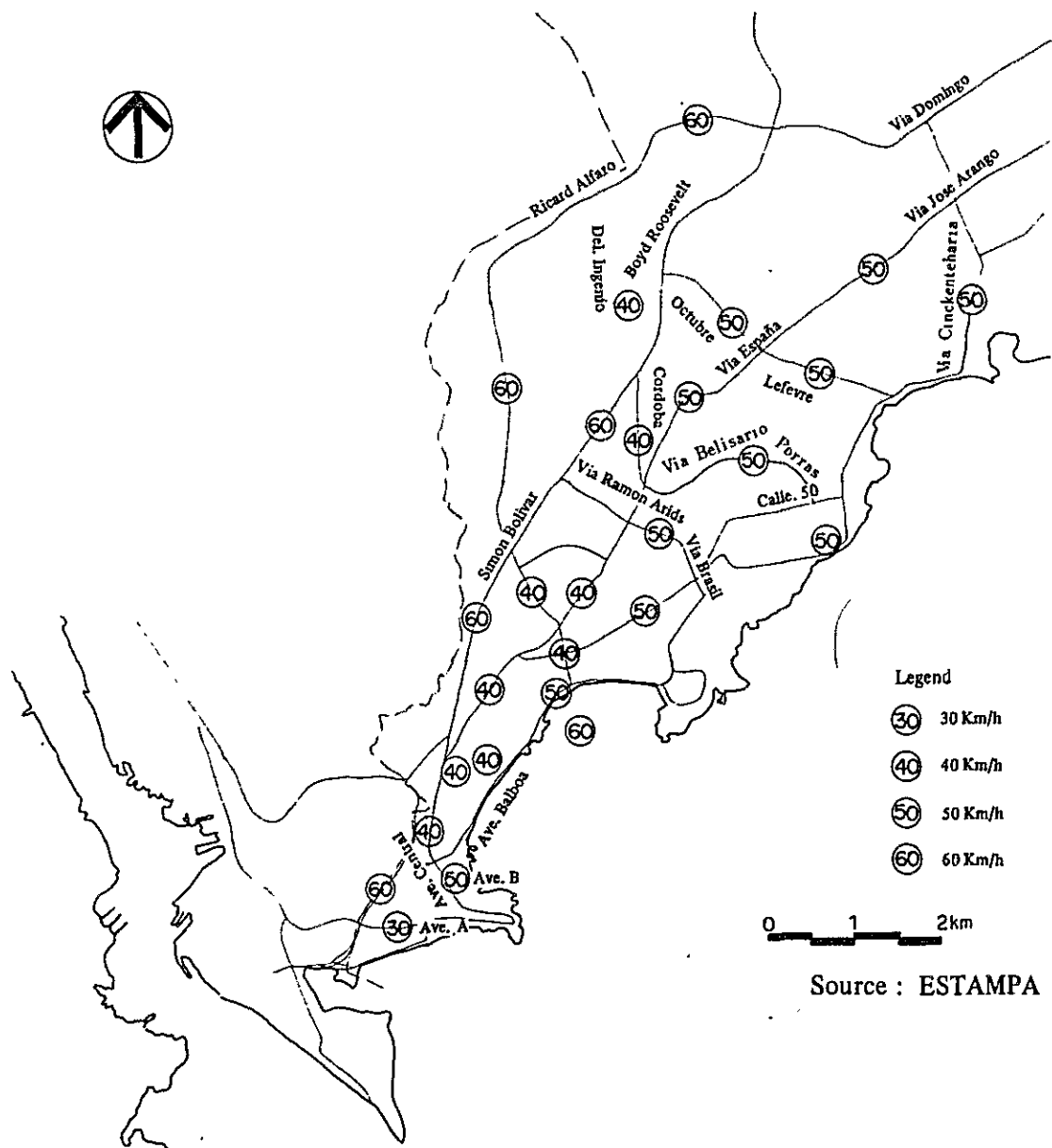
FIG. 7-2   SPEED LIMITS

Speed limit signs need improvement: generally the signs are scarce and what signs posted are a mixture of those expressed in kilometers and those in miles. Also, the speed limits of 50 or 60 kilometers per hour seem to be too high in some road sections, in view of their road structure, traffic volume, intersection intervals, and the frequency of traffic accidents, and, therefore, it would be desirable that these limits be lowered, as traffic volume will increase in those sections in the future.

(3) Curb-Parking Controls

Intensified curb-parking controls are enforced in the Centro Zone (see Fig. 7-3). Curb-parking control rate is 39% in the Centro and Bella Vista Zones, while it is about 60% in Corregimientos de Calidonia and Curundu. Such rate is about 50% in El Chorrillo and Santa Ana, as well as in Obarrio (P. T. Zone 8), and ranges from 10% to 15% in all other areas.

Legend

— All Day
—— Parking Meter
— Time Limit
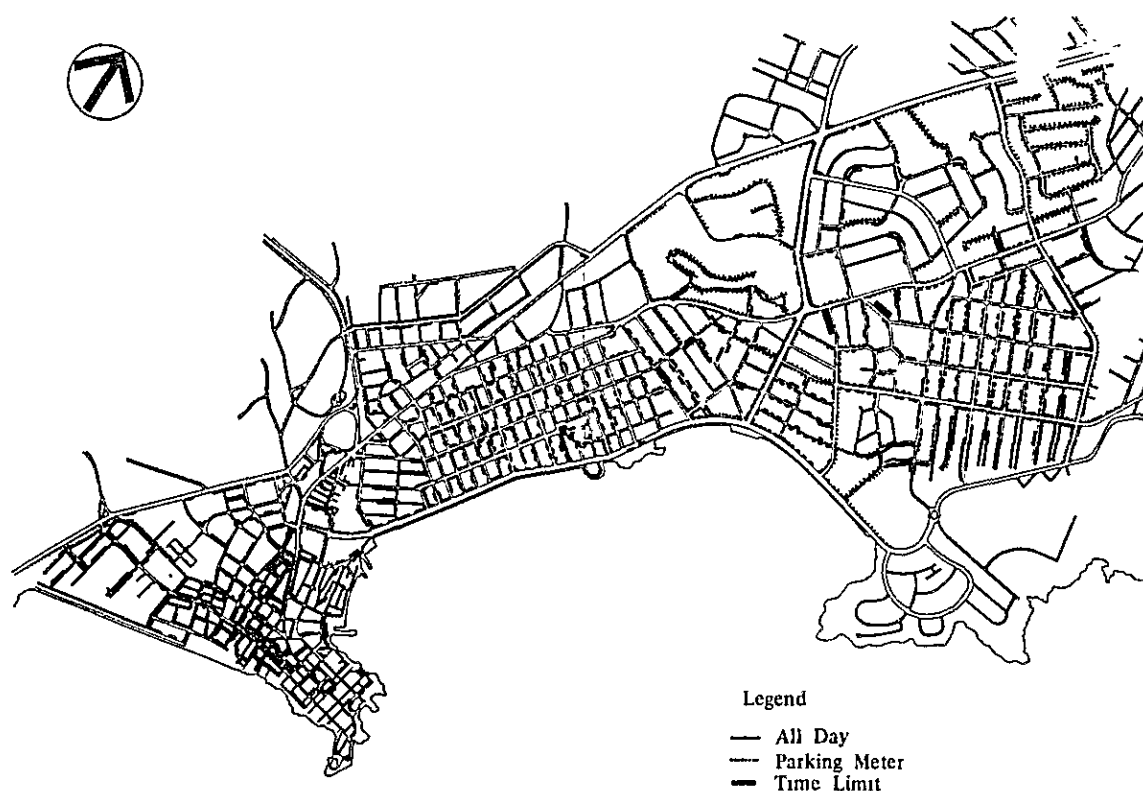
FIG. 7-3 ROADS WITH RESTRICTED PARKING

2) Road Signs and Markings

(1) Information Signs

While signs giving route directions, distanres, and so forth are inadequate except on Via Simon Bolivar, but signs giving the name of the roads are fully equipped throughout the arterial roads and narrow streets.

(2) Directive/Control Signs

o "No Parking" signs: few exist; only markings on curb stone are seen.

o "Stop" signs: Relatively abundant, due to a large number of intersections without traffic control signals (see Fig. 7-4), but needed stop signs are missing from some intersections with ambiguous priority right.

o "Pedestrian crossing" signs: many seen along Via Espana and in Corregimientos de Calidonia and Santa Ana, but, with a sign, pedestrians may often not be able to exercise their priority right, while, on the other hand, pedestrians were observed to cross even where signs are not installed.
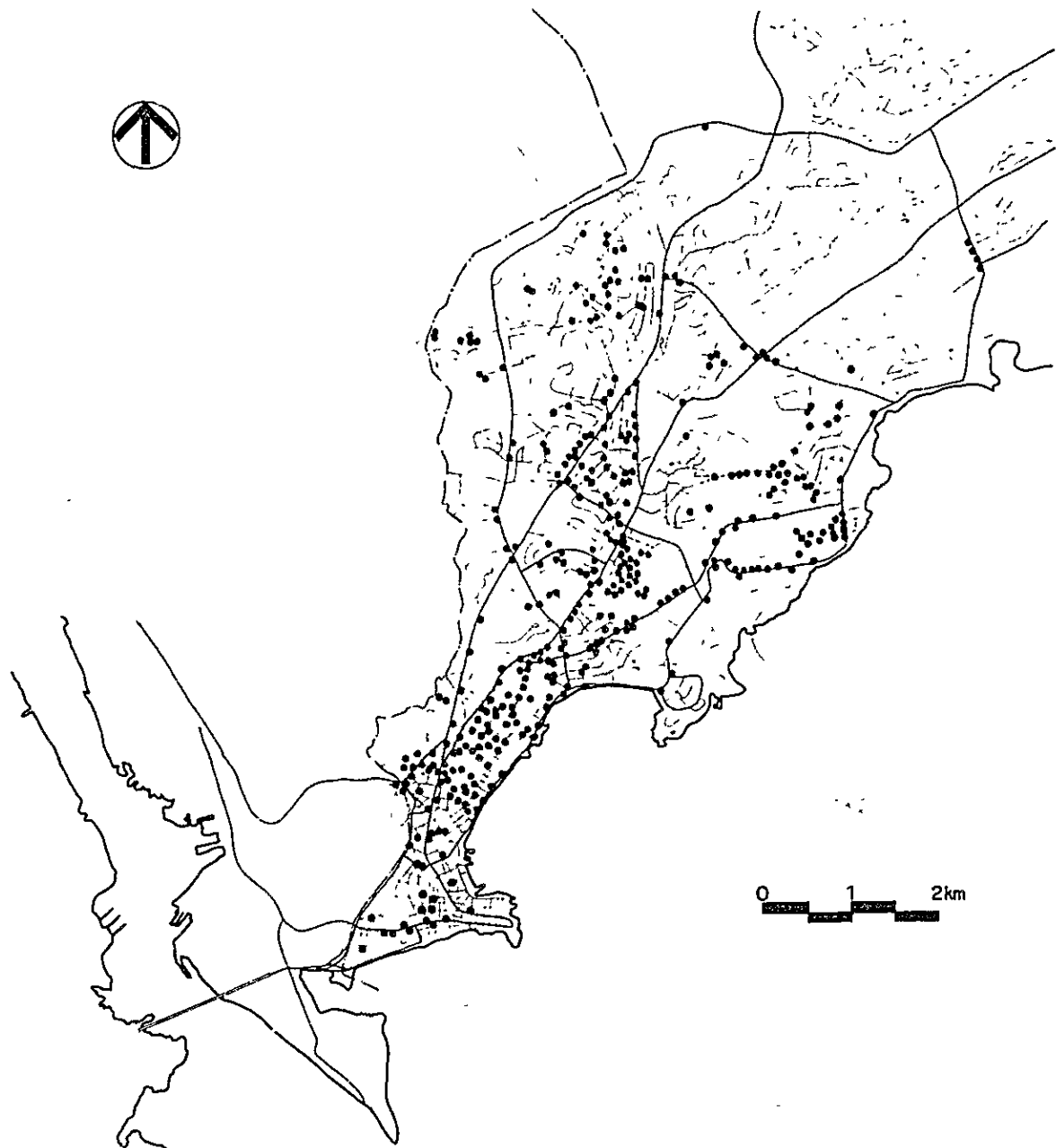
FIG. 7-4 LOCATIONS OF STOP SIGNS

FIG. 7-5 EXISTING SIGNALIZED INTERSECTIONS

Source : D.N.T.T.

○ Speed limit signs are also few in number.

○ "School Zone" signs: seen installed in areas where schools are concentrated.

It may be generally pointed out that traffic signs are ambiguous, insufficient in number, and need improvement in how they are managed, and that enforcement of traffic regulations indicated by the signs is inadequate. A traffic sign system should be developed in the future, if the number of traffic accidents is to be minimized.

3) Traffic Signals

In Panama Urban Area, a total of 54 intersections are signal-controlled, many of them occurring on Via Espana, Via Simon Bolivar, Calle 50, and streets in Centro Zone (see Fig. 7-5).

Most of these signals are multi-phase fixed cycle signals allowing the traffic to proceed only in one direction at each phase and, therefore, the cycle length is relatively long, at 100 to 120 seconds. A green arrow tells the traffic to proceed. Right-turns are allowed even at a red light at most intersections. Traffic signals are often hard to find, because their lighting fixtures are insufficient and their supporting poles are short. Also, because inadequate signals are installed at each intersection, the signal indication is sometimes difficult to read, depending on the viewing angle of the driver.

The existing traffic signals are pre-timed and cannot be actuated or adjusted in accordance with traffic. Therefore, they are manually operated by a policeman to cope with the severe traffic conditions during the morning, noon, and evening rush hours. The manual operation of signals, however, results in a longer cycle time and a difficulty in synchronizing two or more intersections, which, in turn, bring about longer waiting lines of vehicles at intersections and prolonged travel time. Normal hour signal phase scheduling is not proper and need improvement at some intersections. Also, the existing non-synchronous signal control is short of achieving effective traffic management betwen closely positioned pairs of intersections.

Traffic flow on arterials are seen to be disturbed by traffic frequently merging from smaller roads at intersections without a traffic signal. Signals should be installed at such intersections if order of traffic is to be restored.

In view of the above, improvement and development of an adequate traffic signal system is an objective to be achieved in the short terms, in consideration of the increasing traffic volume.

4) Areas with Compounded Traffic Problems

Each arterial street was evaluated for the capacity of signaled intersections, traffic flow at such intersections, pedestrian crossing practices, degree of congestion at bus stops, traffic entry to and from narrow streets, left-turn vehicles, traffic accidents, parking situation, and road structure (see Table 7-1).

The road sections in which the number of these items is evaluated as poor and areas in which such items are ubiquitous—namely, particularly, Via Espana and Centro Zone—have been identified as traffic management problem areas (see Table 7-2).

TABLE 7-1 CRITERIA FOR EVALUATION OF TRAFFIC CONDITIONS

Cause of Existing Traffic Problems	Criteria	Standard	Evaluation
1. Signalized Intersection	Average Travel Speed during Rush Hour Waiting Time at Signalized Intersection Average Travel Speed during Rush Hour	−Under 10 Km/h[1] −Above 60 Seconds (with Jam)[1] −Under 20 Km/h	Serious Tolerable
2. Improper Pedestrian Crossing	Frequency of Test Car's Stop due to Pedestrian Crossing − Do. −	−Above 6 Times/8 Round Trips[1] −Under 5 Times/8 Round Trips[1]	Serious Tolerable
3. Jamming at Bus Stop	Frequency of Test Car's Stop by Jamming at Bus Stop. Frequency of Test Car's Stop by Jamming at Bus Stop	−Above 6 Times/8 Round Trips[1] −Under 5 Times/8 Round Trips[1]	Serious Tolerable
4. Traffic Merging from Minor Road	Frequency of Test Car's Stop due to Traffic Merging from Minor Road. − Do. −	−Above 6 Time/8 −Under 5 Times/8 Round Trips[1]	Serious Tolerable
5. Left-Turn Vehicles	Frequency of Test Car's Stop in Left-Turn Vehicles − Do. −	−Above 6 Times/8 Round Trips[1] −Under 5 Times/8 Round Trips[1]	Serious Tolerable
6. High Frequency of the Occurrence of Traffic Accident	Yearly Accident Rate by Rout (Accident/100M) or, Frequency of Yearly Accident at Intersection Frequency of Yearly Accident at Intersection	−Above 10.0 −Above 50. −Under 49.	Serious Tolerable
7. High Parking Density & Heavey Traffics on Minor Road	Parking Rate on Street (Demand/Capacity) Average Travel Speed during Rush HOur	−Above 50%[2] −Under 10 Km/h[1]	Serious
8. Demand/Capacity at Signalized Intersection	Traffic Congestion Rate at Intersection (Demand/ Capacity)	−Above 1.0[2]	Serious
9 Physical Condition	Width of Road Way Lateral Clearance Sidewalk	−Under 11.0M −Under 1.0M −Under 2.0M	Serious

Note: 1) Based on Travel Time Survey
       2) Based on Parking Survey

TABLE 7-2 EXISTING TRAFFIC PROBLEMS BY LOCATION

Area and Location	Average Travel Speed km/h (Section Wise, Minimum)	High Frequency of the Occurrence of Traffic Accident	Signalized Intersection	Improper Pedestrian Crossing	Jamming at Bus Stop	Traffic Merging from Minor Road	Left turn Vehicles	High Parking Density and Heavy Traffic on Minor Roads	Demand 1.0 Capacity at signalized Intersection	Physical Condition
1 VIA ESPAÑA										
Via Cincuentinario – Via 11 de Octubre	~30	●		O		O	O			
Via 11 de Octubre – Via Fernandez	~20	●	O	O		O	O			
Via Fernandez – Via Porras	~10	●		O	O	O			●	
Via Porras – Via Brasil	~10	●	●	●	●	O		●	●	
Via Brasil – Via Federico Boyd	~10	●	●	●	●	●	●	●	●	
Via Federico Boyd – Via Justo Arosemena	~10	●		●		●	●		●	
Via Justo Arosemena – Calle 29	~20			O	O	O				
Calle 29 – Plaza 5 de Mayo	~10	●		●	●	O		●		
2 AVE CENTRAL										
Plaza 5 de Mayo – Calle 7	~10	●		●	●	●		●	●	●
Calle 7 – Calle 12 0	~10	●	●	●	O	●		●		O
Calle 12 0. – Calle 1	~20	O				●	O			●
3 AVE PERU										
Calle 25 – Calle 43	~10			●		●				●
4 AVE JUSTO E. AROSEMENA										
Plaza 5 de Mayo – Via España	~10	●	●		O	●			●	
5 AVE. A										
Calle 1 – Calle 12 0.	~20	O			O	●		O	●	
Calle 12 0 – Ave Martires	~20	O			O	●	●	O	●	
6 AVE. B										
Calle 12 0 – Calle 7	~20	●			O	●			●	●
Calle 7 – Plaza 5 de Mayo	~10	●	●		O	●			●	
7 VIA SIMON BOLIVAR										
Ave José Espinar – Via Manuel Espinosa	~10	●	●							
Via Manuel Espinosa – Via Arias	~20	●	O							
Via Arias – Via Fernández	~10	●	●					●		
Via Fernández – Via 11 de Octubre	~10	●	●					●		
Via 11 de Octubre – Via Domingo Díaz	~10	●	●					●		
8 VIA RICARDO J ALFARO										
Via Simon Bolivar – Calle El Paical	~10	●	●				O			
Calle El Paical – Calle De Ingenio	~10	O	●							
Calle Del Ingenio – Via Transistmica	~20	●	O							
9 AVE. BALBOA										
Ave Central – Via Federico Boyd	~20	●	O		O			●		
Via Federico Boyd – Via Brasil	~20	O	O	O	O					
10 VIA ISRAEL										
Via Brasil – Calle 50	~20	O			O					
Calle 50 – Via Lefevre	~40				O					●
11 VIA CINCUENTENARIO										
Via Lefevre – Via España	~20				O	O				
Via España – Via Domingo Diaz	~30					O				
12 CALLE 50										
Ave. Justo Arosemena – Via Federico Boyd	~10	●				O	●		●	
Via Federico Boyd – Via Brasil	~10	●					●	●		
Via Brasil – Via Israel	~10	O	●	O		O		●		
13 VIA FEDERICO BOYD										
Ave Balboa – Calle 50	~20	●	O		O	O	●			
Calle 50 – Via España	~10	●	O			O	●	●		
14 VIA MANUEL ESPINOZA										
Via España – Via Simon Bolivar	~10	●	●	·	O			O		
15 VIA FERNANDEZ DE CORDOBA										
Via España – Via Simón Bolivar	~20	●	O	O	O					
16 VIA BRASIL										
Via Israel – Via España	~10	●	●					●		
17 VIA R. ARIAS – CALLE EL PAICAL										
Via España – Via Simón Bolivar	~10	●	O				O			
Via Simon Bolivar – Via Ricardo J Alfaro	~10	O	●							
18 VIA BELISARIO PORRAS										
Calle 50 – Via España	~10	●	●		O	O				
19 VIA ERNESTO T LEFEVRE										
Via Cincuentenario – Via España	~20	O		O	O	O	O			
20 VIA 11 DE OCTUBRE										
Via España – Via Simon Bolivar	~10	O	●					●		
21 CALLE EL INGENIO										
Via Simon Bolivar – Calle Santa Librada	~30				O					·
Calle Santa Librada – Via Ricardo J Alfaro	~30									
22 AVE DE LOS HARTIRES										
Ave A – Calle 22 B	~20	O			O					
Calle 22 B – Ave 12 A	~10		O							
23 AVE. L" A										
Via Simon Bolivar – Gaillard Highway	~20	O		O						
24 VIA JOSE D ESPINAR										
Via Simón Bolivar – Gaillard Highway	~20						●			
25 VIA DOMINGO DIAZ										
Via Transistmica – Via Cincuentenario	~10	●	●	O			●			

Source : ESTAMPA

PART II

FORCAST AND PLAN
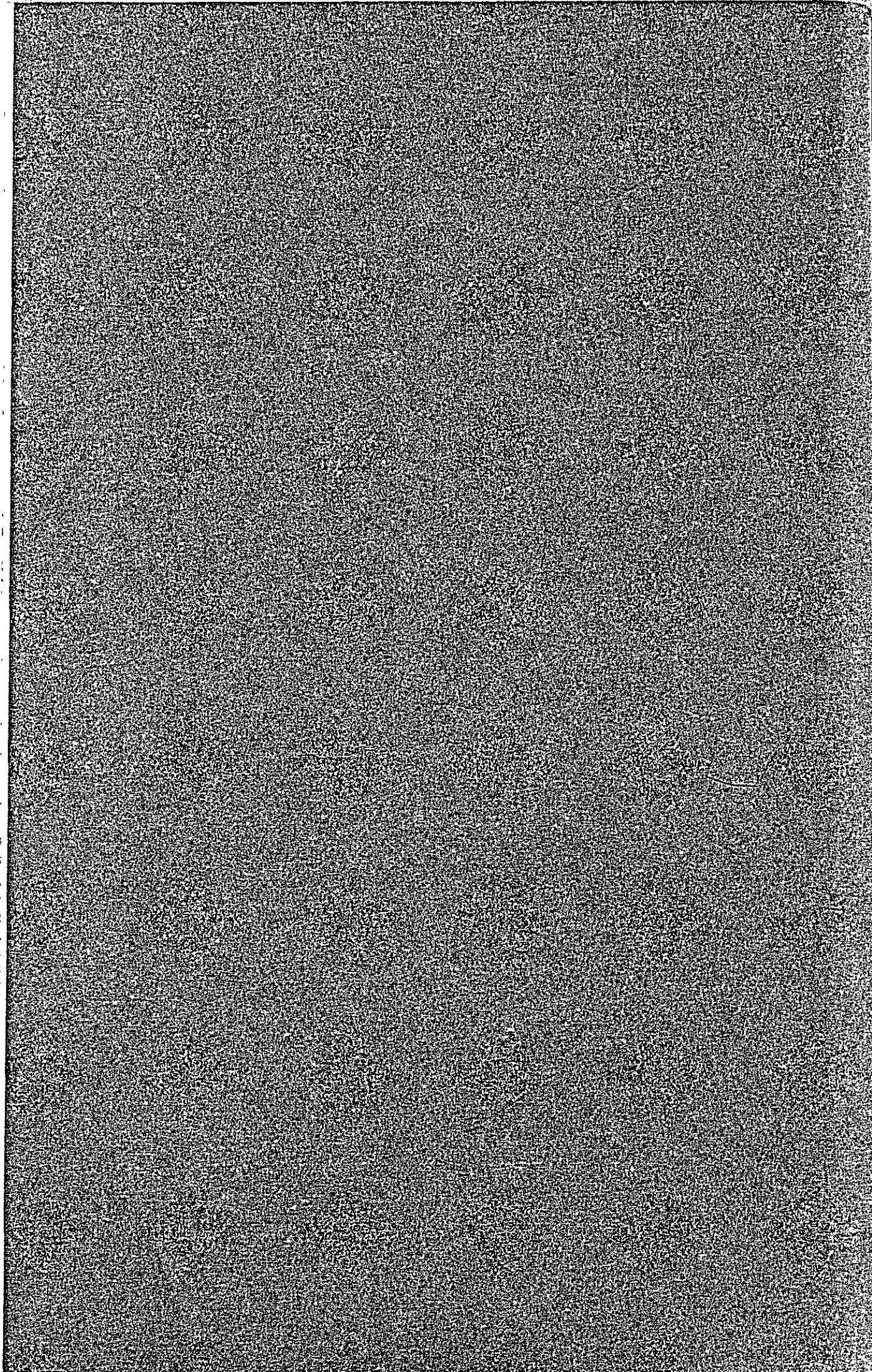
INTRODUCTION OF THE PART II
PROBLEMS TO BE SOLVED

In PLANNING PART, future problems are predicted from the current problems identified in ANALYSIS PART, and plans are recommended for preventing such problems from actually occurring or for minimizing the impacts of such problems.

Land use will change as follows. Housing area will expand in the periphery of Panama Urban Area. Low population density urbanization will spread from developable land in the vicinity of built-up area outward, forming a conurbation. Urbanization will particularly be rapid in San Miguelito District and the reverted area in Corregimiento de Ancon. Inside Panama Urban Area, on the other hand, population will continue to shrink in Centro, while high rise apartment house buildings will increase in vacant lots and conversion of low rise house buildings into stores and offices will be accelerated in Bella Vista.

As a result of uninterrupted flow of population and economic activities into Panama City, land price will rise vehemently and the acquisition of houses at desirable locations will become difficult; submerged areas, steep hills, and other land unsuitable to urbanization will be utilized for buildings, and houses will be built in the catchment area, aggravating the contamination of Alajuela Lake, the source of water supply to Panama City. Apartment houses will represent the majority of new house construction activities in Panama Urban Area, which because of speculative hoarding of land by landowners, will result in a vermicular development of land.

Of the problem that can be predicted from the above changes in land use, traffic problems have been identified and quantified. As a result, the followings are predicted.

—   According to the trend, traffic burden in the year 2000 will be 3.2 to 3.4 times the present level.

—   Particularly at the Bella Vista-Area Residencial cross-section, a transport demand in excess of 100,000 person-trips, or about twice the present level, will occur in 2000.

—   At Corregimiento de Santa Ana — Corregimiento de Calidonia cross-section and Corregimiento de Calidonia — Corregimiento de Balla Vista cross-section, transport demand will increase from the present 250,000 to 500,000 and from just under 400,000 to 700,000, respectively.

—   Transport demand to and from Panama Urban Area will exceed 1,000,000 person-trips.

—   The major mode of transport will shift from the bus (representing 44% of total motor vehicle trips in 1981 and 31% in 2000) to the car (35% in 1981, 51% in 2000)

—   The average length of trips by bus will be extended 9.6 kilometers to 13 kilometers, while that by car will be extended from 6.5 kilometers to 10 kilometers.

The current status of road traffic and public means of transport is reviewed in the light of such future traffic increase.

The existing public transport system in Panama is structured around buses. The current problem of bus transport system is, simply put, that the structure of bus service supply has failed to keep up with the development and modernization of Panama City. In more detail —

— Bus routes have been installed for the purpose of providing shuttle service between residential area and the city center, without any intention of forming a route network. New routes are always installed as shuttle lines connecting a new residential area with the city center. By nature, shuttle lines usually select the route which connect two terminal points with minimum of time and maximum ease of access and thus, converge onto arterials, but their route lengths become longer and longer as residential areas expand further away from the city center.

— The bus operation entity which is responsible for nearly all of the existing bus transport capacity, SICOTRAC, exercises very lax control on bus owners, and most of the bus owners rent out their buses, leaving bus operation at the whims of the drivers. As a result, the un-evenness of bus service supply distribution has exceeded the unevenness of demand distribution, as reflected by the capricious fluctuation of bus service level from hour to hour and by irrational allocation of buses to routes.

— Management data are unavailable, and the need thereof is not fully appreciated. As a result, detail facts about bus transport demand or bus operation business expenses are not known, as reflected by the crude process of fare revisions.

The problems of the road system can be summarized as follows:

— Historically, each development project resulted in the installation of streets in a defferent network pattern under the developer's phylosophy that streets are to serve only for serving internal traffic. As a result, urbanization has progressed as an accumulation of closed blocks of town with little continuity between them.

— Streets in Panama Urban Area took access to Via España, forming a herringbone with Via España as the spine. As a result, up traffic converges onto Via España, crowding it and its continuation Ave. Central.

— East-west arterials such as Via Transistmica, Ave. Balboa, and Via Ricardo J. Alfaro were installed in addition to Via España for the purpose of connecting said closed blocks of town (which have increased without a well developed road frame) with Centro. In contrast to relatively smooth east-west flow of traffic, thanks to the development of these arterials, the development of north-south arterials has lagged due to the difficulty of installing such arterials inevitably through individually developed residential areas and to the lack of recognition of the importance of north-south arterials.

Against the road network of a premature skeleton pattern and the premodern bus system, transport demand will double by the year 2000 in terms of person-trip. To meet this situation, isolated remedial projects will be insufficient. It is essential that an comprehensive and systematic approach is made based on an organic combination of various measures: curbing utilization of passenger car trips, improvement of public transport system, road network construction, and so forth.

Formulated, utilizing traffic assignment models and recommended hereunder, will be funda-mental road and fundamental transport plan as systems.

CHAPTER 8.

SOCIO.ECONOMIC FRAMEWORK
AND LAND USE

8. SOCIO-ECONOMIC FRAMEWORK AND LAND USE

1) Economic Future of the Republic and the Study Area

(1) Outline of Econometric Models

(i) Base and Structure of Model

Although the Panamanian economy has lost its previous growth momentum since the oil crisis, data on the period spanning across the oil crisis (a 11-year period from 1968 through 1978) were used as the base for the formulation of econometric models for predicting the future economic behavior of the Republic, because the model will lead to the identification of measures for economic growth to start from now — the present time as the turning point.

The key value to be predicted is Gross Domestic Products (GDP). The operand is government investments, limitations to which are public debts. In order that the models explain the relationships between these elements, their structure is divided into (1) economic sector, (2) income and expenditure sector, and (3) financial sector.

Units used in this Sub-Chapter will be million balboas in 1975 prices and 1,000 people, unless otherwise noted.

Economic Sector

GDP is measured in terms of expenditures, and only exports and gross government fixed capital formation are used as exogenous variables and all other expenditures as endogenous.

$$GDP \equiv C + I + X - M$$
$$C \equiv CG + CP$$
$$CG = 0.28011\ EX + 0.17303\ IG + 106.650$$
$$CP = 0.64416\ GDP - 47.140$$
$$I = IG + IP$$
$$IG = IG_{-1} \times (1 + R_{IG}) \quad {}^{1)}$$
$$IP = 1.05049\ (GDP_{-1} - GDP_{-2}) + 32.45393\ DM_1 + 239.888$$
$$X = X_{-1} \times (1 + R_X)$$
$$M = 0.80650\ GDP - 641.119$$

Exports (X) and gross government fixed capital formulation (IG) are calculated based on yearly growth rates. Consumption expenditures (C) is expressed as the total of government consumption expenditures (CG) and private consumption expenditures (CP). The total of government consumption expenditures and gross government fixed capital formation must approximate the amount of central government expenditures expecting the error to result from the public enterprise activities not being included in the latter. Therefore, government consumption expenditures is determined by using two explanatory variables: central government expenditures (EX) and gross government capital formation (IG). Private consumption expenditures is a function of GDP. Gross fixed capital formation (I) also consists of public sector and private sector. Private

Note 1)
Suffix "O" indicates the base year (1975) and suffix "−1" or "−2" indicates that the value of variable to which it is affixed is for one year or two years before the year of the dependent variable in the left side of the equation. This rule is valid for the equations in this Chapter.

investment (IP) is held as a function of GDP increase and estimated to increase by 1.05 times faster than GDP increase. DM_1 is a dummy variable to function from 1975.

$$MO = MO_{-1} \times (1 + R_{MO})$$
$$\ln L = 0.41878 \, (\ln GDP + 0.01124 \ln P + 2.913$$
$$NL = EP - L$$
$$NLR = NL/EP \times 100$$
$$LG = 0.70107L + 0.10880IG - 264.393$$

Petroleum and petroleum products import (MO) is calculated using average growth rate. For national population (P) and economically active population (EP), values calculated by using other models were input. Population at work (L), which is most affected by the level of economic activity and population increase, is held as a function of GDP and national population (P). Population not at work (NL) is the difference between economically active population and population at work, and unemployment rate (NLR) is the ratio of population not at work to economically active population. Population at work in government sector is held as a function of total population at work and government investment.

Income and Expenditure Sector

$$RV = DTAX + ITAX + CANAL + OTR1$$
$$DTAX = DT1 + DT2$$
$$DT1 = -0.12656L + 0.06918GDP + 24.603$$
$$DT2 = 0.00789IP + 9.772$$
$$ITAX = IT1 + IT2 + IT3$$
$$IT1 = 0.10576M - 0.12591X - 0.01302MO + 63.159$$
$$IT2 = 0.01904GDP + 0.01711P - 19.601$$
$$IT3 = 0.05891CP + 13.51684DM_2 - 49.631$$
$$OTR1 = 0.39264RV - 48.288$$

The central government revenues (RV) consists mostly of direct tax receipts (DTAX) and indirect tax receipts (ITAX). In addition, Republic of Panama has a peculiar revenue: canal annuity. Direct taxes are clasified into income tax (DT1) and other direct taxes including fixed property tax (DT2). Income tax is held as a function of population at work and GDP, and other direct taxes as a function of private investment. Indirect taxes are classified into customs tax (IT1), domestic transaction tax (IT2), and other indirect taxes (IT3). Customs tax is held as a function of export, import, and petroleum and petroleum products import, domestic transaction tax as a function of GDP and population, and other indirect taxes as a function of personal consumption expenditures. Other indirect taxes includes the consumption tax which was introduced in 1977 and, therefore, a dummy variable (DM2) is used as of 1977. Canal annuity is calculated separately for input. Other revenues is a function of total revenues.

$$EX = WAGE + INT + AMT + OTR2$$
$$EX = 0.39370GDP - 252.087$$
$$WAGE = LG \times LE$$
$$INT = INSTD + INTLD + RFD$$
$$AMT = RSD + RLD + RFD$$
$$OTR2 = EX - (WAGE + INT + AMT)$$

Total central government expenditures (EX) is determined by GDP. Government personnel

wage expenditure (WAGE) is arrived at by multiplying population at work in government sector (LG) by employment expense (LE). Interest payment (INT) and loan redemption (AMT) are determined by factors from private finance sector.

Financial Sector

$$F = EX - RV$$

$$F = SD + LD + FD$$

$$SD = SD_0 \times (1 + RSD_{-1})$$

$$SD = LD_0 \times (1 + RLD_{-1})$$

$$FD = F - (SD + LD)$$

$$SBK = SBK_{-1} + SD - RSD$$

$$LBK = LBK_{-1} + LD - RLD$$

$$FBK = FBK_{-1} + FD - RFD$$

$$RSD = SD_{-1} \times 0.2 + SD \times 0.8$$

$$RLD = LBD_{-1} \times \alpha_{RLD}$$

$$RFD = FBK_{-1} \times \alpha_{RFD}$$

$$INTSD = SBK_{-1} \times \alpha_{INTSD}$$

$$INTLD = LBK_{-1} \times \alpha_{INTLD}$$

$$INTFD = FBK_{-1} \times \alpha_{INTFD}$$

Required loan (F) is calculated as the difference between expenditues and revenues. The amount of loan is made up with short-term loan (SD), long-term domestic loan (LD), and long-term foreign loan (FD). For short-term loan and long-term domestic loan, ceilings are determined yearly based on yearly increases rates, RSD and RLD. Then, fund shortage is made up for with long-term foreign loan. Amounts of loan redemption are calculated, for short-term loan, under the assumption that 80% is paid back in the year in which the loan is taken out and the remaining 20% in the next year and, or long-term loans, under assumption that a given rate (α) of the cumulative total as of the beginning of year is paid in that year.

(ii) Model Fitness

The fitness of the formulated models has been tested by compairing the model "prediction" of economic fluctuations from 1972 to 1979 based on 1971 and 1972 data against the actual experience. The comparison result, shown in Table 8-1, indicates a high fitness of the models, except for expenditures. A lower fitness for expenditure is explained by the fact that government investment is used as the operand.

TABLE 8-1 FITNESS TEST

TABLE 8-1 FITNESS TEST (Million Balboas in 1975 Year Prices)

Item		1972	1973	1974	1975	1976	1977	1978	1979
Gross Domestic Products	A :	1758.3	1873.0	1922.1	1934.2	1928.1	2016.0	2146.8	2298.2
	M :	1878.5	2030.1	2029.4	1937.0	1905.9	2028.5	2244.3	2400.3
Consumption	A :	1298.3	1406.4	1574.4	1465.4	1432.7	1620.4	1646.3	1880.3
	M :	1450.3	1569.0	1562.2	1493.2	1470.8	1563.1	1726.8	1845.2
Fixed Capital Formation	A :	518.9	521.9	442.2	568.9	608.9	448.2	565.1	517.1
	M :	637.3	759.2	640.4	517.6	458.6	560.5	759.6	895.0
Net Borrowing	A :	143.2	184.0	204.5	148.0	158.0	83.9	85.8	222.7
	M :	167.9	182.7	209.7	208.7	211.8	201.4	194.7	185.3
Government Revenues	A :	268.1	287.5	284.3	297.1	270.9	318.6	380.6	436.2
	M :	319.3	364.1	337.5	302.0	286.8	344.9	436.5	507.2
Government Expenditure	A :	411.2	471.5	488.8	445.1	428.9	402.5	466.3	658.8
	M :	487.2	564.8	547.2	510.7	498.6	546.3	631.2	692.6

Note : A = Actual   M = Model Output
Source : IMF, IFS op., cit. and ESTAMPA

(2) Exogenous Variables

(i) Policy Variable and Manipulatable Environment Variables

The size of government investment is used as policy variable. In the decade from 1969 to 1979, government investment grew by an yearly average of 5.5% in real term. In 5-year period from 1974 to 1979, however, such growth rate was 4.1% per annum. Here, 4% is used as floor and 6% as policy effort target. Thus, calculation is done at 4%, 5% and 6%.

Growth in exports is used as manipulatable environment variable. This model uses export growth as an exogenous variable. Average annual rate of real growth in export was 5.4% from 1969 to 1979 and was 3.8% from 1975 to 1979. Here, calculation is done at 3%, 4% and 5%.

(ii) Canal Revenue

Republic of Panama has the following revenues from the Canal according to the Torrijos-Carter Treaty :

a) Transit cargo volume X 30 cents/Panama ton (PCNT)

Provided that this is in 1979 prices and is, therefore, escalated at American inflation rate. Here, American inflation rate is assumed to be the same as Panamanian inflation rate.

b) An annuity of $10 million

Here, this is discounted at the inflation rate of 8% per annum.

c) Bonus up to $10 million to be distributed when financial surplus is available.

Here, it is assumed that the bonus is paid every year, and the amount is discounted at the inflation rate of 8% per annum.

All the cases of a), b) and c) are in 1979 prices and, therefore, they are converted into 1975 prices respectively.

The volume of transit cargo is calculated as follows:

a)   The ceiling of transit cargo is determined:

The average carrying capacity of ships with 100-foot width (that is, 60,000 tons in the case of ore carriers and 35,000 tons in the case of containerized freighters) or larger was 36,620 Panama tons (1979 and 1980 data). Assuming that each ship carries 36,620 Panama tons and using the number of passable ships of 37 at the present and 48 after 1983,

Present: 36,620 x 37 x 365 = 494,553,100 Panama tons
After 1983:   36,620 x 48 x 365 = 641,582,400 Panama tons

b)   While considering this ceiling, the record level of Canal passage is projected toward future at a trend and estimate cargo quantity for each future year up to the year 2005.

$Y = -1,540.99 + 388.69 \ln X$ $(R^2 = 0.83)$
Where: X =   the last two digits of year number
              Y =   transit cargo volume (Panama tons)

From the above, Canal revenues are calculated as shown in Table 8-2.

The cost of the Canal operation is borne by Republic of Panama after the transfer of the Canal Area of the Republic (1979) under the new Treaty. However, such cost is accounted for as an administrative expense and, therefore, is not deducted from the above revenue.

TABLE 8-2   GOVERNMENT REVENUE FROM THE CANAL
(CASE OF MAXIMUM BONUS AND 8% OF INFLATION RATE)

(Million Balboas in 1975 Year Price)

Year	Annuity and Bonus	Panama Share of Canal Toll	Total	Year	Annuity and Bonus	Panama Share of Canal Toll	Total
78	2.3	—	2.3	92	0.6	52.7	53.3
79	2.3	—	2.3	93	0.6	53.7	54.3
80*	1.5	44.2	45.7	94	0.5	54.7	55.2
81	1.4	40.6	42.0	95	0.5	55.6	56.1
82	1.3	41.6	42.9	96	0.4	56.6	57.0
83	1.2	42.8	44.0	97	0.4	57.6	58.0
84	1.1	44.0	45.1	98	0.4	58.6	59.0
85	1.0	45.0	46.0	99	0.3	59.5	59.8
86	0.9	46.2	47.1	2000.	0.3	60.5	60.8
87	0.9	47.4	48.3	01	0.3	61.5	61.8
88	0.8	48.4	49.2	02	0.3	62.5	62.8
89	0.8	49.6	50.4	03	0.3	63.2	63.5
90	0.7	50.5	51.2	04	0.2	64.2	64.4
91	0.6	51.5	52.1	05	0.2	65.1	65.3

Note :   *New Treaty came into effect from this year
Source : ESTAMPA

(iii) Population

Population forecast by The Panama Statistics Bureau has been modified by ESTAMPA Team based on the result of 1980 population census (see 8-2) for detail). Economically active population has been forecast based on the past trend.

Values for the years not shown in Table 8-3 are interpolated; provided that for years 2001 to 2005 the curve for years 1995 to 2000 is extrapolated.

TABLE 8-3 NATIONAL POPULATION AND ECONOMICALLY ACTIVE POPULATION

(Person)

Year	National Population	Economically Active Population
1980	1,830,200	594,500
1985	2,010,600	688,800
1990	2,199,200	795,700
1995	2,387,900	911,700
2000	2,576,600	1,030,600

Source : ESTAMPA

(iv) Other Exogenous Variables

All other exogenous variables are projected on past trends. Details are presented in the Technical Report under "Economic Framework"

(3) Calculation Results

(i) Selected Cases

The cases of average annual government investment growth rates of 4%, 5% and 6%, as well as the cases of average annual export growth rates of 3%, 4% and 5% are used for calculation. The calculation of their impacts on GDP is summarized in Table 8-4.

TABLE 8-4 GDP BY CHANGE OF GOVERNMENT FIXED CAPITAL FORMATION AND EXPORTS

Government Fixed Capital Formation	Year	Export					
		3% Growth Case		4% Growth Case		5% Growth Case	
		Amount	Growth[2]	Amount[1]	Growth[2]	Amount[1]	Growth[2]
4% Growth	1990	2,982	(2.4)	3,135	(2.9)	3,305	(3.4)
	2000	3,701	(2.3)	4,103	(2.8)	4,594	(3.4)
5% Growth	1990	3,021	(2.5)	3,174	(3.0)	3,344	(3.5)
	2000	3,813	(2.4)	4,215	(2.9)	4,706	(3.5)
6% Growth	1990	3,064	(2.6)	3,217	(3.1)	3,388	(3.6)
	2000	3,950	(2.6)	4,352	(3.1)	4,843	(3.6)

Source : ESTAMPA   Note : [1] Amount (Million Balboas)
[2] Average Growth Rate, 1979–2000 (%)

When the past trends are projected, government investments are expected to grow by 5% and exports, by 4%. In view of rapid swell of labor force, however, the sustenance of a higher economic growth rate will be necessary. Therefore, 5% increase in government investments and 5% increase in exports are assumed for the basic case. (See Technical Report under "Economic Framework" for the result of calculation for cases other than basis case.)

(ii) Calculation Result

The result of calculation is summarized in Table 8-5.

TABLE 8-5   ECONOMIC FRAMEWORK

(Million Balboas in 1975 Year Prices)
(one thousand persons)

Item	Year				Average Growth Rate (1979–2000)
	1979	1985	1990	2000	
GDP	2,298.2	2,815.9	3,344.6	4,706.4	3.5 $^{(\%)}$
Consumption	1,880.3	2,159.6	2,565.2	3,626.1	3.2
Gross Fixed Capital Formation	517.1	1,052.8	1,255.4	1,660.9	5.7
Exports	923.1	1,237.8	1,579.9	2,571.4	5.0
Imports	1,116.7	1,629.3	2,055.9	3,154.1	5.4
Population	1,820.2[1]	2,010.6	2,199.2	2,576.6	1.6
Economically Active Population	594.5[1]	688.8	795.7	1,030.6	2.7
Population at Work	528.3[1]	558.2	600.4	694.1	1.4
Government Revenue	436.2	795.6	1,026.6	1,526.3	6.1
Government Expenditure	158.8	856.2	1,064.4	1,600.5	4.6
Investment for Development	180.4	241.9	308.7	502.9	5.0

Note : 1) Figures in 1980   Source : ESTAMPA

GDP growth rate is shown as 3.5%. Per capita GDP is shown to increase from the 1,254 balboas in 1979 to 1,825 balboas by the year 2000 at an average annual rate of 1.8%. Seen based on economically active population, it is to increase from the 3,869 balboas in 1979 to 4,567 balboas by the year 2000, in which case the average annual growth rate is only 0.8%.

The existing pattern that imports are greater than exports and that government expenditures are greater than government revenues will remain unchanged. However, it is expected that government finance will be improved in view of the 6.1% increase in government revenue and 4.6% increase in government expenditures.

Population increase is low at 1.6%, while economically active population increase is shown at 2.7% due to higher percentage proportion of youths.

Government's development investments are shown to grow by 5% per annum, which is lower than government revenue growth rate and, therefore, considered sound.

(4) Economies of the Study Area

The revenues and GDP of Republic of Panama are closely related with each other, needless to say. In fact, when tax revenues from 1975 to 1979 are "regressed" by GDP :

$$Y = 1205 \ EXP \ (0.00217 \, X) \qquad (R^2 = 0.9834)$$

Wherein: Y = GDP

X = Tax Revenue

On the other hand, the ratio of Panama Province tax receipts to national tax receipts fluctuated between 61% and 63% in said 5-year period. Assuming that the rate of increase in such ratio will be the same as rate of increase in the ratio of Panama Provincial population to the national population during the next 20 years, the ratio of Panama Province tax receipts to total tax receipts, calculated using the rate of increase in the degree of population concentration shown in Table 8-6, will be 67% in 1985, 71% in 1990, and 76% in the year 2000.

TABLE 8-6 POPULATION IN THE REPUBLIC OF
PANAMA AND PROVINCE OF PANAMA

				(Thousand Persons)
Population	Year			
	1980	1985	1990	2000
Republic of Panama (A)	1,830	2,011	2,199	2,577
Province of Panama (B)	830	979	1,129	1,410
Ratio of B to A	45%	48%	51%	54%

Source : ESTAMPA

Using these values, the forecast values of the whole-national economic model are distributed to Panama Province, as shown in Table 8-7. The Study Area, which is encompassed by Panama Province, represents 88% of the Provincial population (as of 1980) and a great majority of economic activities are carried out in the Study Area. Economic activities in Panama Province can be safely considered to practically represent economic activities in the Study Area.

TABLE 8-7 ECONOMIC FRAMEWORK OF STUDY AREA (Million Balboas)
(Thousand Persons)

Item	Year			
	1979	1985	1990	2000
GRDP	1,447.9	1,886.7	2,374.7	3,576.9
Regional Consumption Expenditures	1,184.6	1,443.6	1,821.3	2,755.8
Regional Gross Fixed Capital Formation	325.8	705.4	891.3	1,262.3
Population	732.8*	874.2	1,018.0	1,334.8
Economically Active Population	237.9*	299.3	368.0	533.4

* : Figures in 1980   Source : ESTAMPA

The Gross Regional Domestic Products (GRDP) of Panama Province is shown to increase from the 1,448 million balboas in 1979 to 3,577 million balboas by the year 2000, for an average annual increase rate of 4.4%. Per capita GRDP is shown to increase from the 1,976 balboas in 1979 to 2,680 balboas by the year 2000, at 1.5% per annum on the average.

Average annual rates of increase in gross regional fixed capital formation and in per capita gross regional fixed capital formation are both shown to be high from 1979 to the year 2000 at 6.7% and 3.6%, respectively.

Also from 1979 to 2000, regional consumption expenditures and per capital average of same are shown to increase by an average yearly rate of 4.1% and 1.2%, respectively.

In summary of the above, it is believed that the living of average people will remain on the present level, because, while both population and wealth will continuously concentrate in Panama Province, wealth concentration is not shown to proceed faster than population concentration.

2) Population Forecast

(1) General

The population of the Study Area is forecast for 1985, 1990, 1995 and 2000 by sex and by age bracket. Forecast is based on the following:

i) The national population forecast values are based on the existing data of the Republic Government. The details (birth rate, mortality rate, etc.) of the 1980 population census are not yet published, and it was impossible to reconstruct such details based only on the general information of the census that has been released. The national population forecast data that is published with highest precision is Proyeccion de la Poblacion de la Republica de Panama, por Sexo y Grupos de Edad: Años 1950 − 2000 (1978) by the Bureau of Statistics, Office of the Comptroller General. Therefore, this data is used with some modification for the forecast of national population.
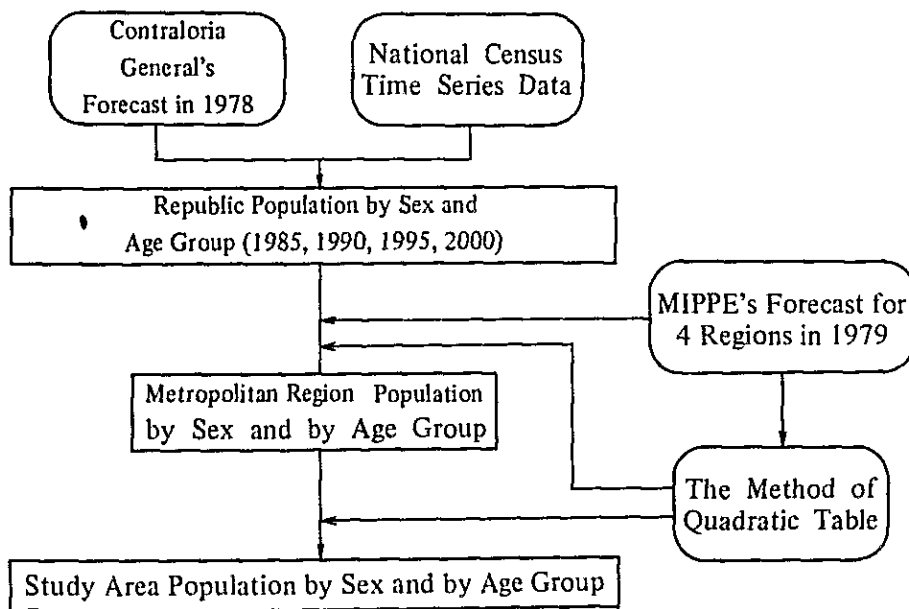
FIG. 8-1 STEPS OF POPULATION FORECAST

Source : ESTAMPA

ii) The national population forecast data is broken down to arrive at estimates for the Study Area. As shown in Figure 8-1, the population of the Study Area is arrived at by breaking down the national data by using a quadratic table, which is of the same kind of Frater method.

iii) Population at work is forecast by deducting unemployed population, estimated at the same unemployment rate as the present, from the future labor force, estimated by applying the labor participation rate established for each age bracket to the future population by age bracket.

(2) Total Population and Age Structure

(i) National Population Forecast

The national population forecast released by the Bureau of Statistics, Office of the Comptroller General in 1978 used five cases of estimated gross reproduction rate. The forecast is based on census statistics up to 1970 and the results of population surveys made by the Bureau in 1975 and 1976, as well as the results of birth rate surveys conducted by the Ministry of Welfare in 1975 and 1976. The forecast was made for mid-year (July 1st).

Subsequently the 8th National Census was taken on May 11th, 1980, and a preliminary figure of national population was released. This preliminary value is lower than any of the five cases previously estimated for 1980, even when allowance is made for the 2-month gap between May and July. In the absence of a dynamic population data such as birth rate for recent periods, it is presumed that this gap is explained by faster decline in birth rate than predicted.

Of the five cases used by the Bureau of Statistics, population curves for Cases I, II, and III follow a gradually accelerated path, in which 5-year population increments continue to swell after 1980. On the other hand, curves for cases IV and V follow a gradually decelerated path, in which population increases taper off (see Fig. 8-2). Inasmuch as the actual 1980 population is believed to have been lower than any of the estimates, future population curve is not believed to follow the former path — though neither is it believed that the curve will show sudden deceleration as in case V.

It is presumed that the population curve will come to an inflection point sometime between now and the year 2000 but will otherwise show only gradual changes with the curve more or less straight on both sides of the inflection point.

For the purpose of this Study, rather than making another forecast based on the detailed analysis of age structure and other dynamic population data, the linear regression curve was used for total population for the reason given above, and the composition ratios under case V were used for age structure of population.

Also, while the Bureau of Statistics forecast was for a mid-year date, this Study is based on figures as of May 11 of each year so as to be compatible with the 1980 population census.

The four-point data of the 1950 — 1980 population census were used for liner regression, from which the result presented in Table 8-8 were obtained.

The values of Table 8-8 were distributed by the composition ratios of case V in arriving at values by sex and by age group, as presented in Table 8-9.

Here, the population dynamics of the Republic as reviewed at the time of the Bureau Statistics estimate and the birth rate assumed for case V are briefly discussed, because it is believed that they characterize forecasts made in this Study.
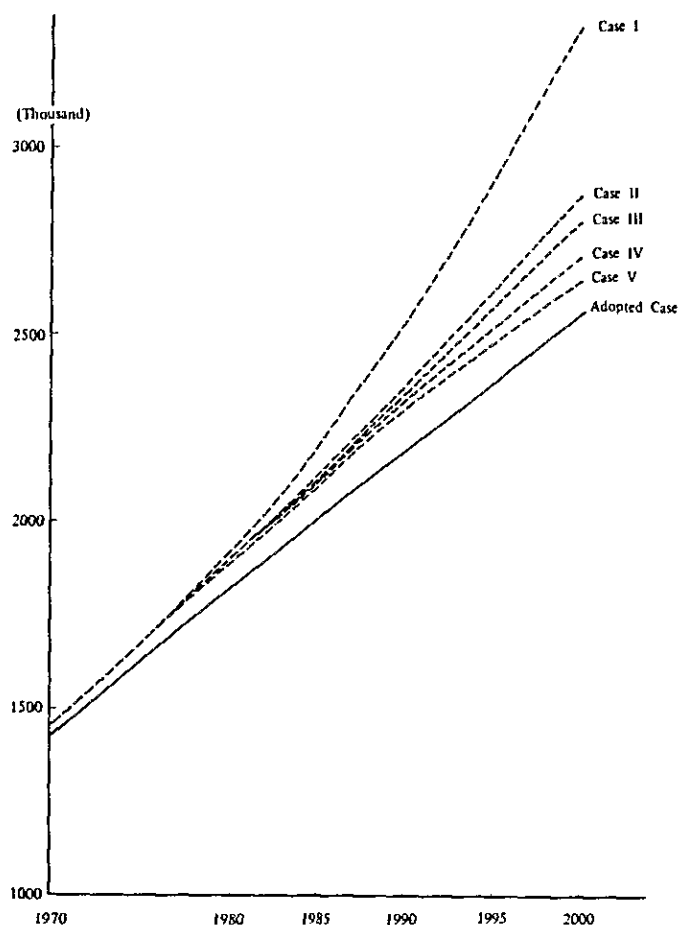
FIG. 8-2 FIVE CASES OF POPULATION PROJECTION BY CONTRALORIA GENERAL AND THE ADOPTED FUTURE POPULATION OF THE REPUBLIC

Source : ESTAMPA

TABLE 8-8 FUTURE POPULATION PROJECTION
THE REPUBLIC OF PANAMA

Year	Population
1985	2,011,000
1990	2,199,000
1995	2,388,000
2000	2,577,000

Note: The regression equation is:

$$y = 37732t - 1196600 \quad (R = 0.9986)$$

Where; y : population
t : year (1900 = 0)

Source : ESTAMPA

Birth rate declined from 1950 to 1975, as shown in Table 8-10: the 1950 gross reproduction

rate of 2.88 dropped by 0.70 point 2.18 in 1975, which in terms of (annual) birth rate was a reduction from 42.6 per 1,000 persons to 33.0 per 1,000 persons.

TABLE 8-9   TOTAL POPULATION BY SEX AND AGES CATEGORIES
THE REPUBLIC OF PANAMA

1. Male

Ages Categories	1980	1985	1990	1995	2000
0–4	129,759	127,672	125,571	121,305	118,264
5–9	125,001	125,460	124,916	123,692	120,325
10–14	114,935	122,444	124,257	124,409	123,932
15–19	101,757	112,793	121,398	123,932	124,963
20–34	88,214	99,725	111,721	121,066	124,447
25–29	75,037	86,254	98,526	111,276	121,356
30–34	60,396	76,386	85,330	98,142	111,565
35–39	50,330	58,910	72,355	84,770	98,167
40–44	40,630	49,058	58,060	71,876	84,511
45–49	34,956	39,206	47,943	57,071	71,113
50–54	28,917	33,577	38,047	46,803	56,169
55–59	25,073	27,344	32,109	36,535	45,347
60–64	21,047	23,122	25,511	30,087	34,526
65–69	16,289	18,497	20,673	22,924	27,311
70–74	10,432	13,270	15,395	17,432	19,582
75–79	6,040	7,640	9,897	11,701	13,398
80 and above	4,668	5,308	6,268	8,600	10,304
TOTAL	933,481	1,023,686	1,117,977	1,211,621	1,305,280

2. Female

Ages Categories	1980	1985	1990	1995	2000
0–4	125,733	123,851	121,838	117,962	115,172
5–9	121,158	122,243	121,838	120,827	117,748
10–14	110,177	118,423	120,518	121,066	120,840
15–19	96,816	106,963	116,779	119,872	121,098
20–24	83,822	94,899	106,663	116,529	120,325
25–29	71,560	82,234	94,127	106,500	117,233
30–34	56,918	69,968	81,372	93,844	106,927
35–39	47,219	55,693	69,056	80,950	94,044
40–44	38,617	46,042	54,761	68,533	80,904
45–49	33,858	37,598	45,084	54,205	68,279
50–54	27,636	32,772	36,727	44,415	53,592
55–59	23,792	26,540	31,668	35,818	43,544
60–64	19,949	22,317	25,071	30,326	34,268
65–69	15,923	18,095	20,673	23,401	28,342
70–74	10,981	13,873	15,834	18,148	20,870
75–79	6,589	8,645	10,996	12,895	14,944
80 and above	5,946	6,733	8,251	10,980	13,140
TOTAL	896,694	986,889	1,081,256	1,176,271	1,271,270
BOTH SEXES TOTAL	1,830,175	2,010,575	2,199,233	2,387,892	2,576,550

Source : ESTAMPA

In comparison with Central and South American Nations, the birth rate in the Republic of

Panama is lower than those in Mexico, Colombia, and Venezuela, while it is higher than those in Costa Rica and Argentina. In comparison with the United States, the Panamanian rate is slightly higher than twice the American rate.

Case V assumed the following future declines in gross reproduction rate:

0.32 point 5-year decrements from 1975 to 1985
0.20 point 5-year decrements from 1985 to 1995
0.10 point 5-year decrements from 1995 to 2000

Under this assumption, gross reproduction rate will drop to 1.03 by the year 2000, which means that each female person will bear only one female child in a lifetime to continue reproduction, or the situation in early 21st century will be that every person will barely have a child to replace him or her. This is the situation which advanced nations have already reached, such as in the U.S., where gross reproduction rate is below 1.0, as shown in Table 8-11.

TABLE 8-10   GROSS REPRODUCTION RATE AND ANNUAL BIRTH RATE

1950 — 1975

	1950	1955	1960	1965	1970	1975
Gross Reproduction Rate	2.88	2.88	2.87	2.74	2.54	2.18
Annual Birth Rate	42.6	41.9	41.1	39.0	37.0	33.0

Source : Contraloria General, Proyecciones de la Poblacion de la Panama, por Sexo y Grupos de Edad :
Anos 1950–2000

TABLE 8-11   BIRTH RATE AND GROSS REPRODUCTION RATE
OF CENTRAL AND SOUTH AMERICAN NATIONS

PANAMA : 1975,   OTHER COUNTRIES: 1973

	Birth Rate	Gross Reproduction Rate
Mexico	45.8	3.15
Colombia	40.6	2.87
Venezuela	36.1	2.58
Panama	33.0	2.18
Costa Rica	28.5	1.88
Argentina	22.7	1.45
U.S.A.	14.9	0.92

Source : United Nations, Demographic Yearbook 1975

(ii)   Population Forecast for the Study Area

The value for the entire Republic was broken down by the quadratic table method to arrive at the future population of the Study Area (See Fig. 8-1).

MIPPE has forecast regional populations by dividing the entire Republic into four regions and using the Bureau of Statistics estimate as the framework. The Study Area covers a part of the Metropolitan Region (Area Metropolitana, comprising of Panama City and its vicinity on the Pacific side, and Colon City and its vicinity on the Atlantic side), which is one of the four

regions. So, in order to first define population flux into the Metropolitan Region, the MIPPE estimate was adjusted by the 1980 census data in arriving at Metropolitan Region population.

This was used as a framework for determining the Study Area portion of that population by the following equation.

$$\frac{P'_s}{P'_m} = \frac{P_s e^{(1+r_s)t}}{P_s e^{(1+r_s)t} + P_o e^{(1+r_o)t}} = \frac{P_s}{P_s + P_o e^{(r_o-r_s)t}}$$

where:

P'm	:	Future population of the Metropolitan Region
P's	:	Future population of the Study Area
Pm	:	Population of the Metropolitan Region in 1980.
Ps	:	Population of the Study Area in 1980.
Po	:	Population of the Metropolitan Region other than the Study Area in 1980.
r_x	:	Parameter representing population increase rate of area x during 1970—80.
t	:	Forecast year

Then, Metropolitan Region population as classified by sex and by age group was broken down to that for the Study Area in the same way as the national data was broken down into the Metropolitan Region Data (that is, by the quadratic table method). The results are presented in Table 8-12 and 8-13.

TABLE 8-12 FUTURE POPULATION OF AREAS CONCERNED

Area	1980	1985	1990	1995	2000
Metropolitan Region	901,700	1,059,600	1,216,400	1,380,600	1,554,500
Study Area	732,840	874,200	1,018,000	1,170,800	1,334,800

Source : ESTAMPA

The predicted demographic tree of the Study Area will shift from that of a pyramid shape to that of a barrel shape due to social increases and declines in birth and mortality rates. Child (0—14 years of age) population will drop from the 33% in 1985 to slightly over 25% by the year 2000, when working age (15—64) population will exceed two-thirds of total population at 68.5%. Aged (65 years or older) population will proportionally increase to exceed 6% by the year 2000.

(3) Worker/Employment Structure

(i) Workers by Industry

The number of workers (population at work) for each industrial sector was estimated through the following procedure:

A. Establishment of ratios of economically active population to total population by age group and estimation of economically active population.

B. Establishment of ratio of workers to economically active population and estimation

of total workers.

C. Review of worker trend and estimation of workers by industrial sector.
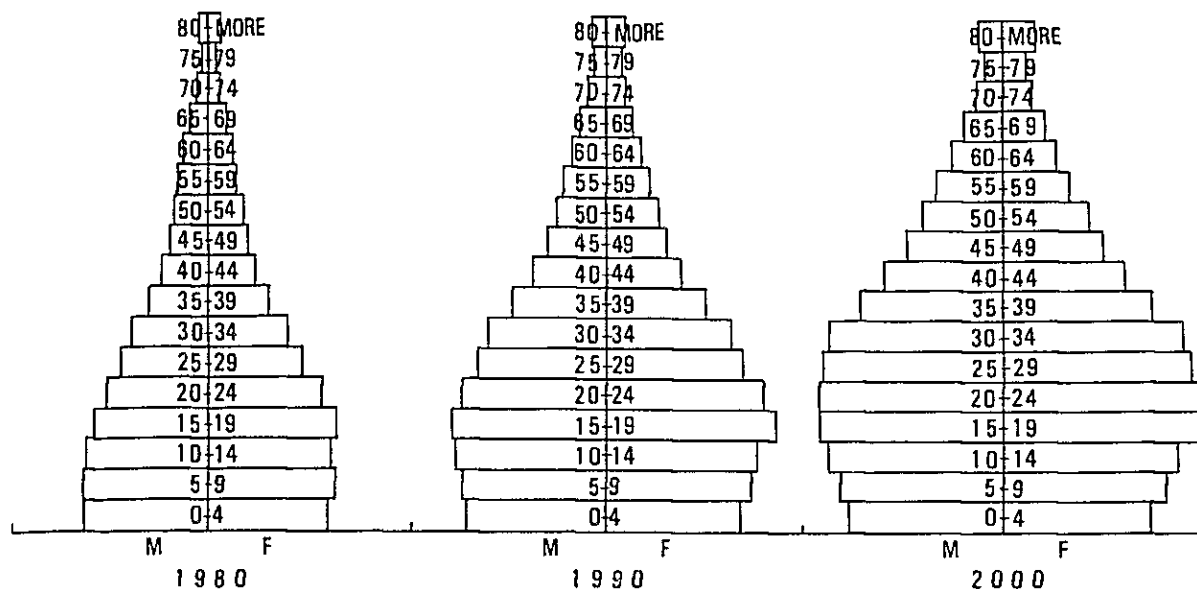
Source : ESTAMPA

FIG. 8-3 FUTURE POPULATION PYRAMIDS OF THE STUDY AREA

TABLE 8-13 FUTURE POPULATION OF STUDY AREA BY SEX AND AGE AGROUP

Ages	1985		1990		1995		2000	
	Male	Female	Male	Female	Male	Female	Male	Female
0–4	47,250	44,840	49,990	47,320	51,720	49,000	53,850	51,080
5–9	48,330	48,440	51,640	51,570	54,590	54,420	56,610	56,400
10–14	49,780	49,400	54,010	53,520	57,570	57,030	60,910	60,330
15–19	48,160	52 880	55,100	60,740	59,690	65,560	63,750	69,580
20–24	43,380	47,590	51,490	56,160	58,970	64,280	64,100	69,630
25–29	37,950	39,900	45,870	47,990	54,600	56,880	62,750	65,610
30–34	34,410	36,150	42,170	44,000	50,930	52,970	60,720	62,960
35–39	25,620	26,810	33,180	34,800	40,920	42,700	49,830	51,880
40–44	20,710	20,730	25,920	25,940	33,730	33,960	41,720	42,030
45–49	15,830	16,460	20,480	20,780	25,710	26,210	33,670	34,550
50–54	14,290	15,830	17,160	18,660	22,180	23,580	27,970	29,700
55–59	12,000	12,110	14,880	15,190	17,840	18,050	23,200	22,950
60–64	10,000	10,450	11,700	12,370	14,520	15,650	17,540	18,540
65–69	7,640	8,040	9,070	9,690	10,630	11,540	13,330	14,630
70–74	5,100	5,740	6,290	6,930	7,550	8,370	8,980	10,130
75–79	3,080	4,170	4,210	5,550	5,250	6,810	6,350	8,260
80 and above	3,820	5,510	4,780	7,050	6,400	9,190	8,070	11,390
TOTAL	427,350	445,050	497,940	518,260	572,800	596,200	653,350	679,650

Source : ESTAMPA

The basic philosophy of each step and its result will be outlined hereunder (see Technical Report Vo.3 for details).

It is proposed that the ratio of economically active population to total population changes with the progress of urbanization. As it is expected that the Study Area will in its entirety be as urbanized in the future as Panama District is presently, the ratio of economically active population by age group in the Study Area was adjusted to approach, by the year 2000, to the present values in Panama District. The economically active population thus obtained is as previously presented in Table 8-7.

Of this economically active population, the rate of unemployment, as estimated from the 1980 census, is 7.06%, which is somewhat low compared with the rate obtained from a recent household survey. When economically active population is estimated to grow faster than total population, unemployment rate will always tend to rise.

Nevertheless, the number of total workers was estimated under the assumption that unemployment rate will hover around the 1980 level under government efforts. The estimated numbers of future workers and future population are presented in Table 8-14.

TABLE 8-14 WORKING POPULATION VS. TOTAL POPULATION (1980–2000)

Year	Working Population		Total Population		Ratio of Working to Total Population
	Number	Index	Number	Index	
1980	221,070	100	732,840	100	30.2
1985	278,170	126	874,200	119	31.8
1990	341,990	155	1,218,000	139	33.6
1995	415,200	188	1,170,800	160	35.5
2000	495,800	224	1,334,800	182	37.1

Source : ESTAMPA

As estimated, the number of workers will increase by 2.24 times the present and reach nearly 500,000 in the 20-year period, while population will increase by 1.82 times. With unemployment rate remaining constant, workers will increase much faster than population, and the ratio of workers to population will ascent from the present 30.2% to 37.1%.

The number of workers by industrial sector was estimated under the following assumptions and through the following process:

A.   Primary Industries

The number of workers in the primary industries will decrease in response to future urban population increases. The number of primary industry workers in the Province of Panama shrank from 23,204 to 20,240 during 1970 to 1980, at an average annual reduction rate of 1.36%, while urban population (Poblacion Urbana by MIPPE) expanded from 498,034 to 704,928, at an average annual growth rate of 3.54%. This indicates that for every 1% increase in ruban population, primary workers decreased by 0.384%. So, the reduction in the number of primary workers in the Study Area is estimated at this relationship (1%vs. 0.384%) to future increases in the population of the Planning Area, assuming that the Planning Area will be entirely urbanized.

B. Manufacturing Industries

Manufacturing industries, chiefly food and other consumer goods industries, will grow in response to future population increases. Industrial statistics show that in the 1960s, when import substitution progressed rapidly in the manufacturing sector, the number of workers in this sector grew by an average annual rate of 7.8%. as against average population growth of only 2.9%, but grew only 1% per year in the 1970s. According to the census, industrial workers and the population of the Province of Panama grew by average annual rates of 3.32% and 3.36%, respectively; for every 1% increase in population, industrial workers increased by 0.988%. It is assumed that this relationship will be true in the Study Area in the future, for the estimation of the future numbers of industrial workers in the Area.

C. Non-Manufacturing Secondary and Tertiary Industries

The number of workers in the secondary industries other than manufacturing and the tertiary industries is conceived of as the balance arrived at by deducting from the total number of workers the numbers of primary industry workers and manufacturing industry workers. In the Province of Panama, the number of non-manufacturing secondary industry workers grew by an average annual rate of 1.34% and tertiary industry workers by 3.14% from 1970 to 1980. The futue numbers of non-manufacturing secondary industry workers and tertiary industry workers in the Study Area have been estimated under the assumption that they will increase at said average annual rates (1.34% and 3.14%, respective), and subjecting the estimates to total adjustment.

The estimated future number of workers in each industrial sector thus obtained, is presented in Table 8-15.

TABLE 8-15 WORKING POPULATION BY INDUSTRY (1980–2000)

	1980	1985	1990	1995	2000
Primary Industries	9,445	8,805	8,285	7,835	7,440
Secondary Industries	48,925	58,135	67,620	77,050	87,240
Of which, Manufacturing	28,935	34,465	40,070	46,025	52,405
Tertiary Industries	162,700	211,230	266,085	330,315	401,120
Total	221,070	278,170	431,990	415,200	495,800

Source : ESTAMPA

(ii) Employment by Industrial Sector

The number of jobs in the Study Area as classified by industrial sector was estimated by applying the employment/worker ratio of 1980. In other words, it is assumed that the structure under which primary industries lost workers to Chepo District area (sugar cane plantations) and tertiary industries to Colon City area (free trade zone, etc.) will remain unchanged in the future.

3) Extrapolated Population/Employment Distributions and Urbanization Pattern

This sub-chapter will discuss the geographical distribution of population, urbanization pattern, and problems stemming therefrom, under the assumption that urbanization will proceed along the past trend, under no particular policy interference. (For detailed prediction procedure and technical methods, see Technical Report Vol.3 "Economic Frame, Population Frame and Land Use.")

TABLE 8-16 EMPLOYMENT/WORKER RATIO IN STUDY AREA BY INDUSTRY
TABLE 8-16 EMPLOYMENT/WORKER RATIO IN STUDY AREA BY INDUSTRY
(Same as TABLE 2-17)

	(A) Worker	(B) Employment	(B) / (A) Ratio
Primary Industries	9,445	8,155	0.864
Secondary Industries	48,925	49,020	1.002
(Manufacturing)	(28,935)	(29,680)	(1.026)
Tertiary Industries	162,700	162,355	0.998
Total	221,070	219,530	0.993

Source : Contraloria General

TABLE 8-17 EMPLOYMENT BY INDUSTRY (1980-2000)

	1980	1985	1990	1995	2000
Primary Industries	8,155	7,605	7,155	6,770	6,430
Secondary Industries	49,020	58,250	67,755	77,210	87,410
Of which, Manufacturing	29,680	35,360	41,110	47,220	53,760
Tertiary Industries	162,355	210,805	265,550	329,650	400,320
Total	219,530	276,660	340,460	413,630	494,160

Source : ESTAMPA

(1) Forecast of Population by Area

Population move from Panama City to suburban areas started in the 1960s. As a result, population has decreased in Panama Urban Area, particularly in Centro, while population swelling started from San Miguelito and Juan Diaz and spreaded out to Arraijan, and then to Pedregal, Tocumen, Las Cumbres, and La Chorrera.

If this process of central sparsity and outward expansion of urbanization continues in the future, population of the various parts of the Study Area will be as presented in Table 8-18.

According to Table 8-18, the population of the Panama Urban Area will diminish to less than 300,000 in 10 years. In the reverted area of Corregimiento de Ancon, where many development projects will be implemented by public and private sector, the population will grow from present 1,800 to 80,000 in the year 2000. If the existing developable land of 2,150 hectares in San Miguelito is fully developed, San Miguelito population will swell by an additional 185,000 (over 30% of the total 602,000 increase in the Study Area) to about 340,000. The size of population of Arraijan and Tocumen will increase by 2.8 times and 2.7 times, respectively.

The total population of the Study Area as a whole will increase by 1.8 times from the 710,000 in 1980 to 1,300,000 in the year 2000, for an average annual increase of 3.08%.

(2) Zonal Worker/Employment Structure in 2000

(i) Workers by Zone and by Industry

As previously indicated in Table 8-14, the ratio of workers to population will rise to 37.1% by the year 2000. At present, such ratio varies from zone to zone, generally tending to be higher in urbanized zones than in rural zones (see Table 8-19). The relative variation was kept intact in

TABLE 8-18 POPULATION PROJECTED ON PAST TREND (1980-2000)

Zone Group	1980	1985	1990	1995	2000
Panama Urban Area (01—22)	304,127	301,200	299,100	297,100	295,200
Juan Diaz · Pedregal (23—25)	84,511	108,200	132,200	153,200	174,000
Tocumen (26—27)	21,745	31,100	40,600	50,000	59,300
San Miguelito (28—34)	157,063	215,600	270,500	318,400	342,500
Las Cumbres-Chilibre (35—36)	49,075	66,700	84,500	105,100	127,600
Ancon (37—43)	1,800	4,600	11,900	30,700	79,600
Arraijan (44—46)	34,019	47,600	61,300	77,700	95,500
La Chorrera (47—49)	55,385	71,000	86,900	105,100	125,100
Sub-Total (Planning Area)	707,725	846,000	987,000	1,137,300	1,298,800
Pacora-Nuevo Emperador (50—53)	25,115	28,200	31,000	33,500	36,000
Total (Study Area)	732,840	874,200	1,018,000	1,170,800	1,334,800

Source : ESTAMPA

TABLE 8-19 WORKERS BY ZONE GROUP AND BY INDUSTRY (1980)

Zone Group	Worker Primary Industries	Worker Secondary Industries		Worker Tertiary Industries	Total	Population	Ratio of workers to population
Panama Urban Area (01—22)	1,790	17,970	(11,245)	85,335	105,095	304,127	34.6 %
Juan Diaz Pedregal (23—25)	805	6,200	(3,980)	17,815	24,820	84,511	29.4
Tocumen (26—27)	385	1,725	(950)	3,415	5,525	21,745	25.4
San Miguelito (28—34)	830	12,660	(7,225)	30,490	43,980	57,063	28.0
Las Cumbres-Chilibre (35—36)	935	3,550	(1,895)	8,260	12,745	49,075	26.0
Ancon (37—43)	10	10	(5)	580	600	1,800	33.3
Arraijan (44—46)	645	2,125	(955)	5,645	8,415	34,019	24.7
La Chorrera (47—49)	1,000	3,460	(1,960)	9,200	13,660	55,385	24.7
Sub-Total (Planning Area)	6,400	47,700	(22,215)	160,740	214,840	707,725	30.4
Pacora-Nvo. Emperador (50—53)	3,045	1,225	(720)	1,960	6,230	25,115	24.8
Total (Study Area)	9,445	48,925	(28,935)	162,700	221,070	732,840	30.2

Note : Figure in parentheses is workers in manufacturing industry
Source : Estimated by ESTAMPA based on data from Contraloria General

adjusting the zonal ratios so that the overall worker-to-population ratio of the Study Area will come to 37.1%, and the number of workers in each zone was estimated using such adjusted ratios (see Table 8-20).

Future zonal distribution of workers by industrial sector was estimated as presented in Table 8-21, under the existing distribution pattern of Table 8-19.

A comparison of Table 8-21 against Table 8-19 indicates the followings :

A.   In the Panama Urban Area, population will decrease but workers will increase. By industrial classification, the primary and secondary sectors will experience worker reduction, while the tertiary sector will see an increase by a large margin.

B.   Secondary and tertiary industry workers will increase in all zones outside the Panama

Urban Area. San Miguelito, where the population growth is very high, will have a working population as large as that of the Panama Urban Area and particularly, the largest number of secondary industry workers of all zones.

TABLE 8-20   WORKERS BY ZONE GROUP (2000)

Zone Group	Population	Workers	Ratio of Workers to population
Panama Urban Area (01—22)	295,200	127,800	43.3
Juan Diaz · Pedregal (23—25)	174,000	65,900	37.9
Tocumen (26—27)	59,300	20,000	33.7
San Miguelito (28—34)	342,500	124,700	36.4
Las Cumbres·Chilibre (35—36)	127,600	43,800	34.3
Ancon (37—43)	79,600	29,000	36.4
Arraijan (44—46)	95,500	31,500	33.0
La Chorrera (47—49)	125,100	41,200	32.9
Sub-Total (Planning Area)	1,298,800	483,900	37.3
Pacora-Nuevo Emperador (50—53)	36,000	11,900	33.1
Total (Study Area)	1,334,800	495,800	37.1

Source : ESTAMPA

TABLE 8-21   WORKERS BY ZONE GROUP AND BY INDUSTRY (2000)

Zone Group		Primary	Secondary		Tertiary	Total
1. Panama Urban Area	01—22	1,410	15,200	(9,910)	111,190	127,800
2. Juan Diaz·Pedregal	23—25	630	11,640	(7,780)	53,630	65,900
3. Tocumen	26—27	300	4,570	(2,620)	15,130	20,000
4. San Miguelito	28—34	650	25,110 ⸰	(14,930)	98,940	124,700
5. Las Cumbres-Chilibre	35—36	740	8,960	(4,980)	34,100	43,800
6. Ancon	37—43	10	5,760	(3,435)	23,230	29,000
7. Arraijan	44—46	510	5,850	(2,720)	25,140	31,500
8. La Chorrera	47—49	790	7,620	(4,490)	32,790	41,200
Sub-Total (Planning Area)	01—49	5,040	84,710	(50,865)	394,150	483,900
Pacora-Nuevo Emperador	50—53	2,400	2,530	(1,540)	6,970	11,900
Total (Study Area)	01—53	7,440	87,240	(62,405)	401,120	495,800

Note : Figure in parentheses is workers in manufacturing sector   Source : ESTAMPA

(ii) Employment by Zone and by Industry

The geographical distribution of jobs depends on the distribution of industrial locations and activities. Population distribution affects industrial locations as far as commercial and service activities essential to daily life are concerned; however, when population concentration does not reach a certain level, even such activities would not start in the area. So, the present concentration of jobs in Panama Urban Area will be intensified in the future, while population will flow out of the Area.

The prerequisite to job increase in the Study Area as a whole by 2.25 times to 494,000 is

the implementation of active employment opportunities creation measures by the Government. It follows that the Study Area's frame reflects, to a fair degree, such policy intent. It will be easier for the Government to take such policy measures in the reverted area of Corregimiento de Ancon than in any other parts of the Study Area, but no land use plan has been formulated for that area, except for the very rough zoning indicated by "General Land Use Plan for the Panama Canal Area and its Basin (Plan General de Usos del Suelo para el Area y la Cuenca Hidrografica del Canal de Panama)." The number of jobs in Corregimiento de Ancon was estimated based on the areal size and land use as indicated by said plan, and the estimate was incorporated into the extrapolated forecast.

Currently, 69.5% of jobs in the Study Area are concentrated in the Panama Urban Area (see Table 8-22). Some concentrations of secondary industry jobs are seems in Juan Diaz — Pedregal and San Miguelito, and an important concentration of tertiary industry jobs is seen in Corregimiento de Ancon.

TABLE 8-22   EMPLOYMENT BY ZONE GROUP AND BY INDUSTRY (1980)

Zone Group		Primary	Secondary		Tertiary	Total
1. Panama Urban Area	01—22	1,475	32,695	(20,060)	118,350	152,520
2. Juan Diaz-Pedregal	23—25	480	4,870	(3,100)	6,780	12,130
3. Tocumen	26—27	305	1,220	(810)	4,380	5,905
4. San Miguelito	28—34	95	3,295	(1,740)	7,640	11,030
5. Las Cumbres-Chilibre	35—36	825	1,910	(1,270)	2,625	5,360
6. Ancon	37—43	115	345	(60)	14,610	15,070
7. Arraijan	44—46	850	1,345	(640)	1,605	3,800
8. La Chorrera	47—49	845	2,150	(1,070)	5,190	8,185
Sub-Total (Planning Area)	01—49	4,990	47,830	(28,750)	161,180	214,000
Pacora-Nuevo Emperador	50—53	3,165	1,190	(930)	1,175	5,530
Total (Study Area)	01—53	8,155	49,020	(29,680)	162,355	219,530

Note : Figure in parentheses is workers in manufacturing sector
Source : Estimated by ESTAMPA based on data from Contraloria General

Future changes in the distribution of jobs are discussed by industrial classification below:

A.   Primary Industries

All zones will see proportional decreases under the existing distribution pattern.

B.   Manufacturing Industries

In the Panama Urban Area, lots classified as industrial zone or commercial/industrial zone under the Panama City zoning scheme contain a total of about 92 hectares of vacant lots, scattered in Corregimiento de Pueblo Nuevo, Corregimiento de Juan Diaz, Corregimiento de Pedregal, and San Miguelito District. Future industrialization will fill these vacant lots. The plan of utilizing a part of the former Albrook Air Field in Ancon will be materialized by the year 2000. In addition, industries will be located in various zones to accommodate the increasing number of manufacturing industry workers.

C. Tertiary Industries

Some tertiary industries will increase in number in response to population increases while other tertiary industries will increase in response to the size of the existing activity concentration. The former are retailing, restaurant, branch office of financial institutions and insurance companies, medical, educational, and social facilities, as well as personal service, which in 1980, represented 55% of total jobs in the entire tertiary sector in the Study Area. However, the number of jobs in these types of tertiary industry actually located in each zone, except Panama Urban Area, does not quite reach the number in such proportion to the zonal population and is only about 60% even at maximum, which is in La Chorrera District. So, the following is assumed with regards to increases in the number of tertiary sector jobs from 1980 to 2000.

Population-dependent increase: 55% of total:

Of which 40%(or 22% of total) will be in the Panama Urban Area

Of which 60% (or 33% of total) will be in other zones depending on the potential* of each zone

Activity Concentration-dependent increase: 45% of total:
will be distributed in proportion to 1980 concentration

(* The potential is conceived of as the difference between the number of jobs estimated under the assumption that population-dependent industries will be located in proportion to population in the year 2000 and the number of jobs in such type of industries as of 1980.)

D. Non-Manufacturing Secondary Industries

In the non-manufacturing secondary industry sector, the representative industry is construction. Construction activities will be distributed in accordance with demands for the construction of houses, factories, stores, and offices in response to increase in population and the number of manufacturing and tertiary industries in each zone.

Given the above discussed sectoral behaviors, the number of jobs was estimated for the year 2000 by zone and by industrial sector as presented in Table 8-23.

TABLE 8-23   FUTURE EMPLOYMENT BY ZONE GROUP AND INDUSTRY (2000)

Zone Group		Primary	Secondary	(Manufacturing)	Tertiary	Total
1. Panama Urban Area	01–22	1,160	35,250 ·	(20,600)	248,770	285,180
2. Juan Diaz-Pedregal	23–25	380	11,630	(8,020)	23,570	35,580
3. Tocumen	26–27	240	2,570	(1,410)	11,550	14,360
4. San Miguelito	28–34	70	12,220	(6,980)	39,150	51,440
5. Las Cumbres-Chilibre	35–36	650	4,530	(2,380)	14,210	19,390
6. Ancon	37–43	90	11,440	(9,440)	30,790	42,320
7. Arraijan	44–46	670	3,150	(1,270)	10,340	14,160
8. La Chorrera	47–49	670	4,430	(1,980)	17,290	22,390
Total (Planning Area)	01–49	3,930	85,220	(52,080)	395,670	484,820
Pacora-Nuevo Emperador	50–53	2,500	2,190	(1,680)	4,650	9,340
Total (Study Area)	01–53	6,430	87,410	(53,760)	400,320	494,160

Source : ESTAMPA

(iii) Zonal Workers and Jobs

Fluctuations in population, workers and jobs during the next 20 years were compared between zones, as shown in Table 8-24. The comparison indicates that the rate of sufficiency of employment opportunities, in terms of employment (job)/worker ratio (E/W ratio), will be in excess of 1 in 2000 only in the Panama Urban Area and Corregimiento de Ancon. This suggests that employment opportunities will further concentrate in the Panama Urban Area. The E/W ratio will rise in zones where such ratio is currently relatively low, while the ratio may drop in zones where the ratio is currently high, such as Corregimiento de Tocumen and La Chorrera District, where increase in employment opportunities will lag behind population increase.

The E/W ratio in Corregimiento de Tocumen, which is currently over 1.0, is due to the presence of an international airport, and some decline in this ratio along with future population increase will have to be expected. However, the turning of La Chorrera, which is currently a fairly independent city, into a residential area will be a problem.

The greatest[24] population increase will take place in San Miguelito District, which at present shows an extremely low E/W ratio. The ratio is expected to rise to the level of residential areas, as plants will be located in its industrial areas and tertiary industry activities will be established in commercial and public facilities areas to be created by MIVI residential area development.

TABLE 8-24 POPULATION, WORKERS, EMPLOYMENT BY ZONE GROUP (1980 AND 2000)

Zone Group	1980				2000			
	Population	Workers (A)	Employment (B)	(B)/(A)	Population	Workers (A)	Employment (B)	(B)/(A)
Panama Urban Area	304,100	105,100	152,520	1 45	295,200	127,800	285,180	2 23
Juan Diaz-Pedregal	84,500	24,800	12,130	0 49	174,000	65,900	35,580	0.54
Tocumen	21,700	5,500	5,910	1 07	59,300	20,000	14,360	0 72
San Miguelito	157,100	44,000	11,030	0 25	342,500	124,700	51,440	0 41
Las Cumbres Chilibre	4",100	12,700	5,360	0 43	127,605	43,800	19,390	0 44
Ancon	1,800	600	15,070	25.17	79,600	29,000	42,320	1.46
Arraijan	34,000	8,400	3,800	0.45	95,500	31,500	14,160	0 45
La Chorrera	55,400	13,700	8,180	0 60	125,100	41,200	22,390	0.54
Planning Area Total	707,700	214,800	214,000	1.00	1,298,800	483,900	484,820	1.00
Pacora-Nuevo Emperador	25,100	6,200	5,530	0 89	36,000	11,900	9,340	0.78
Total	732,800	221,000	219,530	0 99	1,334,800	495,800	494,160	1 00

Source · ESTAMPA

(3) Future Urbanization Pattern and Problems

Residential areas will expand into suburban areas starting with developable lands near the Panama Urban Area, as previously pointed out. Therefore, the pattern in the shape of the upside-down "T" existing in the east of the Canal will in the future increase in the length and width, while, at the same time, expand into more of a triangle by the urbanization of San Miguelito District and the reverted land in Corregimiento de Ancon. In the west of the Canal, on the other hand, urbanization will expand in Arraijan toward Vacamonte Port and in La Chorrera toward Caimito Port, creating a low density conurbation along the American Highway.

Within the Panama Urban Area, population will continue to diminish while concentration-dependent tertiary industry activities will multiply substantially in Centro. This, in terms of land use, will mean that houses will be gradually replaced by stores and offices and a fair quantity of vacant lots existing in Corregimiento de Bella Vista will be nearly all covered with high-rises and apartment house buildings.

The progress of such urbanization will aggravate problems such as:

A. Substantial rise in land prices, making it nearly impossible for middle-income people to acquire residence and accelerating the building of house on low-priced but unsuitable land (for urbanization) such as steep hills and flooding areas.

B. Formulation of urban areas in a vermiculated or spotty pattern due, on one hand, to high-density development projects to compensate for high land prices and, on the other hand, to the speculative hoarding of land by the owners.

C. Difficulty of creating community centers with adequate commercial and cultural facilities, infrastructures, and the supply of efficient bus service due to the vermiculation.

D. The contamination of Alajuela Lake, the source of water supply to Panama City and vicinity, due to the spread of urbanization into the Canal catchment area.

E. Traffic congestion on arterial roads connecting suburban residential areas with urban centers due to increase in long distance commuter trips under inadequate dispersion of jobs.
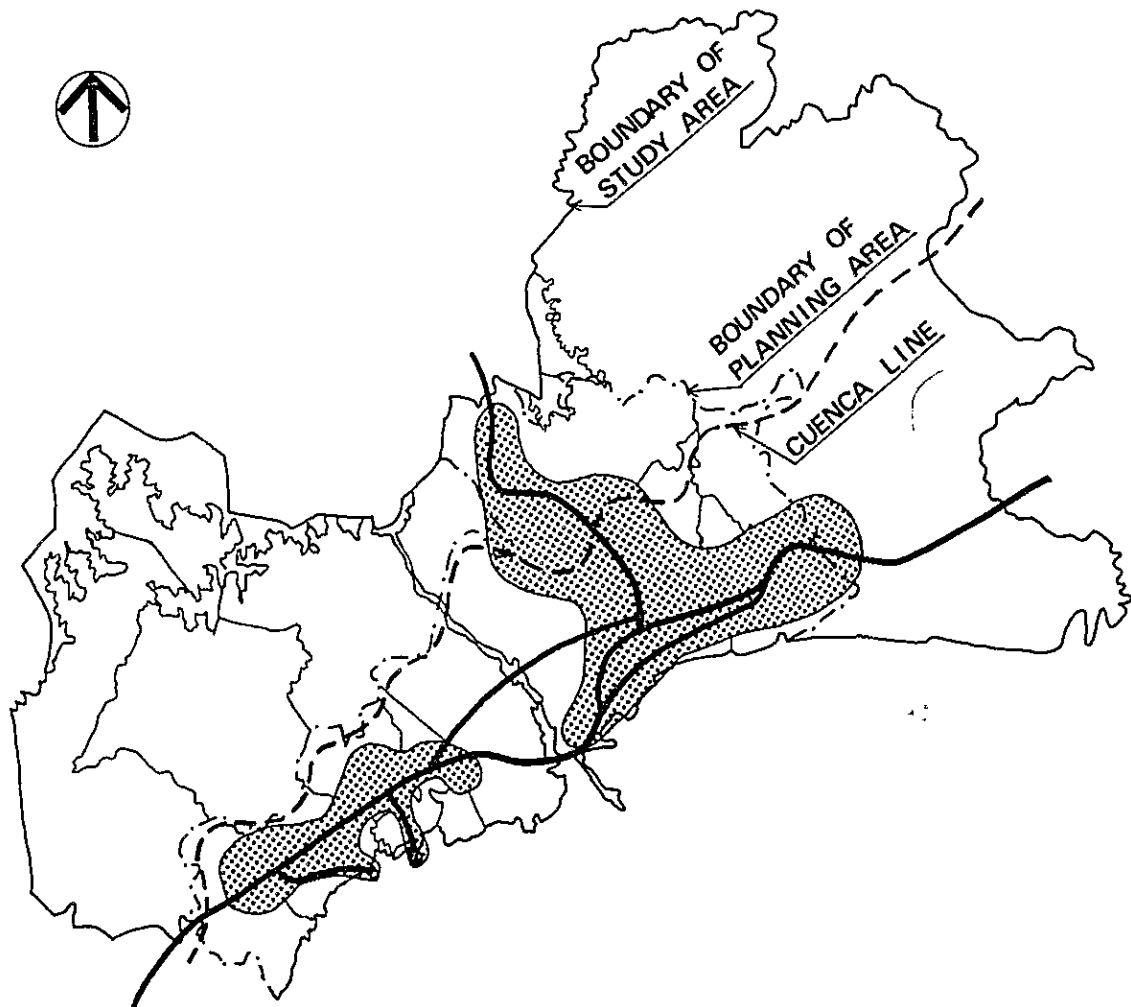
FIG. 8-4   FUTURE URBANIZATION PATTERN ON THE PRESENT TREND

Source : ESTAMPA

F. Obstruction of the growth of the new urban center (Bella Vista) as an international financial center due to traffic congestion and the shortage of parking spaces under swelling trafic volume.

G. It is apprehended that shopping areas in Centro will degenerate due to declining Zone population, the increase of suburban shopping centers, and chronic traffic congestion in the Zone.

4) Alternative Land Use Plans

(1) Fundamental Planning Policy

Land use alternatives are to be formulated with the objectives of mitigating the existing problems and problems which can be predicted on the projection of the current trend, and of enhancing and capitalizing on the features of Panama Metropolitan Area as a community and on its strategic position in international activities.

The following will govern the alternative formulation:

(a) Target year is 2000

(b) The population framework of the Study Area will be based on standard case forecast on the projection of current trend

(c) Land use plan for Corregimiento de Ancon will be limited to the land to be reverted in the life of the Treaty

(d) The Second Panama Canal Plan is not considered

(e) Development of La Cuenca will be held to a minimum

(f) The place of wrok and residence will be brought as close to each other as possible, and local service level will be improved

(g) Efforts will be made for preventing population decrease in the old town and for its renewal

(h) The Panama Urban Area will be developed into a town in commensuration with its strategic position in international activities in Latin America

(i) The securing of industrial land and the promotion tourism will tanken into consideration

(2) Formualtion of Alternatives

(i) Sings of Urban Structural Change

As already seen, the current trend suggests that the problems of existing urban structure will become more serious in the future. Nevertheless, the following will be useful in the improvement of the urban structure:

a) Some industries (such as tobacco manufacturing, paper container manufacturing, etc.) and goods distribution facilities have recently been dispersing to suburban areas. The functions which need not be located in the Panama Urban Area can be dispersed in the future.

b) Shopping centers and suburban type restaurants are finding locations in suburban areas, as population is increasing in those areas. The formation of commercial centers can be expected under appropriate incentives.

c) The Government is making efforts for the consturction/expansion of universities and general hospitals in suburban areas in order to improve educational and medical service levels in such areas.

d) The reverted Canal Area is a vast nationally-owned land which may be used at the discretion of the Government. The development and preservation of this land under well prepared plans will have substantial effects on the urbanization of other areas and may be used an important tool for changing the urban structure.

(ii) Development Pattern

Urban structure can be seen in terms of morphological pattern of development with traffic network as the skeleton, and in terms of distribution of residential areas and urban functions. The existing urban area presents a morphological pattern of reverse "T" and a mono-core style distribution of function.

Abstractly, six combinations of the following may be conceived of for the future Panama Metropolitan Area structure:

Urban pattern: Reverse "T" pattern
                           Ladder pattern
                           Semi-radial pattern

Function distribution: Mono-core style
                           Multi-core style

A1: Reverse "T" and mono-core: The projection of existing trend

A2: Reverse "T" and multi-core:
While the urban structure will remain little changed, functions which may be dispersed to suburban areas are to be so dispersed.

B1: Ladder pattern and mono-core:
Development toward north is to be restrained and development in east-west direction is to be encouraged, and most of functions will remain in the Panama Urban Area.

B2: Lader pattern and multi-core:
As an improvement of B1, as many core-functions as possible is to be dispersed to suburban areas.

C1: Semi-radial pattern and mono-core:
Development in east-west direction is to be discouraged and the reverted land in the north is to be actively developed so as that the urban pattern will become more radial. Most of core functions will remain in the Panama Urban Area.

C2: Semi-radial pattern and multi-core:
As an improvement of C1, as many functions as possible is to be

dispersed to suburban areas, particularly in the north.

Here, functions means urban functions which distribute people and goods to and gather them from a wide expanse of area. Practical examples are government agencies, offices, higher education facilities, shopping centers, markets, high-level medical, cultural, and amusement facilities, and factories.

In the Study Area a number of districts where facilities for daily shopping, education, and medical care are insufficient, as a result of rapid progress of housing projects and development. Therefore, it is very important that community centers with adequate facilities be developed.

Followings are possible candidate locations for core formation:

Central Part:
o   Urban renewal areas designated by MIVI, particularly El Marañon.
o   Bella Vista
o   Albrook

Suburban Area:
o   One location in the east part of suburban area
o   San Miguelito
o   Northern part of the reverted Canal land
o   Downtown Arraijan
o   Vacamonte
o   Downtown La Chorrera
o   Puerto Caimito

(iii) Formulation of Alternatives

Multi-core structure offers greater communication convenience and more even spread of traffic than mono-core structure. In view of the size of population of this area, however, the central control functions will be more efficient when concentrated than dispersed, and it is believed premature to plan for dispersion as seen in large cities in the world. Therefore, while administrative functions will be concentrated, the formation of a multi-core structure will be aimed at through the dispersion, as much as possible, of living-related facilities, such as commercial, medical, and educational facilities to local cores of life facilities. Alternative of purely mono-core structure will not be considered.

a)   Triangular development (Alternative A)

The development pattern will be that of A2 above.

Current trend will be respected, and zonal population forecast based on the projection of current trend will be adopted, but urban development will be accomplished systematically. Local cores will be formulated in San Miguelito and other locations.

b)   East-west development (Alternative B)

Under B2 development pattern, the past trend of urbanization in the east-west direction will be accelerated. The reverted Canal land is to be held for comprehensive development upon the complete reversion of land in the future. Employment bases will be formed particularly in La Chorrera, Arraijan, and Tocumen.

c) North new town development (Althernative C)

Under C2 pattern, a new town will be formed in the northern reverted land under active development projects. A town center with tertiary industries as the core will be developed in this new town.

The above mentioned three alternatives and the basic case (projection on present trend) summarized on the Table 8-25.
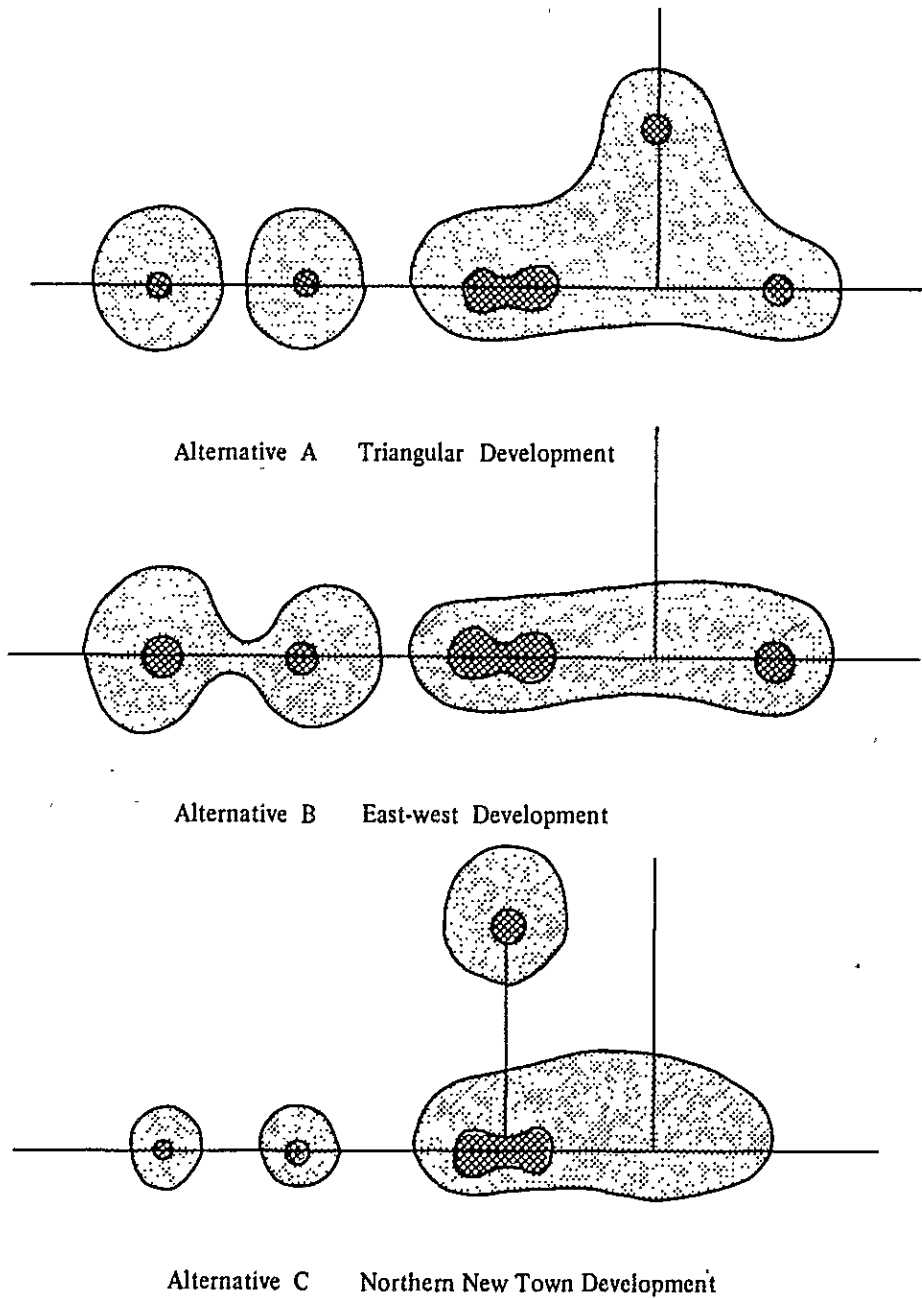

Alternative A   Triangular Development

Alternative B   East-west Development

Alternative C   Northern New Town Development

FIG. 8-5   DEVELOPMENT PATTERNS

TABLE 8-25 SOCIO-ECONOMIC INDICATORS FOR BASE CASE AND ALTERNATIVES

Integrated Zone	Item	1980	2000 Base Case	Alternatives A	B	C
I Centro (01–06)	Population, (person) (A)	107,295	82,900	82,900	87,700	87,700
	Urbanized Area, (ha) (B)	380	380	380	380	380
	Population Density (Psn/ha) (A/B)	282.4	218.2	218 2	230 8	230 8
	Working Population (Psn) (C)	35,425	34,980	34,980	37,080	37,080
	Primary	775	610	610	610	610
	Secondary	6,765	4,700	4,700	4,920	4,920
	Tertiary	27,885	29,670	29,670	31,550	31,550
	Ratio of Workers to Population (%) (C/A)	33.0	42 2	42 2	42 3	42 3
	Employment (Psn) (D)	57,185	87,675	81,030	72,565	79,100
	Primary	620	485	485	485	485
	Secondary	9,240	8,990	8,925	8,840	8,905
	Tertiary	47,325	78,200	71,620	63,240	69,710
	Ratio of Employment to workers (%) (D/C)	1 61	2.51	2.32	1.96	2.13
II Bella Vista (07–10)	Population (person) (A)	28,091	31,300	31,300	31,300	31,300
	Urbanized Area (ha) (B)	450	450	450	450	450
	Population Density (Psn/ha) (A/B)	62 4	69 6	69 6	69.6	69 6
	Working Population (Psn) (C)	12,305	15,030	15,030	15,030	15,030
	Primary	180	145	145	145	145
	Secondary	1,310	1,125	1,125	1,125	1,125
	Tertiary	10,815	13,760	13,760	13,760	13,760
	Ratio of Workers of Population (%) (C/A)	43 8	44 0	44 0	44 0	44 0
	Employment (Psn) (D)	38,105	95,960	85,185	71,450	82,050
	Primary	285	225	225	225	225
	Secondary	4,625	5,505	5,420	5,320	5,395
	Tertiary	33,195	90,230	79,540	65,905	76,430
	Ratio of Employment to workers (%) (D/C)	3.10	6 38	5 67	4.75	5.46
III Area Residencial (11–22)	Population (person) (A)	168,741	181,000	181,000	181,000	181,000
	Urbanized Area (ha) (B)	2,680	2,680	2,680	2,680	2,680
	Population Density (Psn/ha) (A/B)	63 0	67.5	67.5	67.5	67 5
	Working Population (Psn) (C)	57,365	77,790	77,790	77,790	77,790
	Primary	835	655	655	655	655
	Secondary	9,895	9,375	9,375	9,375	9,375
	Tertiary	46,635	67,760	67,760	67,760	67,760
	Ratio of Workers to Population (%) (C/A)	34.0	43.0	43 0	43 0	43 0
	Employment (Psn) (C)	57,230	101,545	92,605	81,215	90,020
	Primary	570	450	450	450	450
	Secondary	18,830	20,755	20,505	20,180	20,430
	Tertiary	37,830	80,340	71,650	60,585	69,140
	Ratio of Employment to Workers (%) (D/C)	1.00	1.31	1 19	1.04	1.16
IV Juan Diaz-Pedregal (23–25)	Population (person) (A)	84,511	174,000	174,000	174,000	174,000
	Urbanized Area (ha) (B)	1,729	3,109	2,639	2,639	2,639
	Population Density (Psn/ha) (A/B)	48 9	56 0	65 9	65 9	65 9
	Working Population (Psn) (C)	24,820	65,900	65,900	65,900	65,900
	Primary	805	630	630	630	630
	Secondary	6,200	11,640	11,640	11,640	11,640
	Tertiary	17,815	53,630	53,630	53,630	53,630
	Ratio of Workers to Population (%) (C/A)	29.4	37.9	37.9	37.9	37.9
	Employment (Psn) (D)	12,130	35,580	39,540	39,540	39,540
	Primary	480	380	380	380	380
	Secondary	4,870	11,630	10,270	10,270	10,270
	Tertiary	6,780	23,570	28,890	28,890	28,890
	Ratio of Employment to Workers (%) (D/C)	0 49	0 54	0 60	0 60	0 60
V Tocumen (26–27)	Population (person) (A)	21,745	59,300	59,300	84,500	41,000
	Population in Urbanized Area (A')	17,000	54,600	54,600	84,500	36,300
	Urbanized Area (ha) (B)	760	1,728	1,567	1,923	929
	Population Density (Psn/ha) (A'/B)	22.4	31.6	34.8	43 9	39 1
	Working Population (Psn) (C)	5,525	20,000	20,000	29,000	13,400
	Primary	385	300	300	300	300
	Secondary	1,725	4,570	4,570	6,780	3080
	Tertiary	3,415	15,130	15,130	21,920	10,020
	Ratio of Workers to Population (%) (C/A)	25.4	33.7	33 7	34 3	32.7
	Employment (Psn) (D)	15,905	14,360	17,000	-26,100	12,060
	Primary	305	240	240	240	240
	Secondary	1,220	2,570	2,950	3,740	2,150
	Tertiary	4,380	11,550	13,810	22,120	9,670
	Ratio of Employment to Workers (%) (D/C)	1 07	0 72	0.85	0.90	0.90

TABLE 8-25   (CONT'D)'

Integrated Zone	Item	1980	Base Case	A	B	C
VI San Miguelito (28–34)	Population, (person) (A)	157,063	342,500	342,500	340,000	340,000
	Urbanized Area (ha) (B)	2,186	4,336	4,336	4,294	4,294
	Population Density, (Psn/ha) (A/B)	71.8	71 8	79.0	79.2	79 2
	Working Population (Psn) (C)	43,980	124,700	124,700	123,800	123,800
	Primary	830	650	650	650	650
	Secondary	12,660	25,110	25,110	24,880	24,880
	Tertiary	30,490	98,940	98,940	98,270	98,270
	Ratio of Workers to Population (%) (C/A)	28 0	36 4	36 4	36 4	36 4
	Employment (Psn) (D)	11,030	51,440	56,120	61,900	61,900
	Primary	95	70	70	70	70
	Secondary	3,295	12,220	12,900	11,700	11,700
	Tertiary	7,640	39,150	43,150	50,130	50,130
	Ratio of Employment to Workers (%) (D/C)	0.25	0 41	0 45	0 50	0 50
VII Las Cumbres Chilibre (35–36)	Population, (person) (A)	49,075	127,600	127,600	89,000	89,000
	Population in Urbanized Area (A')	19,900	98,400	98,400	59,800	59,800
	Urbanized Area, (ha) (B)	710	· 3,466	3,006	1,720	1,720
	Population Density (Psn/ha) (A'/B)	28.0	28 4	32.7	34 8	34.8
	Working Population (Psn) (C)	12,745	43,800	43,800	30,500	30,500
	Primary	935	740	740	740	740
	Secondary	3,550	8,960	8,960	6,190	6,190
	Tertiary	8,260	34,100	34,100	23,570	23,570
	Ratio of Workers to P ,ulation (%) (C/A)	26.0	34.3	34.3	34.3	34 3
	Employment, (Psn) (D)	5,360	19,390	19,710	15,250	15,250
	Primary	825	650	650	650	650
	Secondary	1,910	4,530	4,610	3,530	3,530
	Tertiary	2,625	14,210	14,450	11,070	11,070
	Ratio of Employment to Workers (%) (D/C)	0 42	0 44	0.45	0.50	0 50
VIII Ancon Este (37–42)	Population, (person) (A)	1,600	60,400	60,400	1,600	182,600
	Urbanized Area (ha) (B)	290	1,493	1,342	290	3,280
	Population Density (Psn/ha) (A/B)	55	40 5	45 0	5.5	55.7
	Working Population (Psn) (C)	540	22,000	22,000	540	64,300
	Primary	5	5	5	5	5
	Secondary	10	4,355	4,355	10	12,955
	Tertiary	525	17,640	17,640	525	51,340
	Ratio of Workers to Population (%) (C/A)	33.8	36.4.	36.4	33 8	35 2
	Employment (Psn) (D)	13,575	38,145	35,535	29,525	60,300
	Primary	95	/ 70	70	70	70
	Secondary	310	10,755	8,145	7,095	11,350
	Tertiary	13,170	27,320	27,320	22,360	48,880
	Ratio of Employment to Workers (%) (D/C)	25.1	1.73	1.62	54.7	0 94
IX Ancon Oeste (43)	Population, (person) (A)	200	19,200	19,200	200	19,200
	Urbanized Area (ha) (B)	—	475	475	—	475
	Population Density (Psn/ha) (A/B)	—	40 4	40 4	—	40.4
	Working Population (Psn) (C)	60	7,000	7,000	60	7,000
	Primary	5	5	5	5	5
	Secondary	0	1,405	1,405	0	1,405
	Tertiary	55	5,590	5,590	55	5,590
	Ratio of Workers to Population (%) (C/A)	30.0	36.5	36.5	30.0	36.5
	Employment, (Psn) (D)	1,495	4,175	3,875	1,955	3,870
	Primary	20	20	20	20	20
	Secondary	35	685	385	45	380
	Tertiary	1,440	3,470	3,470	1,890	3,470
	Ratio of Employment to Workers (%) (D/C)	24.9	0 60	0.55	32.6	0.59
X Arraijan (44–46)	Population, (person) (A)	34,019	95,500	95,500	137,200	66,000
	Population in Urbanized Area, (A')	21,400	82,800	82,800	124,500	53,300
	Urbanized Area, (ha) (B)	970	2,049	1,977	3,190	1,431
	Population Density, (Psn/ha) (A'/B)	22.1	40.4	41.9	39.0	37.2
	Working Population, (Psn) (C)	8,415	31,500	31,500	46,200	21,200
	Primary	645	510	510	510	510
	Secondary	2,125	5,850	5,350	8,790	3,960
	Tertiary	5,645	25,140	25,140	36,900	16,730
	Ratio of Workers to Population (%) (C/A)	24.7	· 33.0	33 0	33.7	32.1
	Employment, (Psn) (D)	3,800	14,160	20,480	32,340	14,840
	Primary	850	670	670	670	670
	Secondary	1,345	3,150	4,490	5,900	4,490
	Tertiary	1,605	10,340	15,320	25,770	9,680
	Ratio of Employment to Workers (%) (D/C)	0.45	0 45	0.65	0.70	0 70

TABLE 8-25 (CONT'D)

Integrated Zone	Item	1980	Base Case	2000 Alternatives		
				A	B	C
XI La Chorrera	Population, (person) (A)	55,385	125,100	125,100	172,300	87,000
(47–49)	Population in Urbanized Area (A')	37,100	108,600	108,600	156,300	68,700
	Urbanized Area, (ha) (B)	560	2,355	2,208	3,074	1,490
	Population Density, (Psn/ha) (A'/B)	66.3	46.1	49 2	50 8	46.1
	Working Population, (Psn) (C)	13,660	41,200	41,200	58,000	27,900
	Primary	1,000	790	790	790	790
	Secondary	3,460	7,620	7,620	11,000	5,180
	Tertiary	9,200	32,790	32,790	46,210	21,930
	Ratio of Workers to Population (%) (C/A)	24 7	32.9	32.9	33 7	32 1
	Employment, (Psn) (D)	8,185	22,390	32,960	52,200	25,110
	Primary	845	670	670	670	670
	Secondary	2,150	4,430	6,370	8,350	6,370
	Tertiary	5,190	17,290	25,920	43,180	18,070
	Ratio of Employment to Workers (%) (D/C)	0.60	0 54	0 80	0 90	0 90
Planning Area Total	Population, (person) (A)	707,725	1,298,800	1,298,800	1,298,800	1,298,800
(01–49)	Population in Urbanized Area (A')	642,701	1,235,700	1,235,700	1,240,700	1,233,900
	Urbanized Area, (ha) (B)	10,715	22,521	21,060	20,640	19,768
	Population Density,'(Psn/ha) (A'/B)	60 0	54.9	58.7	60 1	62.4
	Working Population, (Psn) (C)	214,840	483,900	483,900	483,900	483,900
	Primary	6,400	5,040	5,040	5,040	5,040
	Secondary	47,700	84,710	84,710	84,710	84,710
	Tertiary	160,740	394,150	394,150	394,150	394,150
	Ratio of Workers to Population (%) (C/A)	30.4	37 3	37 3	37.3	37.3
	Employment, (Psn) (D)	214,000	484,820	484,040	484,040	484,040
	Primary	4,990	3,930	3,930	3,930	3,930
	Secondary	47,830	85,220	84,970	84,970	84,970
	Tertiary	161,180	395,670	395,140	395,140	395,140
	Ratio of Employment to Workers, (%) (D/C)	1.00	1 00	1.00	1 00	1.00

Source : ESTAMPA

(3) Evaluatin and Selection

(i) Evaluation Method

The four available alternatives (the projection of current trend and Alternative Plans A, B and C) are compared side by side against the following criteria in order to select the best alternative to be used for traffic planning:

(a) Land Use Plan Objectives

A. Safety
   a. Against spread of submerged area
   b. Against land slide

B. Conveniecne
   a. Home-work proximity
   b. Urban service availability

C. Amenity
   a. Well planned residential area
   b. Nature preservation

D. Economy
   a. Development cost
   b. Environmental cost

E. Plan Flexibility
    Post-2000 development potential

F. Feasibility
    a. Alienation from current trend
    b. Public land utilization

(b) Traffic Plan Objectives

A. Smooth Traffic
    a. Travel speed
    b. Congestion rate
    c. Congested section rate

B. a. Energy Conservation
    a. Aggregate traffic volume
    b. Aggregate travel time

C. Economy
    Need of a third bridge over the Canal

Evaluation against land use plan criteria was accomplished qualitatively based on the characteristics and features of each development pattern, and evaluation against traffic plan criteria was accomplished quantitatively using predicted indices of the volume of activity.

(iii) Evaluation Result

The result of evaluation of these four alternatives is summarized in Table 8-26. It is natural that the evaluation ratings of alternative "projection of present trend" is low, inasmuch as the consideration of Alternatives A, B, and C was necessary in view of the various problems anticipated from allowing the current trend to continue in the future. Yet, the "present trend" alternative shows better ratings in the followings:

(a) Nature preservation: A somewhat larger green area will be preserved under the "present trend" alternative than under Alternative C, which contemplates the urbanization of all developable land of the reverted area, although urban development can advance under the former in a sprawl fashion and with "worm holes."

(b) Development cost: Development cost will be smaller under the "base case" alternative than under Alternative C, which anticipates the development of many hilly areas.

When Alternatives A, B, and C are compared, the followings can be pointed out:

(a) The major disaster considerations, in view of the topography of the Study Area, are submergence of lowlands and landslide in sloped areas, as developed, under heavy rains.

As for submergence, little difference is noted between Alternatives A, B, and C, which anticipate the development of upstream areas of the rivers which run through urban areas, as long as adequate safety measures (such as the establishment of an adequate adjustment reservoir) are taken along with development project implementation.

Safety measures must also be taken against landslides, but this accident is liable to happen particularly during the process of land development and thereafter until post-development soil becomes stable. The risk of landslide is greatest under Alternative C, which anticipates the largest

TABLE 8-26 RELATIVE ADVANTAGES OF ALTERNATIVE LAND USE PLANS

Evalu-ation	Objective	Viewpoint	Base Case	Alterna-tive A	Alterna-tive B	Alterna-tive C	Remarks
Qualitative (Land Use Planning)	Safety	Submergence	P	G	G	G	
		Landslide	P	G	E	P	
	Convenience	Home-work proximity (Employment dispersion rate)	P	G	E	E	
		Urban service (Proximity to Panama urban area)	P	G	G	E	
	Amenity	Housing Projects	P	G	G	E	
		Nature preservation (Green area)	G	G	E	P	
	Economy	Development cost	E	E	G	P	Many hilly reaas to be developed (Alternative C)
		Environmental cost	P	G	E	E	"Present Trend": follow-up environ-mental cost is large.
	Developmental Felxibility	Post—2000 potential	P	G	E	G	
	Feasibility	Alienation from present trend	E	E	P	P	
		Public land utilization rate	G	G	P	E	
Quantitative (Traffic Planning)	Smooth Traffic	Average travel speed (Km/h)	5.72	5 76	5.60	5.69	
		Average congestion rate	1.9	1.8	1.0	2.1	
		Congested section rate (%) (Ratio of section with 1.0 or more congestion rate)	60	60	65	59	
	Energy Conservation	Aggregate traffic volume (1000 vehicle-Km)	12116	12020	12175	13076	
		Aggregate travel time (1000 vehicle-h)	2119	2087	2173	2299	
	Economy	Need for 3rd Canal bridge' (Canal cross-section traffic capacity (American bridge + Autopista) — Future traffic volume) (1000 PCU)	−26	−26	−53	11	

Note : E = Excellent, G,= Good,   P = Poor
Source : ESTAMPA

area of steep slope land for development, and is smallest under Alternative B, which emphasizes development in the east-west direction, involving relatively moderate slopes.

(b) As for home-work proximity, Alternatives A and C are about the same while Alternative B, which anticipates the radical dispersion of palces of work, is highly evaluated for its potential of achieving shortest commuting time by relocating shops to near homes.

Urban service availability, on the other hand, is the highest under Alternative C, which plans to concentrate sophisticated commercial, amusement, medical, and other services in places relatively close to the urban center. Of cource all alternatives will secure such services of community level.

(c) Urbanization with "worm holes" and the resultant creation of urban areas with poor

living environment, which is often the case under a strong urban development demand, can be prevented by appropriate urban planning and adequate administrative guidance and regulatory control over development projects.

Also important in this regard is the maximization of the public share in the aggregate volume of development, thereby minimizing reliance on the private sector.

The large-scale public development of the reverted area (national land), anticipated under Alternative C, will, if properly developed, enable the formation of wide and very pleasant housing areas.

As for green area, which is an important contributor to the amenity of life, not only the existing green land should be preserved but also new green land should be established through development efforts. Private gardens of large houses and streetside trees are seen in some parts of Panama City, but, as a whole, green area is still limited. Therefore, the reverted area, which is adjacent to the urban area, is a precious resource for green area. It is inevitable that the total green area will be smaller under Alternative C even with best efforts to preserve such areas and to create parks and other new green areas. Nearly all of the green area resource of the reverted area will be preserved under Alternative B.

(d) The amount of public development fund required will be the smallest under Alternative A, which anticipates the implementation of necessary public development projects while guiding and controlling private development projects following the present trend. It will be the largest under Alternative C, which anticipates a large-scale public development of the hilly area, provided that funds for the environmental projects beyond private capabilities can be somewhat greater under this Alternative.

(e) As for development potential after the year 2000, the target year of this Plan, the most sizable quantity of development land will be preserved near the urban center under Alternative B, which will leave the reverted area undeveloped.

Developable land will remain outside the reverted area under both Alternatives A and C, also. Alternative B is significant more in that it defers the decision as to how the large developable land is to be best utilized — a decision hard to make at this time — to the future, than in that it will have a greater quantity of developable land after the year 2000.

(f) The dispersion of places of work and the guidance/control of urbanization in privately owned land will be difficult to accomplish.

The current trend is strongly suggestive of housing projects further away from urban centers and the further concentration of urban functions in the built-up area. Substantial efforts will be required to change such drift to conform with plan objectives. Alternative A is more realistic than the other two in that it plans to disperse at least the functions which do not have to be located in urban centers. If drastic policy actions are to be taken, the value of Alternative C will be high in that it will utilize the national land (the reverted area) the most extensively.

(g) The assignment of volume of future activities under each Alternative onto the existing road network shows that average travel speed will be the highest and average congestion rate will be the lowest under Alternative A, followed by Alternative B, and then, by Alternative C. This is because, under Alternative A, future urbanization will follow the present trend and the volume of activities will be distributed evenly in close conformity with the existing road network, while such volume is unevenly distributed in the east-west direction under Alternative B and in the northern part under Alternative C. Particularly under C, the number of existing roads in the de-

velopment area is small and traffic is very congested in that direction. However, the rate of congested section to the total road extension is the lowest under C and is the highest under B, which is for a narrow east-west distribution.

(h) The total transport demand, which reflects the energy needed for transportation, is the strongest under Alternative C, followed by B and A. This is believed due chiefly to the difference in passenger car utilization rate, which is believed high in suburban housing areas in the east under Alternative B, high in the lage-scale housing area to be developed in the north under Alternative C, and low under Alternative A, which will be closer to the present trend than the other two.

(i) The established plan of extending Autopista will result in the construction of a second bridge over the Canal, in addition to the existing Puente de Las Americas. Whether a third bridge over the Canal will be necessary or not will importantly affect the cost of traffic plan. Decision on such a third bridge will become essential under Alternative B, in view that traffic demand will far exceed the capacity of the said two bridges.

Based on the above discussions, an overall evaluation of the three Alternatives is that Alternatives B and C are ambitious but difficult in terms of development cost and reality, while Alternative A is relatively advantageous in terms of cost and reality and, therefore, is judged to be the most appropriate assumption for the purpose of urban transport planning.

So final land use plan is prepared based on Alternative A, partly introducing the ideas of Alternatives B and C.

5) Land Use Plan

(1) Key Points of Final Plan Formulation
The final land use plan is fundamentally based on the frame of Alternative A but incorporates some ideas of Alternatives B and C and the opinons and development concepts of the Panamanian Government, as revealed in the process of reviewing the Alternatives. The Final Plan differs from Alternative A in the following points:

A. With the expectation of population decline prevention measures, Alternatives B and C estimated larger Centro Zone population than Alternative A, but the Final Plan estimates still a greater population.

B. As for Area Residencial, the three Alternatives did not estimate a very large population, which was in line with the extrapolated estimation, but a somewhat larger population is estimated by the Final Plan, because the population density is still fairly low and it is expected that traffic load will be mitigated in this Zone in the future.

C. Because developable land in San Miguelito District includes areas which would entail a large scale earthwork due to the topography and also because a compact urban area is desirable for future development in this Zone, the Final Plan estimates a smaller population (and a smaller urbanized area) than Alternatives B and C, which estimated a somewhat smaller population than did A.

On the other hand, the scale of employment estimated by Alternatives B and C is used for

the Final Plan in consideration of the anticipated creation of regional nucleus comprising of the eastern part of San Miguelito and Juan Diaz-Pedregal.

    D.   Alternatives B and C estimates are used for Las Cumbres-Chilibre

    E.   For Ancon Este, the MIVI plan for high-density residential area development is accepted for the Final Plan.

    F.   In Ancon Oeste, development will be limited to a minimum degree in the area conterminous with Arraijan.

    G.   For Arraijan Zone, the movement of MIVI, local government, and private projects for high-density residential area development is incorporated.

(2)   Population Allocation Plan

Population is allocated to zones for planning purposes as follows:

    A.   The future population of Centro Zone is to be secured at 90% of the 1980 population, or 96,600.

    B.   Bella Vista population is to be 31,300 in accordance with the projected estimate.

    C.   In addition to the 1980 population of Area Residencial of 168,700, two-thirds of the population absorption capacity of available vacant lots (see Table 2-27, Chapter 2), or 41,600, is estimated, so that population density will rise to 78.5 persons per hectare.

    D.   The projected estimate of 174,000 is used for Juan Diaz-Pedregal,

    E.   The projected estimate of 59,300 is used for Tocumen.

    F.   San Miguelito Zone population is held at 300,000 under the future population estimate of 100,000 for Corregimiento de Jose Domingo Espinar in the eastern part of the Zone.

    G.   Las Cumbres-Chilibre Zone population is held at 70% of the projected estimate, or 89,000.

    H.   For Ancon Este, future population is estimated at 98,400 (the total shown in Table 8-27 is 98,300; the present population of Fuerte Amador of 100 has been added) under the residential area development concept of MIVI as requested by the projects listed in Table 8-27.

    I.   In Ancon Oeste, a population of 1,500 is to be accommodated in the part of the reverted area adjacent to Arraijan.

    J.   In Arraijan, population in the existing urban part and the rural part is forecast to increase to 56,500. In addition, residents of newly-developed residential areas are estimated at 55,000, 6,000 in Veracruz and 49,000 in Arraijan Cabecera (P.T. Zone 44) and Vista Alegre y Juan D. Arosemena (P.T. Zone 46) under the development projects listed in Table 8-28. The total future population is thus estimated at 111,500.

    K.   The projected estimate of 125,100 is used for La Chorrera Zone, for which, various urban development projects are proposed with a planning population within the scope of said estimate.

TABLE 8-27 HOUSING PROJECTS OF MIVI IN THE REVERTED AREA

Project	Area (ha)	Density (Person per ha)	Population
New Development	372.7	180	67,000
Campo de Antenas de Curundu	28.0	300	6,000
Albrook-Norte	19.0	300	6,000
Camino de la Amistad	33.0	300	10,000
Via Ricardo J. Alfaro	202.7 (144.85)	150 (200)	29,000
Others	90 0	150	13,500
Densification			31,300
Paraiso	40.4	250	8,700
Pedro Miguel	22.4	300	6,300
Others			16,300
Total			98,300

Note : The figures in the parentheses are for residential use.　　Source : MIVI

TABLE 8-28 HOUSING PROJECTS IN ARRAIJAN DISTRICT

Project	Area (ha)	Density (Person per ha)	Population
Nueva Ciudad	204	175	35,700
Nuevo Chorrillo	115 (83) [1]	100 (100) [1]	11,500 (8,300) [1]
Burunga	230 (200) [2]	25 (25) [2]	5,750 (5,000) [2]
Total	549 (487)	95 (100)	52,950 (49,000)

Note : 1) Figures in the parentheses are for new development.
　　　 2) Figures in the parentheses are of the part of Arraijan.
Source : MIVI

TABLE 8-29 POPULATION DISTRIBUTION PLAN (2000)

Integrated Zone		Final Plan	Alternative A
I	Centro (01—06)	96,600	82,900
II	Bella Vista (07—10)	31,300	31,300
III	Area Residencial (11—22)	210,300	181,000
IV	Juan Diaz - Pedregal (23—25)	174,000	174,000
V	Tocumen (26—27)	59,300	59,300
VI	San Miguelito (28—34)	301,800	342,500
VII	Las Cumbres Chilibre (35—36)	89,000	127,600
VIII	Ancon Este (37—42)	98,400	60,400
IX	Ancon Oeste (43)	1,500	19,200
X	Arraijan (44—46)	111,500	95,500
XI	La Chorrera (47—49)	125,100	125,100
Planning Area Total (01—49)		1,298,800	1,298,800
Pacora — Nuevo Emperador (50—53)		36,000	36,000
Study Area Total (01—53)		1,334,800	1,334,800

Source : ESTAMPA

L. The extrapolated estimates of 21,600 and 14,400 are used for Pacora and Nuevo Emperador, respectively.

A through L above are summarized in Table 8-29.

(3) Employment Allocation Plan

If no preventive policy measures are taken and the future is allowed to take shape along the present trend, disorderly development of suburban residential areas and excessive concentration of jobs in Panama Urban Area will result. To facilitate the mitigation of such problems, future employment (jobs) is allocated at the planned E/W ratio. This allocation is accomplished as explained below.

A. Future jobs in Panama Urban Area is limited to 254,000 which is 90% of the extrapolated estimate of 280,000. This 254,000 is distributed to various parts of this Area as follows, taking into consideration the degree of commercial concentration, distribution of vacant lots, and the trend of construction activities:

I.	Centro:	81,000 (E/W ratio: 2.0)
II.	Bella Vista:	85,000 (E/W ratio: 5.7)
III.	Area Residencial:	88,000 (E/W ratio: 1.0)

B. For Panama's suburn area — Juan Diaz-Pedregal, Tocumen, and San Miguelito — a total of 118,000 jobs are to be secured so that the E/W ratio of these three Zones will be raised (from the present 0.4) to 0.6. Toward this end, it is expected that the existing commercial and industrial areas and public facilities will be improved and developed, while a regional nucleus (commercial facilities, public facilities) which will serve the entire suburbs of Panama is planned for the eastern part of San Miguelito (that is, La Pulida and Cerro Viento) and an industrial estate is planned for Tocumen. Then, the number of jobs in those Zones will be as follows:
planned for Tocumen. Then, the number of jobs in those Zones will be as follows:

IV.	Juan Diaz - Pedregal:	39,000 (E/W ratio: 0.6)
V.	Tocumen:	17,000 (E/W ratio: 0.85)
VI.	San Miguelito:	62,000 (E/W ratio: 0.57)

C. 15,000 jobs are allocated to Las Cumbres-Chilibre Zone, so that the E/W ratio will be raised (from the present 0.4) to 0.5.

D. 37,000 jobs are allocated to Ancon Este in the year 2000, which will include additional employment opportunities for 23,000 people through the development of the former Albrook Airfield and areas along the Friendship Road.

E. For Ancon Oeste, 2,400 jobs are estimated, which is a 60% increase over the present 1,500.

F. 24,000 jobs are allocated to Arraijan which will raise the E/W raito (from the present 0.45) to 0.65. This is to be realized through the development of an industrial estate near Vacamonte Port, the formation of a commercial nucleus in Vista Alegre y Juan D. Arosemena for the entire Arraijan, and the development of tourism in Veracruz.

G. With the aim of raising the E/W ratio in La Chorrera (from the present 0.6) to 0.8, 33,000 jobs are allocated to this Zone. It is expected that this employment magnitude will be realized through the improvement and development of the existing shopping area in Barrio Balboa

(P.T. Zone 48) and the development of an industrial estate and the construction of a new college town in Barrio Colon y Puerto Caimito (P.T. Zone 47).

A through G above are summarized in Table 8-30 below.

TABLE 8-30   EMPLOYMENT DISTRIBUTION PLAN (2000)

	Integrated Zone	Final Plan	Alternative A
I	Centro (01—06)	81,030	81,030
II	Bella Vista (07—10)	85,185	85,185
III	Area Residencial (11—22)	87,735	92,605
IV	Juan Diaz · Pedregal (23—25)	39,540	39,540
V	Tocumen (26—27)	17,000	17,000
VI	San Miguelito (28—34)	61,900	56,120
VII	Las Cumbres · Chilibre (35—36)	15,250	19,710
VIII	Ancon Este (37—42)	37,015	35,535
IX	Ancon Oeste (43)	2,395	3,875
	Arraijan (44—46)	24,030	20,480
XI	La Chorrera (47—49)	32,960	32,960
Planning Area Total (01—49)		484,040	484,040
Pacora — Nuevo Emperador (50—53)		10,120	10,120
Study Area Total (01—53)		494,160	494,160

Source : ESTAMPA

(4)   Urban Development Plan

An urban development plan has been formulated for the Planning Area in line with the population allocation plan and employement allocation plan.

(i)   Urbanized Area Size

The areal scale of the urbanized areas is expected to expand from the 12,800 hectares in 1980 to 20,000 hectares, while population dehsity will rise from 50 persons per hectare to 62 persons per hectare. The urban population will be 1,236,000, of which 827,000 will live in the presently urbanized areas, and 409,000 in the newly urbanized areas of 7,200 hectares.

Of the 7,200 hectares, about half or 3,600 hectares, will be developed in the eastern suburb of Panama Urban Area (that is, Juan Diaz-Pedregal, Tocumen, and the eastern part of San Miguelito), 500 hectares in the reverted Canal land and 2,300 hectares in Arraijan and La Chorrera. Chorrera.

(ii)   Panama Urban Area (P.T. Zone 01—22)

The future improvement of Panama Urban Area, which is practically fully urbanized with the current gross population density of 87 persons per hectare, will necessarily emphasize the guidance and control of vacant lot utilization and change of use (from residential to commercial/ business) and urban renewal schemes.

a)   Centro (P.T. Zone 01—06)

After deducting roads (71.2 hectares), parks and cemetaries (10.6 hectares) from the total

TABLE 8-31 URBANIZATION PLAN (POPULATION AND AREA)

Integrated Zone	1980			2000			Area Increase 1980–2000
	Population	Area	Density	Population	Area	Density	
Panama Urban Area (01–22)	304,127	3,510	86.6	338,200	3,510	96.4	–
Juan Diaz Pedregal (23–25)	84,511	2,380	35.5	174,000	3,674	47.4	1,294
Tocumen (26–27)	17,000	1,515	11.2	54,600	2,398	22.8	883
San Miguelito (28–34)	157,063	2,500	62.8	301,800	3,971	76.0	1,471
Las Cumbres - Chilibre (35–36)	19,900	710	28.0	59,800	1,470	40.7	760
Ancon Este (37–42)	1,600	670	2.4	98,400	1,170	84.1	500
Ancon Oeste (43)	–	–	–	1,500	30	50.8	30
Arraijan (44–46)	21,400	970	22.1	98,800	1,577	62.7	607
La Chorrera (47–48)	37,100	560	66.3	108,600	2,208	46.1	1,648
Planning Area Total (01–49)	642,701	12,815	50.2	1,235,700	20,008	61.8	7,193

Source : ESTAMPA

area space of Centro (380 hectares), there exist a total of 298.2 hectares of building lots in this Zone. Of the 298.2 hectares, 10.5%, or 31.2 hectares, are presently vacant (24.1 hectares) or are used as off-street parking lots (7.1 hectares). Of the total 298.2 hectares of building lots, 5% or 14.9 hectares are believed to be left unoccupied by buildings. Deducting this 14.9 hectares of never-to-be-occupied lots from the 24.1 hectares of vacant lots, that which can be utilized for residential or commercial/industrial purposes will be about 9.2 hectares. Adding to this the space to become available due to land use change from residential to commercial/business, the total land space which will be available for future building activities will be about 12 hectares. While the Centro population is forecast to decrease by 10,700 by the year 2000, the population decrease will not directly result in a reduction of residential land: the heavy-density utilization of old houses will somewhat abate and vacant rooms will increase, but not to the extent of causing residential land area reduction or of eliminating need for additional houses.

From 1980 to 2000, the number of jobs will increase by about 24,000, of which about 19,000 will be accomodated in the commercial and industrial zone and in the ground and first floor of high density residential zone, and about 5,000 in the newly formualted commercial area from residential.

TABLE 8-32 AREA OF BUILDING LOTS AND CLASSIFICATION BY USE IN CENTRO

Lot	Area (ha)
Total Area	380
Streets and Parks	81.8
Building Lots	298.2
.Occupied Lots	267.0
Parking	7.1
Vacant Lots	24.1

Source ; ESTAMPA

Under the above frame, the urbanized area will be improved as follows:

A. No vacant space is available in Corregimiento de San Felipe, where IPAT rehabilitation projects are implemented. Lodging facilities and necessary parking lots will be developed and

TABLE 8-33 FUTURE USE OF PRESENT VACANT LOTS IN CENTRO

Lot	Area (ha)	Remark
Present Vacant Lots	24.1	
To be left vacant	14.9	5% of Total Building Lots (298.2)
To be occupied	9.2	
Residential	5.5	$H \cdot R + (C \cdot R + U) \times 2/3$
Commercial	3.7	$C + I + (C \cdot R + U) \times 1/3$

Note : H·R: High Density Residential,   C · R : Commercial/Residential
       U : Urban Renewal Area,   C : Commercial,   I : Industrial
       Source : ESTAMPA

feeder bus service will be introduced. In order to achieve this, condemmed houses and vacant worn down houses arising from future population decrease will be utilized for other purposes, with the exception of those with historical significance.

B. Of the four locations designated by MIVI for urban renewal, developed centering aroud residential houses will be relevant commercial and public facilities in El Chorillo, Santa Cruz, and Santa Ana, and constructed in El Maranon will be public, commercial, and business buildings, as well as high rise residential complexes. A public transport center will be sited in or near El Maranon.

C. Further concentration of automobile sales and other service industries, as well as public facility development, are to be accomplished in the large vacant land in Curundu, after roads are developed to the reverted land.

D. In parts where land use is being changed (transitional area) near Bella Vista, the establishment of obligatory parking space, minimum land lot size, and design check are to be enforced at the time of processing applications for construction permits.

b) Bella Vista Zone (P.T. Zones 07—10)

After deducting roads (50.9 hectares) and parks (8.3 hectares) from the total areal space of Bella Vista of 450 hectares, 390.8 hectares remain for construction purposes. Presently, 11.9% of the 390.8 hectares, or 46.6 hectares, are either vacant (42.4 hectares) or used as parking spaces (4.2 hectares). Assuming that 5% (19.5 hectares) will ultimately remain vacant or as parking spaces that which will be available for building purposes will be 22.9 hectares, which will be divided into use for residential purposes (12.0 hectares) and commercial/business purposes (10.9 hectares). Furthermore, about 7 hectares of land will become available for commercial/business use by changing.

TABLE 8-34 AREA OF BUILDING LOTS AND CLASSIFICATION BY USE IN BELLA VISTA

Lot	Area (ha)
Total Area	450
Streets and Parks	59.2
Building Lots	390.8
Occupied Lots	344.2
Parking	4.2
Vacant Lots	42.4

Source : ESTAMPA

TABLE 8-35   FUTURE USE OF PRESENT VACANT LOTS AND
USE CHANGED LOTS IN BELLA VISTA

	Area (ha)	Remark
Present Vacant Lots	42.4	
Future Vacant Lots	19.5	5% of Total Building Lots (390.8)
Newly Covered Lots	22.9	
Residential	12.0	R + H . R
Commercial	10.9	C + C . R

Note : R : Residential,   H . R : High Density Residential   C : Commercial
C.R. : Commercial/Residential
Source : ESTAMPA

A future population increase of 3,200 is estimated for this Zone, but additional housing demand will be about 4,000 people, taking into consideration the division of multigeneration families into a greater number of smaller families, relocation of people from existing houses through conversion of residential land into commercial, and the inflow of foreigners. This demand corresponds to the capacity of the vacant lots existing in residential areas and in high-density residential areas (excluding the future remaining vacant lots).

On the other hand, employment will increase by about 47,000 jobs, as all the vacant lots in commercial/residential and commercial zones will be filled with commercial facilities, the ground floor of one-half of the apartment houses to be newly built in high-density residential areas will be used as store space, and the existing residential areas will be turned into commercial areas to the extent needed to created said magnitude of employment.

Following the above indicated prospects, the following urban area development will be accomplished:

A.   Necessary land space will be secured for handling large quantities of motor traffic, parking space demand, and pedestrians to be generated through maximum use of the existing commercial/residential areas (chiefly RM3C2) for commercial and business facilities.

B.   The effect of a minimum floor area ratio requirement on improving land use efficiency should be evaluated (In C_2, where maximum floor space ratio requirement is 500%. The actual average ratio is believed to be about 250% due to the presence of buildings with varying number of floors.)

c)   Area Residencial (P.T. Zone 11—22)

Because population is forecast to shrink in Centro and to increase only slightly in Bella Vista, Area Residencial will be responsible for the 34,000 population increase estimated for Panama Urban Area, as a whole, by the year 2000. In fact, it is estimated that Area Residencial population will increase by 41,600, while the 258 hectares of vacant lots within the areas where house construction is permitted by zoning have a capacity of accommodating for 62,600 people (see Table 2-27 in Chapter 2). The utilization of two-third (or 170 hectares) of the 258 hectares to accommodate for the population increase of 41,600 will still leave 88 hectares of vacant residential land, which will be 4.8% of the total designated residential lots of 1,840 hectares — about the proportion finally left unused in any urbanized area. Thus, it is expected that Area Residencial will be as urbanized as it can be by the year 2000.

In Area Residencial, the greatest population increase is forecast to occur in El Dorado (P.T.

Zone 17), where private development project is being implemented near the Curundu River. Also in El Dorado are vacant lots of a large total size existing in the commercial area, where 20%of the job increases in Area Residencial are expected to occur through the development of a regional commercial nucleus for motorized customers around the existing shopping center.

Another growing area will be Punta Paitilla (adjacent to Bella Vista), where commercial areas will develop along Ave. Balboa.

(iii) Juan Diaz—Pedregal

Juan Diaz—Pedregal was urbanized relatively early, but with a low building density and without any concentration of commercial activities due to the distribution of housing areas in a vermiculated fashion, the presence of factories and other large facilities, and the submersion of land in some parts.

The development plan for the coastal mangroved area formualted by MIVI in coordination with relevant ministries envisages residential, commercial, and industrial developments, together with the installation of a draining facility. Of the MIVI Plan, the portion which pertains to the new (low-density) housing development will be adopted into this land use Plan for the development of 380 hectares in Hipodromo (P.T. Zone 23) and Juan Diaz (24).

The fosteration of commerce and industry in the Zone will necessitate a number of actions, some of which are:

• Study on the fosteration of a steel-related industrial mix around the nucleus of the existing steel making plants.

• The improvement of the transport service within the Zone by developing north-south roads.

• The development of a sports center and the attraction of customers by holding various events.

• The development of a zonal service nucleus in line with the development of middle- and high-class housing areas.

(iv) Tocumen (P.T. Zone 26—27)

In Tocumen, future rapid population swelling will result in a corresponding urban development demand of jobs through industrial development and commercial promotion in order to lessen demands for long-distance commutation to Panama Urban Area. An estimated 30 hectares of industrial estate will be developed in line with road development.

(v) San Miguelito (P.T. Zones 28—34)

In San Miguelito, rooms for future development remain in Los Andes No.2 (P.T. Zone 32) along Via Transistmica and in La Pulida (33) and Centro Viento (34) along Via Domingo Diaz.

Development in Los Andes No.2 will start with the opening of Autopista and, in view of the undulating topography, will progress chiefly in valleys, particularly near Autopista approach roads and interchanges.

Private development of a new 100,000 population city will progress in La Pulida/Cerro Viento, and the city's core will function as the regional nucleus for the area including Juan Diaz and Tocumen. In order to guide this project under private initiative, a development masterplan should be developed well in advance. Also, in view of the fact that land holdings are in large scales, the landowners opinions should be surveyed in full, while a basic land use plan and development standards should be formulated. The regional nucleus will consist of the followings:

(1) Commercial facilities: A large shopping center building (housing stores, restaurants, banks, branches of INTEL and other organizations and some cultural facilities).

(2) Medical facilities: General hospitals and specialized hospitals.

(3) Educational facilities: University campuses, colleges, and vocational schools

(4) Amusement-cultural facilities: Movie theatres, halls, swimming pools, and the like

(5) Offices and public buildings: Some government functions, a radio and television broad-casting station, and a newspaper office.

(vi) Las Cumbres-Chilibre (P.T. Zones 35–36)

Urbanization in this Zone will be limited to the Urb. Torrijos-Carter Project of MIVI in the area adjacent to San Miguelito and spontaneous urbanization along Via Transistmica and that in the direction of Las Cumbres; almost no new urbanization will take place in Chilibre.

(vii) Ancon Este (P.T. Zone 37–42)

Conceived of for this Zone are a number of development plans described in the discussion of population and employment allocation plans — some of which are still in the form of land request and some are much refined, but with no full coordination and coherence between them. It is presently hard to believe that the outlines of land use, development area size, and population size, now under review by MIVI, may be changed in the future, and, therefore, these outlines are adopted for this Study.

In Ancon Este, Panamanians presently have the freedom of planning urbanizations in the former airport land (190 hectares) in Albrook Field (40) the reverted area (920 hectares) in Fuerte Clayton (41), and the reverted area (5,010 hectares) in Pedro Miguel (42), as well as the green belt in Balboa (39) facing Centro (where various cultural facilities and houses are located).

The plan envisages the followings for each of the P.T. Zones:

(1) Albrook Field (40)
• The development of 19 hectares north of Albrook Field as a high-density housing area accommodating 6,000 people.

• In the remaining part of this P.T. Zone, public buildings, port-related industries, land transportation facilities, manufacturing, and other various service industries are to be introduced.

(2) Fuerte Clayton Reverted Area

• Of the 920 hectares of reverted land, newly developed will be the 500 hectares where development seems easy judging from the topography. Major land uses will be housing, public facilities, and educational facilities.

- A commercial area will be created near the intersection of Corredor Norte and the road for communication with Curundu.

(3) Pedro Miguel Reverted Area

- Of the 5,020 hectares of the reverted area, the population density of the existing residential area in Paraiso and Pedro Miguel will be made heavier from the current 21.7 persons per hectare to 250 persons per hectare in order to accommodate a total of 15,000 people.

- The existing green belts in the remainder of the Zone will be preserved.

(4) Others

Of the portion of Corregimiento de Ancon facing Centro, the eastern part will be developed into a cultural facility zone and the west side into a public building zone.

(viii) Ancon Oeste (43)

Of the 500 hectares of physically developable area in the reverted area of this Zone, a small urban area of about 30 hectares will be developed near Arraijan.

(ix) Arraijan (44–46)

Large-scale urban development projects in Arraijan are for Burunga, Nueva Ciudad, and Nuevo Chorrillo. No other development projects will, as a principle, be implemented in Arraijan Cabecera (44) and Nuevo Arraijan (46). The remaining building demands will satisfied by the presently low-density urbanized area.

Land not only for houses but also for villas and cottages will be developed in Veracruz (45), in order to develop this area as a tourist spot. An access to Arraijan Cabecera (the district capital) without going through Cocoli (43) will be made.

60-hectare industrial estates will be established in order to accelerate the location of industries in the vicinity of Vacamonte Port. Fish processing will be chiefly promoted, with additional acceptance of the industries presently located in Panama Urban Area that are searching for land for expansion or violating the designated land use.

In order to prepare a favorable environment for the development of Nuevo Arraijan as a new commercial center of Arraijan, facilities whose location can easily be determined under political decisions and which are suitable to a central neucleus — such as public, educational, and cultural facilities, as well as roads, needless to say — will be constructed under Nueva Ciudad Project.

(x) La Chorrera (P.T. Zones 47–49)

Although La Chorerra has so far been a regional center with a higher independence from Panama Urban Area than other parts of the Study Area, it will quickly evolve as a residential area in the future in view of the fact that its climate is somewhat more pleasant than in Panama, that land price is relatively low, and that distance from Panama Urban Area will shrink in terms of time.

Because of the expansion of a relatively low-density urbanization, additional area in La Chorrera will reach 1,600 hectares, or over 20% of the total increments in the Planning Area. The following projects are being implemented in La Chorrera: