社会開発協力部報告書

REPUBLIC OF PARAGUAY

THE FEASIBILITY STUDY ON THE TRANSPORTATION FACILITIES IMPROVEMENT PROJECT OF THE ASUNCION METROPOLITAN AREA

FINAL REPORT

OCTOBER 1988

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to the request of the Government of the Republic of Paraguay , the Government of Japan has decided to conduct a Feasibility Study on the Transportation Facilities Improvement Project of the Asuncion Metropolitan Area and entrusted the study to the Japan International Cooperation Agency (JICA).

The JICA sent to Paraguay, a study team headed by Dr. Juro Kodera of Yachiyo Engineering Co. Ltd., from September of 1987 to October of 1988, and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to promote friendly relations between our two countries.

I wish to express my deep appreciation to all the officials concerned of the Government of the Republic of Paraguay for their close cooperation extended to the team.

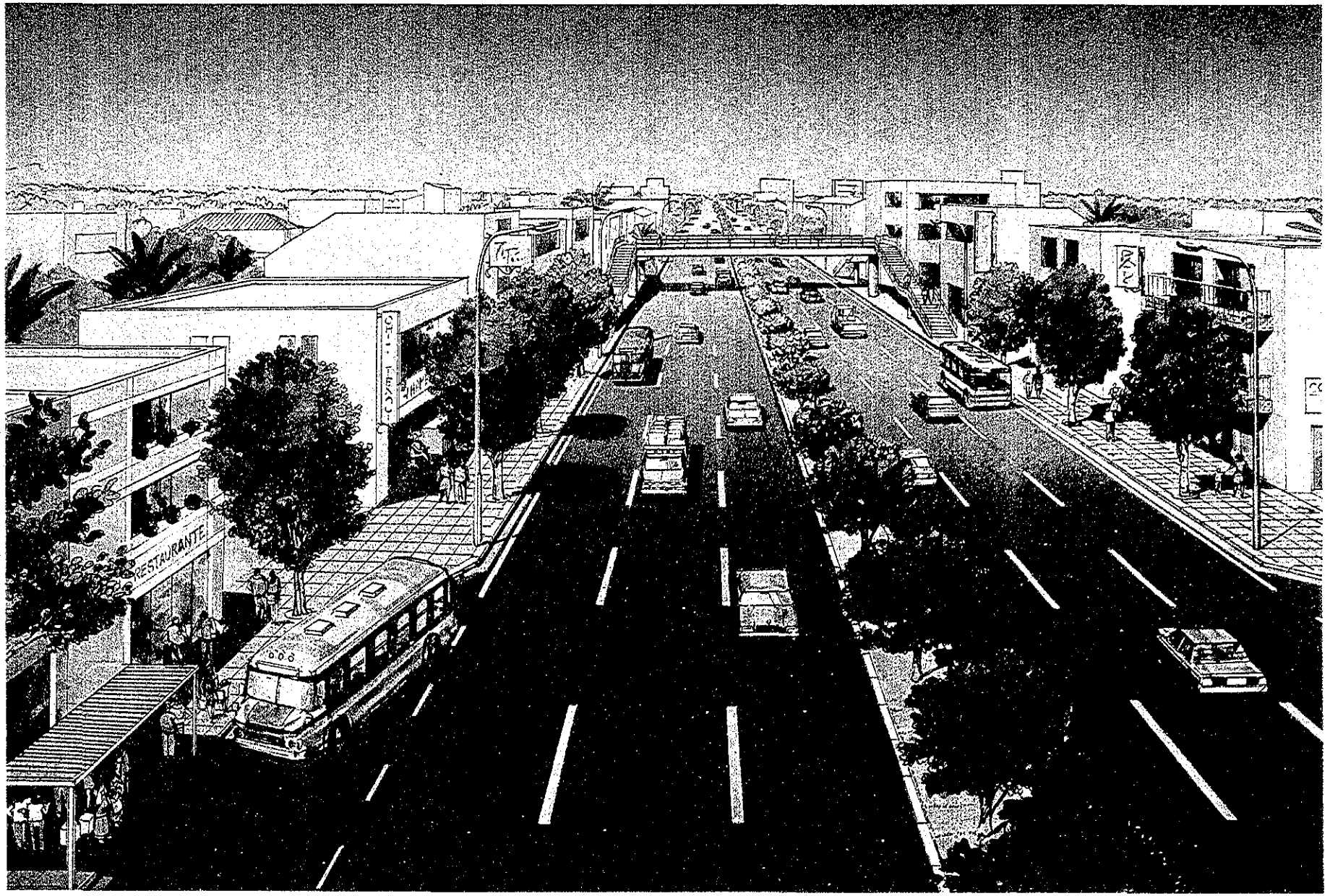
October, 1988

Kensuke Yanagiya

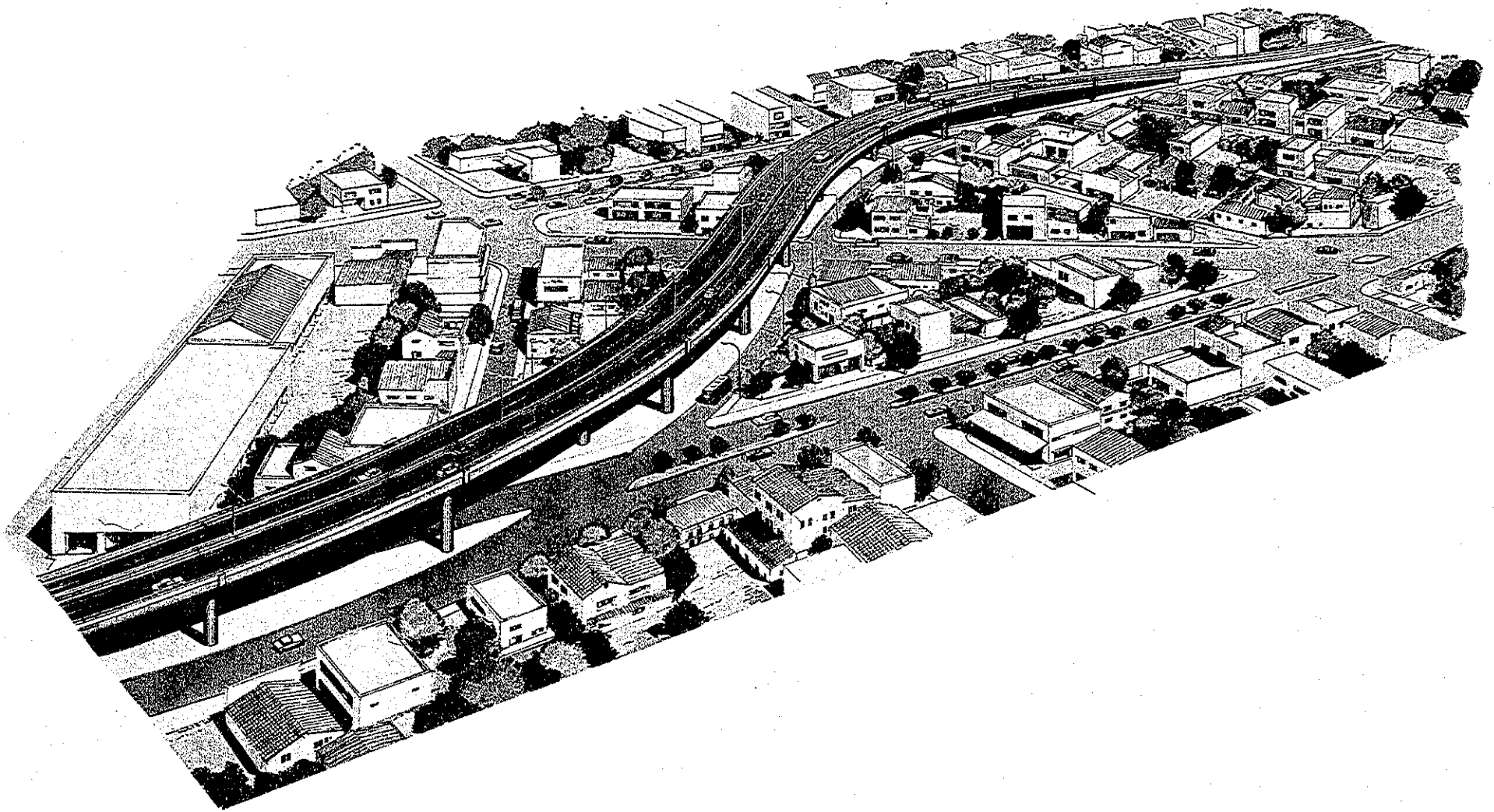
Kensuke Yanagiya
President
Japan International Cooperation Agency

TABLE OF CONTENTS

PROJECT LOCATION MAP



EUSEBIO AYALA AVENUE (35M)



CONNECTING VIADUCT BETWEEN E. AYALA / R. DE FRANCIA

MALL PLAN IN MICROCENTRO (PALMA STREET)

SUMMARY

SUMMARY

1. OBJECTIVES, BACKGROUND AND SURROUNDINGS

1.1 OBJECTIVES AND BACKGROUND

(Background)

According to on the Urban Transport Study of Asunción and its Metropolitan Area, August 1986, the project to widen the Mcal. Estigarribia Road/E. Ayala Avenue/R. de Francia Avenue corridor and the integrated improvement of the Microcentro traffic were chosen as the priority projects.

The corridor formed by the mentioned arteries was considered as the road network which defines the urban structure of Asunción and its Metropolitan Area. The improvement of the Defensores del Chaco/Mme. Lynch Avenues corridor, considered in the report as a fixed project, decided to allow the side expansion to that corridor.

This study started in September 1987, to examine feasibility of the above mentioned projects.

(Objectives)

Objectives of the study are to establish the design standards of the main arteries which define the framework structure of Asunción city and its Metropolitan area, composed by: R. de Francia Av., E. Ayala Av., Mcal. Estigarribia Road (East/West corridor) and Defensores del Chaco Av., Mme. Lynch Av. (North/South corridor). Organization of the functions for public transport and private vehicles, especially the construction of the Urban Bus Terminal , is included in the study.

1.2 SURROUNDINGS

(Land Expropriation)

Legislation for land expropriation is established. Generally, the land expropriation is carried out by the Municipality. The indemnification price is defined through the negotiation between owners and the Municipality, in case the negotiations fail, a legal adviser of the municipality arbitrates.

However, these cases are not common. In the case of the widening of J.F. Bogado Av., carried out in 1982, only two cases were referred to the arbitration. In most cases of land expropriation, the construction line is previously established. Along E. Ayala Avenue, 63.1% of the buildings have front clearance, from the construction line established in 1978.

(Indemnification Value)

Three land value exist. They are, (1) the values for buying and sale activities (Commercial value), (2) the assessment of the real estate tax (Fiscal value) and (3) Municipal tax (Municipal value). The average of these three values is adopted for the indemnification.

(Illegal Settlement)

The so called "Chacarita" area is located along the Asunción bay shore, where illegal settlements are established. The number of illegally settled inhabitants is not defined, but is estimated at around 18 thousand.

A relocation project of "Chacarita" toward the suburban areas was/is carried out without positive results, due to the characteristics of the area workers. They engage in time flexible jobs such as domestic maid, street vendors, newspaper boys, carpenters, etc.

The "Chacarita" area is Municipal property. However, the inhabitants of this area own the certificate, "right of occupation", issued by Seccional Colorada. The buying and selling of those "right of occupation" varies between 600 thousand and 1 million Gs.

The España Avenue extension project penetrates into the "Chacarita area".

(Financial Condition of the MCA)

The financial condition of the MCA in the last 5 years (1983-87), recorded a positive balance. It is around 18 million Gs. annually.

During the same period, the current revenue increased around 13 to 15% per annum. On the other hand, the amount of public investments show an annual increase of 20%, reflecting implementation of the construction of the new City Hall Building and others. The amount of current revenue for 1987 was Gs. 5,732 million and expenditure were Gs. 5,716 million, of which Gs. 3,278 million correspond to current expenditures and Gs. 2,438 million to capital expenditures. The proportion of current expenditures is 57% of the total amount of expenditures. The capital expenditures are Gs. 1,968 millions corresponding to investments and Gs. 144 million to debt amortization. The contents of debt amortization are Gs. 108 million for the internal portion and Gs. 36 million for the external portion.

According to these figures, it can be concluded that the financial aspects of the MCA are well administered.

The budget of Public Works of the MCA in 1988, was Gs. 1,704.5 million, in which the most outstanding were:

Construction cost of City Hall Building	Gs.480 million
Construction cost of Costanera Avenue	Gs.200 million

Cost of paving works Gs. 260 million

(MOPC)

According to the National Plan of Social and Economic Development (1986/90) prepared by the STP, the average annual budget for the highway section of the MOPC is Gs. 16,214 billion, which is distributed mainly for the rural areas. Works related to Asunción and its Metropolitan area are:

- Widening of National Road No. 2 (from San Lorenzo up to 64 km)
- Widening of J.F. Bogado Avenue
- Improvement of access road to the city of San Antonio
- Works against flooding on Mme. Lynch Avenue

(CORPOSANA)

The Balance of CORPOSANA in 1986 was as follows:

Current Balance:	Revenue	Gs. 4,470 million
	Expenditure	Gs. 4,332 million
	Benefit	Gs. 138 million

Investments Balance:

Capital investments	Gs. 3,029 million
Capital expenditure	Gs. 7,173 million
Deficit	Gs. 4,144 million

The investment cost deficit was covered with foreign financing.

2. EAST/WEST CORRIDOR

2.1 MCAL. ESTIGARRIBIA ROAD/EUSEBIO AYALA AVENUE

2.1.1 Cross Section Plan

1) Planning Conditions

(Traffic Demand)

When crossing the Asunción Municipal limit, Eusebio Ayala Avenue has a different name (Mcal. Estigarribia Road). The traffic demands of these two arteries are as follows:

(unit/day)

Street	1992	2000
Eusebio Ayala Avenue	61,000	76,000
Mcal. Estigarribia Road	47,000	64,000

Supposing that the traffic capacity of one lane is 10,000 units/day, for the years 1992 and 2000 it will be necessary to have 6 and 8 lanes respectively.

(Land Use)

Commercial use is dominant. Especially in the areas influenced by the commercial cores of the Municipal Market No. 4, and of the City of Fernando de la Mora, there is a concentration of administrative offices and small shops. Commercial activities related to vehicles are very common in the remaining areas.

(Construction Line)

The Municipality of Asunción is in charge of the Eusebio Ayala Avenue, whose regulated road width is 35m.

The MOPC is in charge of the Mcal. Estigarribia Road, whose road width is established in 50m, but at present it is 35m.

(Public Transport)

Many Bus lines are concentrated along the mentioned corridor. It is estimated that by the year 2000 it will reach 16,000 units/day.

2) Improvement Works

(Year 1992)

Components of improvement are:

- 35m right of way
- Paving improvement
- 6 lanes, which correspond to the 6 central lanes of the final stage improvement
- Exclusive bus lane
- Five elevated intersections including one existing viaduct

(Year 2000)

Components of improvement are:

- 50m right of way
- 8 lanes including the slow traffic lanes
- Exclusive bus lane
- Planting in the central median
- Theinstallation of bus bays in the side separator

2.1.2 Access Plan

Vehicle access to the road is controlled as follows:

Intersections	Present	Stage I	Stage II
1. Crossing with main roads			
Separation	1km	1km	1km
Type of crossing	Stop light intersections (with turning prohibition & no returning lane).	Grade separation or stop light crossing. (With no turning prohibition & returning lane according to needs).	
2. Crossing with secondary roads			
Separation	500m	500m	500m
Type of crossing	Stop light intersections (with turning prohibition & returning lane).	Stop light intersection (with no turning prohibition & returning lane according to needs).	
3. Crossing with local roads			
Separation	Approx. 100m	Approx. 100m	Approx. 200m joining it with the slow speed lane.
Type of crossing	With open central median & without turning prohibition	Allows right hand turn only.	Allows the access to the slow speed lane (only right hand turn).
4. Entrance from the building to the roads	Allows right hand turn only	Allows right hand turn only	Allows entrance to the slow speed lane (only right hand turn)

2.1.3 Intersection Plan

(Elevated Intersections)

- Intersection with Kubitscheck Avenue
- Intersection with Rca. Argentina Avenue
- Intersection with De la Victoria Avenue
- Intersection with Madame Lynch Avenue

(Intersections with Pocket for Left Turn)

- Intersection with Choferes del Chaco Avenue
- Intersection with Pitiantuta Street

(Existing Viaducts)

Intersection with Gral. Santos Avenue (the existing viaduct is used, modifying slightly the road width of the section).

2.2 CONNECTING VIADUCT BETWEEN E. AYALA AV./R. DE FRANCIA AV.

2.2.1 Cross Section Plan

1) Planning Conditions

(Traffic Demand)

The traffic demands of the years 1992 and 2000 were estimated as 18,600 units/day and 23,800 units/day respectively. The four lane viaduct is required in order to facilitate these demands.

(Land Expropriation)

Land expropriation of the commercial zone located on the east side of Market No. 4. The site must be chosen considering joint usage with the proposed Bus Terminal.

2) Cross Section Plan

Under the consideration of the existing road width, 23m, of R. de Francia Avenue, the 3.25m width for the main road lanes, and 3.0m for the lanes of the side roads was adopted. As a total, 32m of width are required.

2.2.2 Intersections Plan

The saturation flow rate at the intersection of R. de Francia Av. and Próceres de Mayo Av. after construction in the "without Terminal" and "with Terminal" cases, are 0.56 and 0.65 respectively. Consequently, no consideration is necessary for the connecting viaduct influence.

2.3 R. DE FRANCIA AVENUE

1) Planning Conditions

(Traffic Demand)

The congestion ratio of the four lanes in the year 1992 is 1.2 along its extension, and in the year 2000, it shows slightly over 1.3 on the section between Próceres de Mayo Av. And EE.UU Av. These values do not grant enough reasons to strongly affirm the necessity of widening to 6 lanes, but considering the 4 lanes of the connecting

viaduct coming from E. Ayala Av., plus the connection with Fernando de la Mora Av., it is illogical that R. de Francia Av. have the same number of lanes as the connecting viaduct has. The widening to 6 lanes up to EE.UU Av. is suggested.

(Land Use)

Commercial installations are common along the section between Próceres de Mayo Av. and EE.UU Av. The section between EE.UU Av. and Colón Av. is a good residential area.

(Construction Line)

The present width is 23m without frontage.

2) Cross Section Plan

The section from the connecting viaduct up to Perú Avenue is widened to 26m, with a median of 1m and without planting. The lane width is 3.0m for passenger cars and 3.25m for trucks.

The section between Perú and EE.UU Avenues will be widened to 26m. The existing trees at the median center are maintained.

3) Intersections Plan

At the intersection with Perú Avenue, the saturation flow rate in the year 2000 will be more than 1.0. However, the elevated crossing is not adopted because:

a. It is difficult to obtain the land for the purpose.
b. A congestion rate does not exceed 1.0 in the main direction.

2.4 BUS TERMINAL AT MARKET NO. 4 AREA

1) Planning Conditions

(Demand)

The present number of buses which have access to the Bus Terminal is 9,140 units/day. In the year 1992, this will increase around 9,000 to 12,000 (the variation will be according to the bus lines re-organization, increase of passenger transport efficiency, implementation of units with major capacity) and from 9,000 to 16,000 units in the year 2000. Here, 12,000 units/day is considered as the design demand because the access roads capacity could not allow more than 12,000 units/day running.

(Bus Terminal Characteristics)

The proposed bus terminal might be considered as a large off road bus stop. Main objective of that terminal is to lessen the road congestion produced by buses. When the congestion in the Microcentro area reaches the most critical condition, the regulating functions of the bus traffic flow will be added.

(Location)

Land under the connecting viaduct between Eusebio Ayala and Rodríguez de Francia Avenues is considered as the bus terminal site.

2) Facilities

The basic facilities to be implemented are:

- Facilities for passenger movement
- Facilities for bus movement
- Facilities for counting of the number of buses coming in and out

Shopping Center and small commercial shops installation in the Bus Terminal area might be necessary. Because it makes the land expropriation easy to provide job opportunities for people who at present carry out their activities in the area.

2.5 TRAFFIC CONTROL PLAN IN MICROCENTRO

2.5.1 Traffic Flow Planning

1) Planning Conditions

(Traffic Demand)

The number of passenger car trips within the Microcentro area was 154,000 units/day in the year 1987. This number will reach 174,000 units/day and 220,000 units/day in the years 1992 and 2000, respectively.

The streets which record more than 135 buses/peak hour are:

- Oliva/Cerro Corá
- Gral. Díaz/Azara
- E.V. Haedo/Luis A. Herrera
- Colón
- O'leary

The streets which are highly congested due to pedestrians and vehicles are Palma street, (from 14 de Mayo street up to Independencia Nacional street), and Cerro Corá street, (from Caballero street up to Tacuary street).

(Land Use)

The future land use in the centro area may have no major changes from the present land use. The only change could be the expansion of the commercial area toward the south.

The future land use are considered as follows:

a. Public Area
   Area surrounded by Pte. Franco/Eligio Ayala, Rio Paraguay streets, Colón Av., and Tacuary Street. Public offices, churches, universities and parks are located within this area.
b. Commercial Area
   Area surrounded by Pte. Franco/Eligio Ayala, E. V. Haedo / Luis. A. de Herrera Streets, Colón Avenue and Brasil Street. Commercial activities are concentrated within this area, and many bus routes aimed to the area.

c. Commercial-Residential Area (Mixed)
   Areas surrounded by Cnel. Bogado, 25 de Mayo, Yegros and Brasil, E.V. Haedo/Luis A. de Herrera, Piribebuy/Manuel Domínguez Streets, Colón Av. and Brasil Street, and along Alberdi, 14 de Mayo, Tacuary Streets, EE.UU and R. de Francia/ Ygatimí Avenues. This area is located close to the commercial area where considerable traffic volume is recorded.

d. Residential Area
   The remaining areas

2) Plans

(Traffic Cell)

Microcentro area is divided into 9 traffic cells, taking into account the land use. The basic criteria are:

- A side of the traffic cell is 500m
- To keep Palma Street of 1km length continuity

(Public Transport Axis)

The integration of bus routes in the Microcentro area is not easy to realize. Consequently, the five streets mentioned in the "Traffic Demand" paragraph could be the public transport axis. However, the number of bus stops and their locations will be organized.

(Pedestrian Axis)

The following streets are considered as pedestrian axes:

- Palma Street (between Yegros and O'leary Streets): Exclusively for pedestrian
- 15 de Agosto Street (between Pte.Franco and Humaitá Streets): Priority for pedestrian (widening of the present sidewalk).
- Chile Street (between Pte.Franco and Humaitá Streets): Priority for pedestrian (widening of the present sidewalk)
- Yegros Street (between Eligio Ayala and Fulgencio R.Moreno Streets): Priority for pedestrians (widening of the present sidewalk)

(Passenger Car Axis)

Streets surrounding traffic cells are designated as passenger car axis.

East-West: El Paraguayo Ind./Cnel.Bogado Street (two way)
R.de Francia/Ygatimí Av. (two way)
25 de Mayo/Estrella Street (one way)
Humaitá/F.R.Moreno Street (one way)

North-South: EE.UU Av. (one way)
Brasil Street (one way)

These streets keep their preferential condition for passenger cars, through the parking restrictions and traffic light synchronization.

2.5.2 Traffic Signal Plan

1) Objectives and Conditions for Installation

(Objectives)

A traffic signal system is implemented in order to make clear priority/non-priority of the traffic together with the maintaining of traffic safety both of pedestrian as well as of vehicles.

(Installation Conditions)

- At the intersections crossing the streets as designated private vehicle traffic axis
- At the intersections crossing the pedestrian preferential arteries
- At the intersections with roads where vehicle crossing is required

2) **Traffic Signal Command System**

Multiple phases of fixed time systems are introduced. Using the information provided by the traffic detectors which will be set at the intersections (entrance and exit points of the centro area) of the East/West, parameter modification is carried out according to the necessity.

2.5.3 Parking Plan

1) **Parking Demand**

The demand of 42,600 units/day of 1984 will increase to 50,000 units/day and 59,600 units/day for the years 1992 and 2000 respectively. The parking with "to work" purpose is the main generation source. Consequently, the demand is higher at those areas which count with a higher demand of building surface for the administrative office.

2) **Required Capacity**

The centro area was divided into fourteen blocks, in order to find the difference between parking capacity and demand of each one. Difference becomes the required equipping volume. Blocks requiring to increase the capacity, equivalent to more than 500 units, are five, both in the year 1992 as well as in 2000. The global equipping necessity in 1992 and 2000 is for 4,300 units and 6,600 units respectively.

3) **Parking Projects**

Five possible lands corresponding to those five blocks which show deficit at their parking capacity are chosen in order to cover those deficits. The construction of parking buildings in four of them and underground parking in the remaining one is proposed.

2.5.4 España Avenue Extension

1) **Objectives**

The objective is to mitigate the congestion of traffic flow into/out the Microcentro area through Artigas, Mcal. López and España Avenues. These avenues are considered to follow Eusebio Ayala Avenue on the traffic volume.

2) **Traffic Demand**

The traffic demand in 1992 and 2000 is estimated as 9,000 units/day, and 11,000 units/day respectively in the case of 2 lanes,

and estimated as 11,000 units/days and 15,000 units/day in the case of 4 lanes. However, when constructing the 4 lane road, the congestion ratio in certain sections of España Avenue surpasses 1.5.

3) Plans

(Year 1992)

The extension work is not carried out. The improvement of the Tacuary intersection is carried out in order to lighten the congestion at that section.

(Year 2000)

The extension work is carried out to connect with México and Caballero Streets.

3. NORTH/SOUTH AXIS (DEFENSORES DEL CHACO AV./MME. LYNCH AV.)

3.1 CROSS SECTION PLAN

1) Planning Conditions

(Traffic Demand)

The traffic demand is subject to the improvement stage of the Eusebio Ayala Avenue. The following figures are estimates of traffic demands with E.Ayala Av. 6 lanes in 1992, 8 lanes in 2000.

Madame Lynch Avenue	1992	2000
2 lanes	14,500 (1.32)	17,600 (1.91)
4 lanes	23,900 (0.63)	36,600 (0.96)

Note: The numbers in parentheses show the congestion rate.

(Land Use)

The proportion of land use is, according to the land frontage width, that the unused lands occupy 50% of the total, 30% is of residential use and 10% is for commercial use related to vehicle spare parts. The establishment of various productive activities concerning transport and distribution will be recorded in future. The installation of regional commercial cores in large scale next to the intersections formed with the main arteries could be expected.

(Construction Line)

The established construction line is 50m. The constructions located along the 2.1km section, between Santa Teresa and Aviadores

del Chaco Avenues, counts with the correspondent frontage. The 3.3km section, between Eusebio Ayala and Sta. Teresa Avenues, does not count with correspondent frontage.

(Cross Section)

The improvement of Madame Lynch Avenue requires repair works of the Itay branch (which runs parallel to the Avenue) to protect the newly improved road.

The plan includes 40m of total width in a 0.8km section, starting at E. Ayala Avenue, and 50m in the remaining sections. The open channel of the Itay branch is included in that width.

2) Improvement Plan

From the point of view of the traffic demand, the beginning of work could occur after 1993. But, taking into account the improvement schedule together with the channel, the improvement might start with 4 lanes of road and the open channel structure of the branch.

3.2 INTERSECTIONS PLAN

1) Intersections Plan

The main arteries which cross Mme. Lynch Av. are: Mcal. López, Santa Teresa and Aviadores del Chaco Avenues. The saturation flow rate until the year 2000 does not surpass 1.0 excepting the intersection with Mcal. Mcal López Avenue, that is approximately 1.0. Intersections are facilitated as level crossings.

2) Crossing Bridges

Actually, the wood bridges are constructed over the channel with a distance of approximately 100m one from another. After the widening to 4 lanes, that separation changes to 500m to maintain design speed.

4. ROAD DESIGN

4.1 DESIGN STANDARDS

(Adopted Standards)

Design standards are based on the AASHTO technical standards.

(Design Speed)

The 60km/h speed is employed for the R. de Francia, Eusebio

Ayala, Mme. Lynch and Mcal. López Avenues as well as for the Mcal. Estigarribia Road, and 40km/h for the remaining arteries.

4.2 ALIGNMENT PLAN

(Horizontal Alignment)

The planning was carried out basically to maintain the existing alignment. Consideration to avoid constructions for which relocation or demolition are supposed to be difficult, are taken up to the limit allowed by the technical aspect.

(Vertical Alignment)

Some sections of Eusebio Ayala Avenue are measured to be with a gradient which is lower than the drainage gradient. Those sections are planned to elevate the road height 0.5 to 1.5m higher in order to avoid flood.

The minimum height difference between the road surface and the channel bottom on Mme. Lynch Avenue is 4m.

4.3 PAVING PLAN

(Design Standards)

A coefficient of 2.5, which corresponds to the main arteries was adopted. Also, the resultant value of the volumetric calculation of the 20 years was employed as the traffic volume for the design, supposing the service starts from 1992.

The mixing rate of large vehicles was obtained considering that trucks and buses employed on the estimation correspond to that group.

(Pavement Design)

The possibility of adopting the Empedrado as the first base layer and the Telford base as the second layer are examined separately by each of the road project sections. The pavement design is carried out based on these results.

4.4 STORM WATER DRAINAGE PLAN

(Design Standards)

A rainfall intensity of 150mm/h was employed as well as a runoff coefficient of 0.9. The inflow is calculated applying the rational formula. The runoff section does not surpass 80% of the planned section. The estimate of the runoff capacity of the drainage installations was based on the "Manning uniform flow" formula.

(Drainage Facilities Design)

The drainage facilities from road surface until the channel are range of those design.

4.5 STRUCTURE PLAN

(Design Standards)

The following values were adopted for the design: HS 20-40 for the live load, taking into account that the object roads are considered as the main arteries; C=0.06 for the seismic coefficient (to cope with small magnitude earthquake); and 5.0m for the clearances.

The concrete strength is based on the real values recorded in Asunción, and the steel strength is based on the ASTM standards.

(Construction Works)

Viaducts: 5 units
Pedestrian bridges: 8 units
Box culverts: 11 units
Others: España Avenue extension work

(Superstructure of Viaducts)

RC girders are adopted for those viaducts whose span length is shorter than 20m, and simple composite PC girders are adopted for those whose span length is longer than 20m.

(Substructure of Viaducts)

The solid stratum with N value more than 30 and also the direct foundation will be employed when the solid stratum is less than 4.5m of depth, and if deeper, the piles foundation will be employed.

The viaduct piles will be of wall type, except those of the Eusebio Ayala/R. de Francia Av. connecting bridge, where cylindrical and solid structure piles will be simultaneously adopted.

(Pedestrian Bridge)

The live load for those structures are considered 290kg/m^2.

Pile over the median will not be employed. PC girder of the T type is adopted.

(Bridge over the Mme. Lynch Av. Channel)

Box culvert type bridge are employed. Eleven bridges are considered to be constructed.

(España Av. Extension)

80m extension of box culverts are carried out with the same cross section of the existing ones. Concerning the uncovered parts (posterior section of the outlet), the energy disperser is required in order to protect against erosion.

4.6 COST ESTIMATE

1) Conditions

(Construction Execution Method)

International bidding system is supposed.

(Estimation Method)

Labor costs, machines and necessary expenses for each construction item are accumulated corresponding to each work unit. Efficiency of each project is estimated under the assumption of representative combination of machines and labor.

The land indemnification costs are determined through the tax, municipal and commercial value survey. Sections for calculation are divided as follows:

- R. de Francia Avenue : 1 section
- Eusebio Ayala Avenue : 5 sections
- Mme. Lynch Avenue : 2 sections

The indemnification cost of the buildings/houses are calculated as Gs. 50,000/m^2.

4.7 WORK SCHEDULE

(Viaduct Construction Schedule)

When excluding the land expropriation, construction of viaducts manage the total construction schedule, which takes 28.5 months.

(Target Year taking into Consideration the Demand Aspect)

The target year for the improvements according to the demand is synthesized as follows:

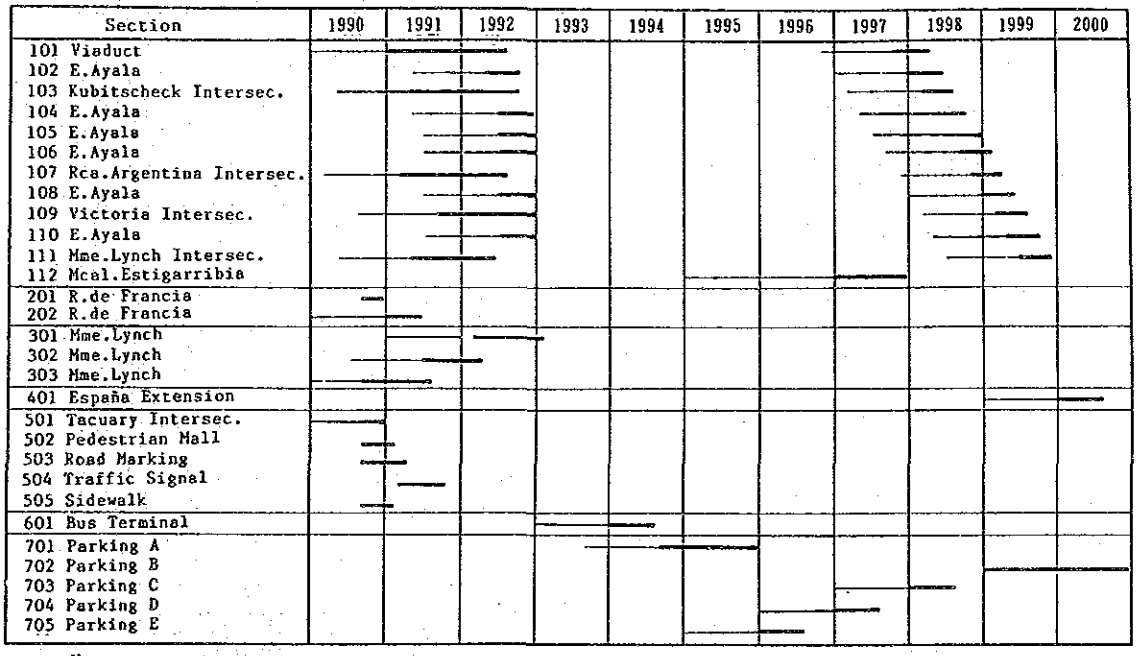
Improvements	Target years	Note
E. Ayala Avenue (35m)	before 1992	
E. Ayala Avenue (50m)	before 2000	
Mcal. Estigarribia Road (35m)	before 1992	*
Mcal. Estigarribia Road (50m)	before 2000	

R. de Francia Av. (East of Perú Av.)	before 1992	
R. de Francia Av. (Perú Av/EE.UU Av)	before 1992	
R. de Francia Av. (EE.UU Av/Colón Av)	before 1992	Only pavement improvements.
Connecting bridge	before 1992	
Mme. Lynch Avenue	before 1992	
Centro Arteries	before 1992	
España Av. extension	before 2000	
Tacuary intersection	before 1992	
Bus Terminal	before 2000	
Centro Area Parking	before 2000	

(*) Although the requirement is generated by the demand, the target years were planned also taking into account other aspects. As Mcal. Estigarribia Road is under jurisdiction of the MOPC and located within Fernando de la Mora municipality, it is misgiven that the coordination will take time for factors such as land expropriation, etc. So it was included in the second group, that will start in 1993 and which target year is the year 2000, although the requirement to finish before 1992.

(Global Work Schedule)

Following chart indicates the entire work schedule.



Note: —— : Indemnity
—— : Construction

(Costs by Stage)

Estimates based on the above indicated work schedule is shown below. The construction cost of parking facilities is excluded from the calculation, expecting the private sector investment.

(Unit: Mill.Gs./Mill.US$)

Projects	Stage 1			Stage 2		
	Indem.	Local	Foreign	Indem.	Local	Foreign
Economic Cost						
Road (East/West Corridor)	1,361	3,464	13.0	6,392	2,362	8.4
Road (North/South Corridor)	1,384	1,530	6.9	0	0	0.0
Bus Terminal	0	0	0.0	785	363	0.7
Microcentro	68	541	1.8	4,142	6,728	18.0
Indirect Cost	0	5,834	11.1	0	8,111	14.8
Total	2,813	11,369	32.8	11,319	17,564	41.9
Financial Cost						
Road (East/West Corridor)	1,361	4,283	13.0	6,392	2,808	8.4
Road (North/South Corridor)	1,384	1,975	6.9	0	0	0.0
Bus Terminal	0	0	0.0	785	449	0.7
Microcentro	46	714	1.8	293	107	0.5
Indirect Cost	0	9,061	11.9	0	4,130	5.4
Total	2,791	16,033	33.6	7,470	7,494	15.0

5. EVALUATION

5.1 ECONOMIC ANALYSIS

(Projects to be carried out)

All the proposed projects are included. The Bus Terminal projects, Microcentro area streets improvement and parking buildings are handled only as expenses items.

(Analysis Result)

The difference in the vehicle operative cost between the "nothing case" and "with project case" will be calculated as benefit. The results are shown as follows:

	Stage I Net	Global Net
EIRR (%)	19.9	19.2
PNV (millions of Gs.)	30.0	39.1
B/C	2.0	1.7

(Sensibility Analysis)

When the total construction cost records an increase or

decrease of 10%, the EIRR of the Stage I works increase or decrease between 1.2% - 1.5%, and considering all the projects, the variation is between 1.4% - 1.7%.

In case the demand increases or decreases 10%, the positive or negative influence of the EIRR is more the EIRR increases or decreases between 2.6% - 5.3%. So the to the demand variation, but in any case, they practically do not affect the possibility to implement the projects.

5.2 FINANCIAL ANALYSIS

(Analysis Objects)

The objects of analysis are the five parking buildings.

(Analysis Results)

Only 1 parking lot with the non-mechanized parking system, whose running cost is less than the mechanized parking system, has a positive FIRR.

Even in that case, to amortize the funded debt will take 17 years. This means amortization continues until the year 2007, presuming the beginning of operations in 1989 and operation in 1991.

Concerning the foreign currency portion, two cases were studied, with an annual interest rate of 4.25% and 3%, but the difference has no influence in large scale for the general statement.

(Observations)

The analysis result indicate that the profitability of the parking project is extremely low. In order to increase the profitability from the inside point of view, it is necessary to prepare inside capital as much as possible. One of the ideas is to apply private sector funds. To attract private sector funds, a sales point might be to obtain soft loans through joint administration with the public enterprises.

From the outside point of view, the establishment of parking toll is an important matter.

6. RECOMMENDATIONS

According to the conclusions obtained through the process mentioned above, the following is recommended:

6.1 RECOMMENDATIONS

The road network projects (east-west corridor, north-south corridor, and España extension) must be carried out according to the

schedule proposed in the present study. The economic meaning of execution is enormous, with an economical internal rate of return (EIRR) of 19.2%. This economic value is, when taken as benefit only, the saving of the vehicle operative cost, but, besides this, there are other economical meanings which are mentioned as follows:

- It offers adequate conditions for vehicle traffic.
- It offers a solution to the interruption of traffic produced by flooding.
- It encourages the reactivation of commercial activities along the road, together with the induction of land use at the area
- It provides space preservation for future introduction of massive transport facilities
- It provides an increase of work sources

The project's execution will require a remarkable financial cost, therefore, the immediate objective must be concentrated into the implementation of the projects related to the first stage. Only these ones completely justify the execution, with an EIRR of 19.9%. As when implementing up to the projects of Stage II, the value is when taken as benefit, the saving of vehicle operative cost, but, besides this, with the implementation of the projects of Stage I, it is expected to obtain almost the same benefits as when implementing those of Stage II.

The project of the Microcentro road network improvement will be carried out together with road network projects related to other areas, because the microcentro offers the adequate flow environment for both bus users, as well as pedestrians (totaling 70% of the trips).

The project's object for the present study were classified into projects of Stage I and Stage II. For Stage I, those projects requiring the smallest land expropriation were selected. Besides, it is showen that only the projects related to Stage I allow obtaining enough economical benefits, but, with projects of Stage II, greater economical benefits could be expected. Consequently, i.e., in case of Eusebio Ayala Avenue, it would be convenient, during the implementation of Stage I, if the definition of the necessary space for the foreseen project on Stage II, through the Municipal Order (which defines a widening of 35m), is a widening to 50m, in order to restrain the remodeling or new constructions, in order to avoid unnecessary friction at the moment of the implementation.

6.2 ADDITIONAL REMARKS TO BE CONSIDERED ON THE PROJECTS IMPLEMENTATION

The additional remarks, which should be considered in order to increase the effects and facilitate the implementation of the projects, are as follows:

A. The positive effects that constitute the centro parking project implementation for decreasing traffic congestion problems is something incalculable, but there are also various

items which have to be solved, such as, users conscientiously paying the parking toll, toll revising, search of land assigning form, etc. Therefore, it is premature to implement it at present as a public characteristic project; rather, the financial support form should be analyzed in order to promote the private administration parking construction.

B. It is convenient to implement the urban bus terminal project, taking into account the innumerable advantages that offers the project, such as, vehicle congestion decrease on the secondary streets, increase of users comfort on the trading area of the Municipal Market No. 4, bus check-points for future line integration, strategical point to promote the formation of the trading nucleus. However, there also exists the tough problem which implicates the coordination with the public transport enterprises, related to the administration of the installation. Therefore, although the immediate implementation can not be realized, it must be carried out in Stage II, solving the mentioned problems as well as other existing ones. Besides, together with the implementation of the projects of Stage I (at the moment of construction of the Eusebio Ayala - R. de Francia connecting bridge), it is convenient to execute the necessary procedures for the expropriation of land destinated to the urban bus terminal.

C. The España Avenue extension will serve not only for the lightening of the Tacuary intersection, but it is also considered as the main north-south corridor which starts at the end of the microcentro. Therefore, if presumed to improve the traffic flow at the microcentro, the extension should be executed as part of the road network project. However, this implicates the expropriation of the "Chacarita" area, which would have political overtones. Consequently, it would be convenient to execute the implementation after a meticulous study and analysis concerning the treatment and improvement form of the "Chacarita", especially concerning the area subject to inundation during the overflow season of the Paraguay river, and not just confine it to a simple land expropriation.

D. Eusebio Ayala Avenue, from Municipal Market No. 4 up to the city of San Lorenzo, is an area which has the latent possibility of turning into the commercial axis of Asunción and its Metropolitan Area. At present, the development of commercial activities along the avenue is verified, and on the other hand, the installation of shops in the residential areas located behind the avenue is also observed, avoiding traffic congestion which is verified on it. But, with the improvement of Eusebio Ayala Avenue and the offering of adequate conditions for traffic, it is estimated that the dispersed shops within those areas will concentrate again on this avenue. Foreseeing such tendency, it would be necessary to encourage the creation of the Metropolitan Area representative commercial axis, and at the same time, to guide the most desirable access way to the avenue, through regulations and restrictions of land use. Therefore, the active orientation from the institution in

charge of the following aspects is expected:

- Control of regulations concerning the building surface ratio of commercial constructions along the avenue.
- Tax regulation benefits of those constructions under appropriate use.
- Tax regulation benefits concerning the land tenancy for the implementation of super-blocks.

E. Concerning the traffic improvement in Asunción and its Metropolitan Area, it was analyzed from the point of view of the physical improvements at the present study. However, it traffic improvement through theoretic means for the traffic control which are mentioned as follows should not be ignored:

- Traffic control centralization through carrying out traffic campaigns periodically, together with concientization related to the traffic safety aspect through advertisements and posters.
- Integration of the artery traffic control regulations. At present, the traffic police and the Asunción city Police Department carry out the traffic control in an independent way, consequently with their integration, a more efficient control regulation and a greater co-action force within all municipalities which compose the Metropolitan Area could be expected.
- Increase of reliability concerning the traffic signs. Effective traffic control will be possible through the implementation of greater reliability signs which allow one to reach his destination with safely and comfortably. And in order to achieve that, it is necessary to guarantee on the left turn and the crossing on the traffic sign intersections crossings (in other words, the left turn and the crossing at the non-traffic sign intersections are prohibited), to reduce the traffic sign deficiency ratio, to coincide with the regulations and signs, to guarantee the pedestrian exclusive preference on the pedestrian walk, etc.

F. In the present project, the following public institutions are directly related: Municipality of Asunción, Municipality of Fernando de la Mora, CORPOSANA, and the MOPC. Consequently, a very closed coordination is required for the implementation, concerning the interests, proportion of work cost, executive authority of executing institutions and the execution schedule.

1. INTRODUCTION

1. INTRODUCTION

1.1 INTRODUCTION

With the cooperation of the Japan International Cooperation Agency (hereafter JICA), studies have been conducted on the urban transport project of Asunción and its metropolitan area (from now on Master Plan) from August, 1984 to August, 1986.

The Master Plan has important projects such as the widening of Eusebio Ayala - R. de Francia Avenues and the improvement of the access to the Microcentro area.

In addition to the Master Plan, 2(two) studies that are closely related to the current Feasibility Study were made.

One of them is the improvement of the Asunción city storm water drainage project. This project was done with JICA cooperation, from August, 1985 to January, 1987. This Study is related with the project of widening and improving of the Defensores del Chaco - Madame Lynch Avenues.

The other project is the Municipal Development Project of Asunción (from now on PRODEMA). PRODEMA finished its studies in November, 1984 and the report for approval was prepared in March, 1985 by the World Bank. That Study is related to the widening and improvement of the Defensores del Chaco - Madame Lynch Avenues and the improvement of Eusebio Ayala Avenue.

The Feasibility Study of the important projects explained in the Master Plan started in September, 1987, which also included the results of the 2 studies mentioned above.

1.2 STUDY BACKGROUND

1.2.1 Asunción Metropolitan Area

Asunción, capital city of the Republic of Paraguay, is located 57 degrees, 39 minutes west latitude and 25 degrees, 17 minutes south longitude. Asunción is surrounded by 10 municipalities which together form the metropolitan area with a surface of 71,100 hectares. They are: San Lorenzo, Fernando de la Mora, Lambaré, San Antonio, Ñemby, Luque, Mariano R. Alonso, Limpio, Villa Hayes and Villa Elisa.

According to the estimate figures of the year 1984 (somehow outdated), the population of Asunción and its metropolitan area, economic active population and Gross Domestic Product (GDP) were 858,000 inhabitants, 383,000 inhabitants respectively and Gs. 19 billion in constant values of 1982. These figures in relation with the national overall figures, the population and the GDP are 24% and 43% respectively.

1.2.2 Master Plan

1) Metropolitan Area Population and its Movement

The Master Plan was prepared assuming that the Metropolitan Area population would increase from 858,000 inhabitants in 1984 to 1,452,000 inhabitants by the year 2000. The total number of trips made in the study area was: 2,169,000 trips in 1984 (based on the Person Trip Survey). For the year 2000 it is estimated it would reach to 3,749,000 trips mainly because of the demographic development, as well as the economical activation and the increasing family income.

2) Land Use and Transit Zone Demand

Defensores del Chaco and Madame Lynch Avenues will be important to the future main axis of urban activities. Along with the present main urban activity axis, Rodríguez de Francia-Eusebio Ayala Avenues, the Defensores del Chaco-Madame Lynch axis will also be added. Demographic distribution would be basically kept the present pattern, but fitting the aforementioned purpose, a greater proportion has been assigned to Defensores del Chaco-Madame Lynch and the city of Lambaré.

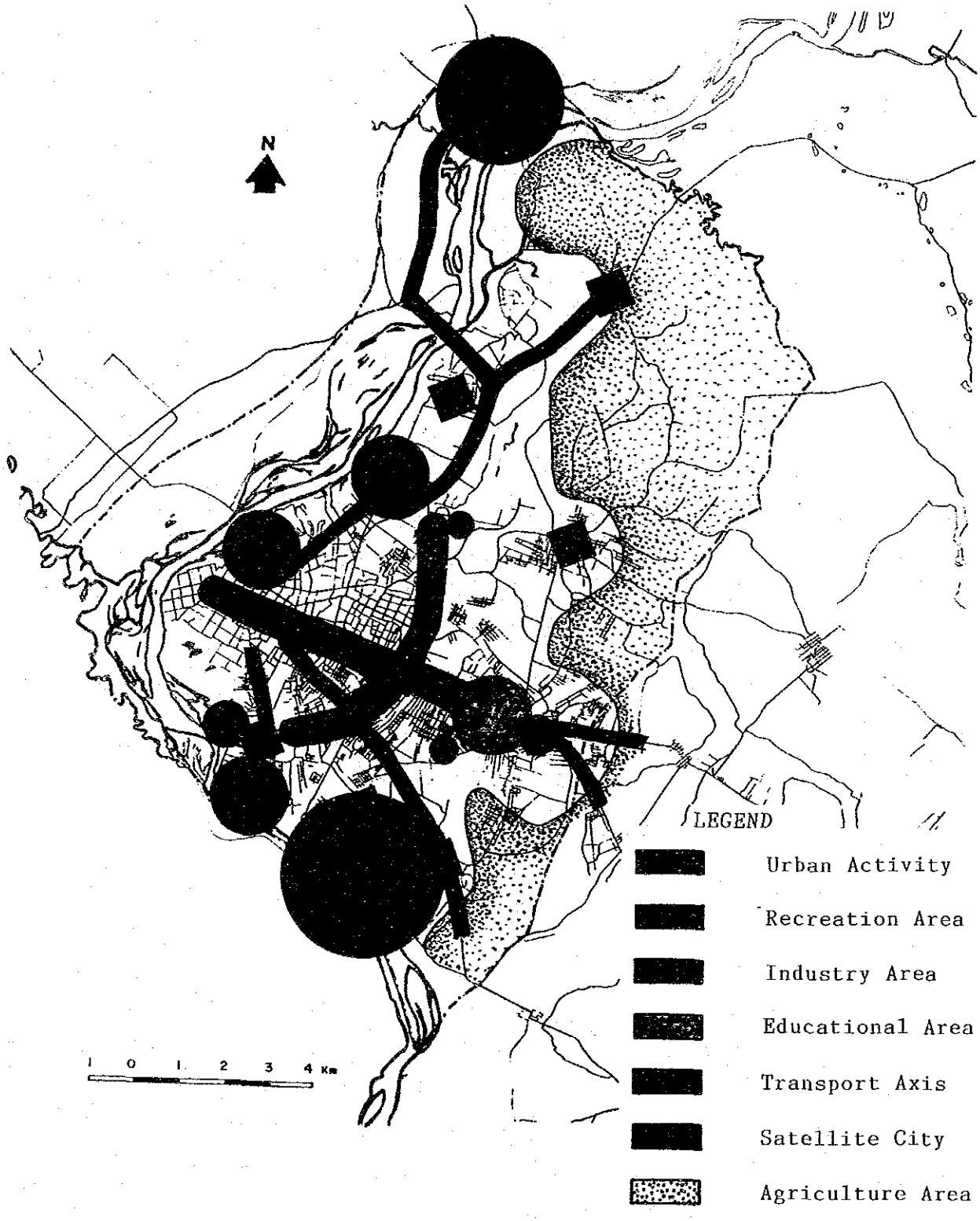


FIGURE 1-2-1 FUTURE LAND USE SCHEME

3) Road Planning

Based in the actual road net, it has been planned in such a way that with small-scale improvement, such as pavement improvement and short widenings, the roads can handle the amount of transit that would increase in the future. Also, the remaining amount of transit that cannot be handled with small-scale improvement, will be dealt with by strengthening the Rodríguez de Francia-Eusebio Ayala axis (including widening of 8 lanes, the building of the connection viaduct and grade separated crossroads).

Referring to Defensores del Chaco/Madame Lynch axis, as it has been noted that work would be performed through financing by of the World Bank, it has been admitted channels of 4 lane, according to the project performed by such Institution (2 lanes by now).

Therefore, because the widening of Defensores del Chaco and Madame Lynch Avenues, has not been performed, according to the preceding plan, it was included into this Feasibility Study, in such a way that the review of the road plan will also be necessary to consider the case of keeping them at 2 lanes. (See FIGURE 1-2-3).

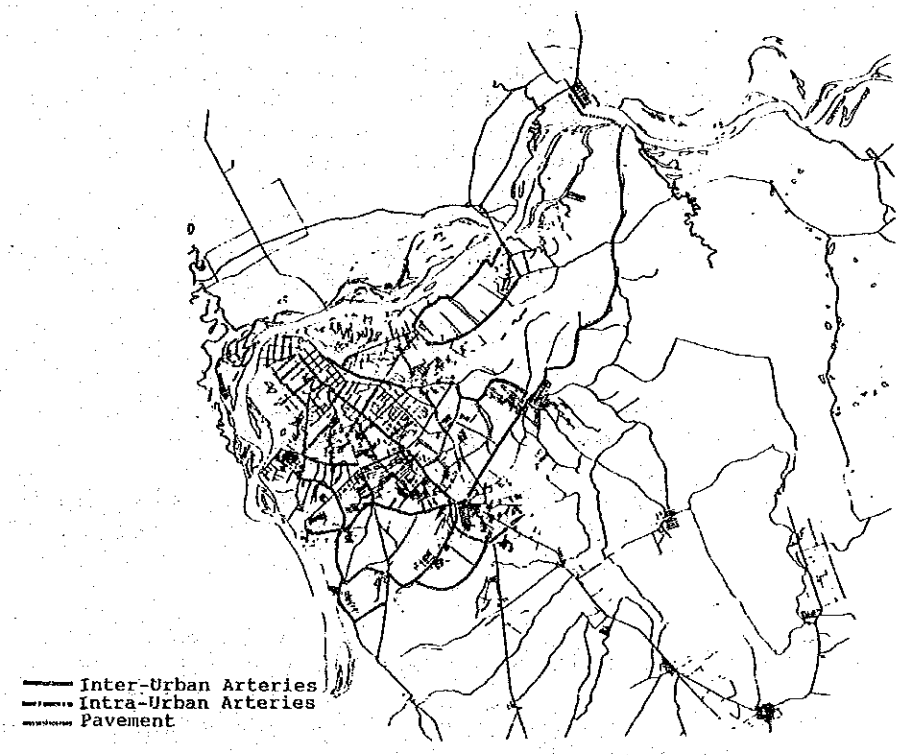


FIGURE 1-2-2 ROAD PROJECT IN MASTER PLAN

4) Microcentro Traffic Planning

In the Master Plan, the Microcentro traffic planning was specifically analyzed, due to the intense traffic congestion that took place in this zone.

To solve the traffic congestion problem in the Microcentro area, without modifying the urban structure, ordering alternatives were planned through a separation of the traffic flow in terms of transport modes. Overall, there is a great difference regarding the prevailing criterion, the fact of granting major priority to pedestrian traffic which is actually relegated. In this way, private vehicle flow is restricted in some ways.

Furthermore, the premises of this plan are: the widening and improvement of the Eusebio Ayala/R. de Francia (including the connection by means of a viaduct) and the extension of the España Av. to the center of the Microcentro.

5) Public Transport Planning

A premise has been adopted that the principal means of public transport in future will still be the bus. The growth demand of 1.7 times, which will be registered in the year 2000 will be covered with the increase of the bus operating performance. Such increase in performance will be achieved through the improvement of the transport efficiency and the introduction of bigger vehicles. To increase the efficiency of transport, a reduction in the number of buses which concentrate in the sections of low performance is needed, and for the introduction of bigger vehicles, a passenger demand concentration is required, according to the possibilities.

From this point of view, the Master Plan has proposed a reorganization of the lines, which adjusts to the demands, and concentrates the demands actually scattered on the principal arteries.

In order to realize this proposal, the 40 bus companies which existed in 1984 (generally one company owns one bus line) must be integrated, increasing the importance of the companies, and facilitating the reorganization of the lines.

At present (year 1987), according to the Master Plan, the Municipality is reducing the number of companies with a method of absorption.

1.2.3 Other Projects related to the Study

1) Project for the Improvement of the Storm Water Drainage System of Asunción City (JICA)

In this Study, Master Project has been prepared on the project for the Improvement of the Storm Water Drainage System of Asunción City (does not include Microcentro) and the surrounding cities. Parallel to this Study, a feasibility Study on the improvement of the

Storm Water Drainage System of the Mburicao and Itay river was carried out, as the first stage projects.

The main point relating to this Feasibility Study is to improve the basin of the Itay river branch. The work has its starting point on Eusebio Ayala Av. and the first 2.5km will be closed channel, constructing the carriageway over this channel.

With this measure, the widening of Madame Lynch Av. up to 4 lanes is planned. Furthermore, downstream of the indicated section, the implementation of the open channel with a 4 lane artery by means of land expropriation is planned.

2) **PRODEMA Project**

In this Study, land use and the traffic system of Asunción City up to the year 2000 was planned, and other important projects are foreseen for the implementation of this program.

The points related to this study are the improvement of the basin of the Itay river branch and the corresponding widening to 4 lanes of Madame Lynch Av., and the widening of Eusebio Ayala Av. to 6 lanes.

Both projects, JICA and PRODEMA, agree with the following points: in the initial sections, the closed channel as far as km 2.5, and building the carriageway over this channel. From km 2.5 on, an open channel will be used with four lane ways through the expropriation of land. But they differ in detailed technical specifications.

Regarding the second point, a 6 lane artery is planned with the widening of the avenue, to a width of 35 meters (from the Municipal Market No. 4 up to the intersection of the Defensores del Chaco Av. and Madame Lynch Av.). The present width of Eusebio Ayala Av. fluctuates at around 35 meters with a variation of up to 5 meters. Therefore, land must be partially expropriated.

Both projects depend on the staff appraisal of the World Bank, but up to this moment, these projects have not yet been executed.

1.3 AREA AND TARGET YEAR OF THE STUDY

The area to be covered by the Study will be that of the Master Plan, that is, Asunción and its Metropolitan Area, with a surface of 71,100 hectares. However, the sections which will be planned in the Study are: Microcentro of Asunción, G. R. de Francia Av., Eusebio Ayala Av., Madame Lynch Av. and its corresponding strips.

The target year of the projects will be in the year 1992. Furthermore, the evaluation period of the projects will be the year 2014.

1.4 OBJECTIVE OF THE STUDY

1.4.1 Objective

The objective of the Study is to determine the technical specifications of the principal roads: East-West corridor consisting of Microcentro / R. de Francia Av./ Eusebio Ayala Av./ Mcal. Estigarribia Road, and the North-South corridor, consisting of Madame Lynch Av., which composes the urban frame structure of Asunción and its Metropolitan Area. It also includes the Bus Terminal, in the Municipal Market No. 4 environs.

Following, the detailed description of the objectives of the Study are cited, adjusting itself to each of the work stages.

1.4.2 Study Policy

1) Research on the Possibility and Feasibility for the Implementation of the Project

The construction of the roads requires land expropriation. According to the situation of land use and land ownership, such cases would arise as:

- Extremely difficult to expropriate
- Possible but very expensive
- Requires too much time

In these cases, from the possibility and implementing facility point of view, some measures must be introduced, such as, reducing or modifying the initial plans, or implementing them in two stages.

Furthermore, the work of widening the Madame Lynch Av. up to 4 lanes must be done along with the Storm Water Drainage, without forgetting to analyze the case in which both projects are not executed at the same time.

The design of the extension of the EspañaAv. affects the residential area of the Chacarita (area occupied illegally), therefore the project must be studied, carefully considering the social and political problems that could arise, regarding the removal of the affected houses.

The details of each of the projects are determined, considering the above mentioned limitations and modifying the projects to cope with the increase of the traffic flow which will exist in the year 2000.

2) Estimation of the Construction, Maintenance and Operating Costs

The most important objective of the Feasibility Study is the cost estimation. The estimation of the exact cost of the projects is

one of the main factors to check the possibilities. The cost may determine the implementation and to execution of projects. The goal will be to maintain error of less than 10% on the estimation of this study, in relation to to the result of the definite final design.

The result of the definite final design will be the maximum acceptable cost for the work bidding.

3) Benefit

For the Feasibility Study, it is necessary to determine what kinds of benefits can be obtained if the important projects proposed are executed in a completely different manner from the Master Plan.

4) Project Evaluation

The relation of cost/benefit will be determined in a form of bid package, due to the close relation that exists between the projects of the Eusebio Ayala Av. and the other projects.

With the results of the evaluation, the Municipality of Asunción will analyze whether or not to apply for external government financing. Once the results are accepted, the Study will be employed as a foundation of the financing request to be presented, so that the evaluation must be done from the same points of view.

1.5 REPORT STRUCTURE

According to the contents, the present report is divided into four parts. The first corresponds to the general summary. This was based on the main report structure.

The second part refers to the planning. It is related to various conditions, such as land expropriation, Chacarita, the financial situation of Asunción City, etc. The description of the East/West and North/South axis relation is also described, as well as the planning of each project.

The third part refers to the design. It describes details of designs that were carried out according to the projects. However, the corresponding plans were collected all together in one independent volume.

The last part is related to the evaluation and recommendation. Costs and effects were analyzed and chosen in order to recommend the implementation of projects which must be carried out urgently.

1.6 STUDY ORGANIZATION

The Japan International Cooperation Agency has appointed and sent to the Republic of Paraguay a Mission to study the Asunción Metropolitan Area urban traffic planning in order to execute the corresponding study, and also, an Advisory Committee for the supervision of activities, which must advise and supervise the study and planning.

The Republic of Paraguay has appointed the Municipalities Association of the Metropolitan Area as the depository agency of the study. A Coordinating Commission which is headed by the Asunción city Mayor Porfirio Pereira Ruiz Díaz as the General Coordinator of the Programming Technical Office of the above mentioned Association, and a Counterpart Technical Team, which at executive and technical levels allowed the normal development through their necessary cooperation, advice and deductions for the study and planning, were created.

FIGURE 1-6-1, shows people and agencies which participated in bodies created for the mentioned purposes.

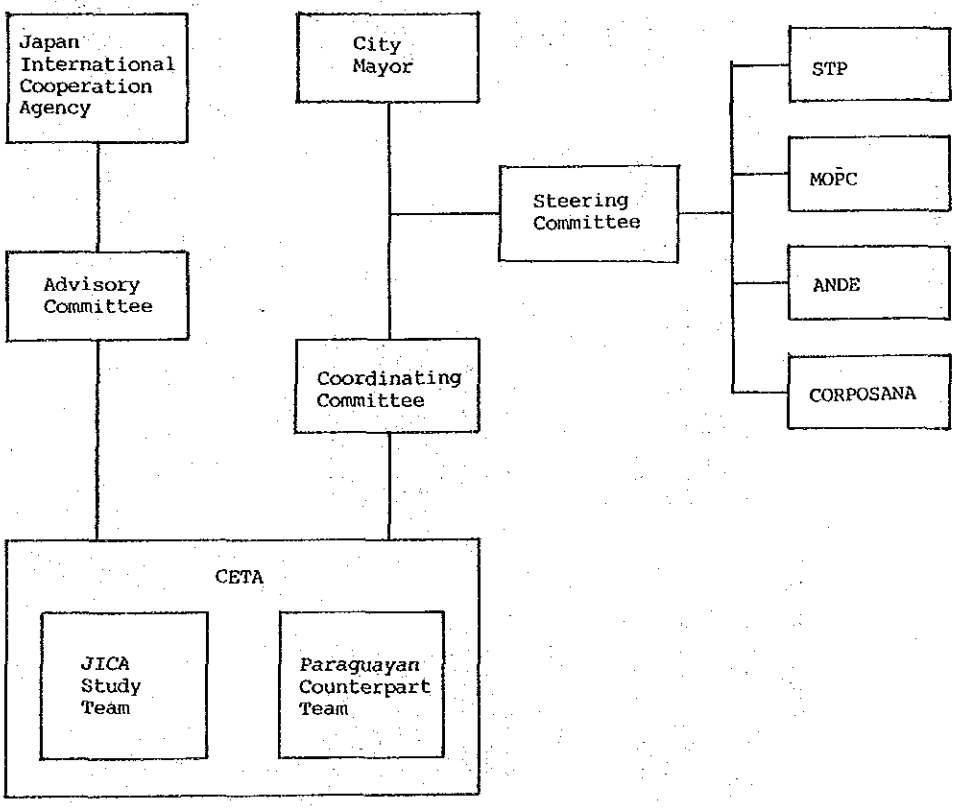


FIGURE 1-6-1 ORGANIZATION OF STUDY

TABLE 1-6-1 STUDY MEMBERS

ADVISORY COMMITTEE

Prof. Kouichi Yamagata	Ibaragi University
Eng. TakayoshiHotta	The Housing and Urban Development Corporation
Eng. Masayasu Kokubo	Ministry of Transport
Eng. Teru Fukui	Ministry of Construction
Lic. Masamoto Ogane	The Overseas Economic Cooperation Fund

STUDY TEAM

Dr. Juro Kodera	Team Leader
Arch. Ryuzo Hasegawa	Land Use
Eng. Tetsuo Kawamura	Road Planning
Eng. Tutomu Horie	Road Design
Eng. Kenjiro Ohno	Structure Design
Eng. Kazuhiro Fujita	CBD Street Planning
Eng. Hajime Tanaka	Public Transport
Eng. Toshiaki Horii	Evaluation
Eng. Shin-ichi Kohno	Topographic Survey

STEERING COMMITTEE

Municipality of Asunción City (MCA):	
Porfirio Pereira Ruiz Díaz	City Mayor
	General Coordinator
Dr. Juan Manuel Morales	Legal Advisor
	Coordinator of the Traffic Special Commission
Technical Planning Secretary (STP):	
Dr. Fulvio Monges	Executive Secretary
Dr. Armando Hermosilla	General Director
ANDE:	
Eng. Miguel Angel Otazú M.	Commercial Manager
Eng. Guillermo Krauch	Head of the Control and Planning Studies Office
CORPOSANA:	
Eng. Ronald Chenú Abente	Sewerage Manager
Public Works and Communication Ministry (MOPC):	
Eng. Isidro Nunez Gómez	Head of the Planning and Coordination Office of Transport (O.C.P.I.T.)
Arch. Fernando Cabral	Technician of the O.C.P.I.T.

COORDINATING COMMITTEE (MCA)

Dr. Juan Manuel Morales	Legal Advisor
Dr. Herenio Centurión	Public Treasury Director
Dr. Juan Neffa	Economic and Financial Planning Director
Dr. Carlos Gonzalez	Urban Service Director
Eng. José Orué	Works Director
Arch. Miguel Angel Solis	Urban Development Director
Cnel. Arnulfo Becker	Transit Director

PARAGUAYAN COUNTERPART TEAM

Arch. Josefina A. Romero	Executive Coordinator
Arch. José Luis Jarolin	Public Transport
Eng. Milciades Acosta	Road Network
Arch. Clara P. de Amarilla	Land Use
Eng. Luis Maria Pereira	Traffic Light Planning
Eng. Concepción de Galeano	Road Network

2. SOCIAL CONDITION SURROUND IN THE PROJECTS

2. SOCIAL CONDITION SURROUNDING THE PROJECTS

2.1 LAND ACQUISITION FOR PUBLIC USE

2.1.1 Legislation

1) Land Expropriation

Land expropriation and compensation of private property for public use is made according to Art. 96 of the National Constitution, Art. 222 and 234 of the Administrative Organization Law, and Art. 200 to 205 of Municipal Act No. 1294.

According to Art. 96 of the National Constitution, private property is guaranteed, but its purpose and range are limited by law, according to their economic and social function. Private property may be expropriated for public use or social interest. Such reasons must be established by law (expropriation law, which is proclaimed for each case). This Art. also establishes that an appropriate price must be paid for the expropriated property.

The Administrative Organization Law, in Art. 222 to 234 explains the legal process required for the expropriation of private property needed for public use.

Municipal Act No. 1294, chapter VII, Art. 200 to 205, deals with property expropriation for conducting urban development plans. For instance, if an urban development plan requires the purchase of private property, that property would be declared property of social interest and subject to expropriation. To carry out the expropriation, the City Mayor must ask the authorization of the Municipal Council, so that a request can be made through the Ministry of Interior, to approve the expropriation. After the law is promulgated, the amount of compensation is arranged in common agreement between the Municipality and the owner, to an appropriate price. If no agreement is reached to determine the amount, the case must be submitted to justice (Art. 200-201).

In the cases of expropriation for opening or widening of streets, avenues or other works that increase the value of the properties favoring the owners, fifty percent of the property value increase will be deducted from the compensation amount (Art. 203). If the expropriation covers most of the property and the remaining portion is not useful to the owner, the expropriation must be done for the entire property.

The amount of compensation must be paid in a period of no longer than five years. If the expropriated property is the house of a person who does not have another house, the period cannot be longer than six months.

Besides, the Municipal Order in Art. 129 and 130 says that if a municipal public work helps directly to increase the property value, their owners must help the Municipality with an amount equivalent to

20% of the increase obtained, and with an amount not exceeding 10% if the benefit is indirect. This is applied only if the work was not completely paid by the property owner who received the benefits. Property tax will be based on the fiscal value of the property before and after the work was completed.

In practice, there have been very few concrete cases like that and in the majority of cases when there is need to purchase land for public use, negotiations between the State of District and the owner of the property are made to reach a convenient agreement. This is mainly because of the time required to obtain the lands through the expropriation law. Usually, this procedure takes many months (minimum six months) and sometimes many years (there are cases of expropriation requests that have remained in the Parliament for two years), since the beginning of the transaction (in the Legal Assistance Department in case of the Municipality of Asunción) until the publication of the law. Once the law is promulgated, the parties must proceed to fix the compensation amount. That may also take many months. On the other hand, if land acquisition is obtained through direct transaction between the parties, the time needed is reduced substantially, as can be seen in the cases that are shown as follows:

The Case of José Félix Bogado Avenue

The widening, building and paving projects of José F. Bogado Avenue were initiated in the year 1982, by the Ministry of Public Works and Communication (MOPC) and supervised by the Municipality of Asunción. Since then, that street was made into a four lane avenue, with asphalt pavement in all its extension, from Acuña de Figueroa Avenue to Ita Enramada Port.

According to Municipal Law No. 2501 of 19 August, 1952, the Right of Way (ROW) width of the avenue was fixed in at 26 meters and the Municipal property to 5.60 meters, leaving the sidewalk on the east side of the new plan. Besides, overseeing a new enlargement, another 5 meters minimum of the municipal line have been arranged.

Subsequently, Municipal Law No. 2140 was promulgated in 1978, establishing 32 meters for the width of the streets, thus annulling Law No. 2501.

In spite of the dimensional difference established in both laws, they are basically similar. In this way, considering that the new law does not establish municipal property and other characteristics for widening the Avenue, Law No. 2501 was created.

To start the widening project, MOPC notified property owners located along the Avenue, whose buildings did not meet with Law No. 2501, to measure the land for future sidewalks in order to make the estimates of the amount of compensation.

The estimate of the amount to compensation were made for;

a. surface area of the land affected, and
b. affected structures by their size and materials

The walls, gates and water supply, light and telephone, as well as the light post and the power supply to be removed were included into the direct costs of the widening projects.

Once the amount of compensation corresponding to each one of the owners was obtained, they were notified by the construction enterprise contracted with MOPC. To settle the bills, the property owners could select one of the following options;

a. Removal and reconstruction of the properties by the construction enterprise
b. Payment in cash for removal and reconstruction cost

The process from the time negotiations started (notification) to the compensation settlement took about a year.

In the beginning, the land acquisition costs were estimated based on their tax assessment value, but were adjusted through negotiation between the parties to reach the convenient value for both sides.

In spite of the fact that the real cost of removing and reconstruction were included in the cost of widening of the avenue, in most of the cases, compensation cost for the land affected was not paid. The owners gave it up to the Municipality in exchange for payment exoneration for the new pavement.

There were some isolated cases of uncompromised owners who required legal assistance. In these cases, the land acquisition and the compensation payment for improvement were done in better conditions than most of the cases.

According to the work inspector, only two owners along the avenue belonged to these cases.

At the beginning, José F. Bogado Avenue was a state road. That meant the property owners along that street did not have to pay construction and pavement expenses for this avenue. With the promulgation of Law 818 of 13 October, 1980, both E. Ayala and José F. Bogado Avenues were transferred to the responsibility of the Municipality of Asunción. From that time, the construction and paving expenses of those avenues were to be paid by the property owners, in equal halves for each side.

2) Right of Way

The municipalities have laws that legislate the municipal activities. Such laws are dictated by members of the Municipal Council and the City Mayor, and are studied by the permanent assistant commissions of the Municipal Council. When the study is concluded, the laws are promulgated by the City Mayor and a copy is forwarded to the Ministry of Interior.

Law No. 2140 of 1978 regulates the right of way (ROW) width of

the main streets and connectors within Asunción city. According to this law, ROW of Eusebio Ayala Avenue is of 35 meters and of Madame Lynch Avenue of 50 meters, which are obviously different from what they really are. In other words, this law has the purpose to regulate future building or rebuilding that might be done along those streets and to make it possible to have enough width for future widening of these avenues at a lower cost of compensation. This means avoiding unnecessary expenses resulting from demolition and rebuilding of structures.

2.1.2 Land Evaluation System

There are two types of land evaluation;

a. evaluation for tax assessment to estimate the State property tax, and
b. evaluation of market value for the sale of private property

There is also another evaluation system which is the so-called municipal evaluation. This system is used as the estimation base of municipal taxes for buildings, urban cleaning, commercial patent, etc.

TABLE 2-1-1 shows the tax assessment values and the values of municipal evaluation in each zone of Asunción city, as well as the commercial values along E. Ayala and Madame Lynch Avenues. The last ones were obtained from real estate companies in Asunción.

The estimates of the amount of compensation that would be applied in cases of widening E. Ayala Avenue to 35 meters, and 50 meters, were made using the average value of the three evaluation systems mentioned. The costs for moving and setting up poles, electric wires and public services were obtained from such administrative offices as ANDE, ANTELCO, MOPC and MCA.

TABLE 2-1-1 LAND VALUE (YEAR 1987)

Unit:Gs./m²

Section	Tax Assessment Price	Official Price	Market Price
Eusebio Ayala Avenue			
1. Pettirossi - Gral.Santos	12,240	15,029	70,000-30,000
2. Kubitscheck - Chof.Chaco	12,240	15,029	20,000-30,000
3. Chof.Chaco - R.Argentina	12,240	15,029	25,000
4. R.Argentina - Mme.Lynch	12,240	15,029	15,000
5. Mme.Lynch - Fdo. de la Mora	12,240	15,029	20,000
Madame Lynch Avenue			
1. E.Ayala - Mcal.López	3,960	5,191	7,000-15,000
2. Mcal.López - Sta.Teresa	6,000	7,651	7,000-15,000

2.2 CHACARITA

In addition to normal implications of land purchase, for the execution of project there are other factors that must be taken into consideration from a social point of view. One of the social problems that count directly in the Study is the "Chacarita".

The "Chacarita" is low income housing spread along the shore which is exposed to flooding in Asunción from Trinidad to 15 de Agosto Street. Treatment of those who live close to the Microcentro and would be affected by the construction of the España Avenue extension, is a subject for which special care must be taken.

The population density is larger near the Microcentro, decreasing as it goes further. According to the Census data of 1982 of the General Direction of Statistics and Census, the Chacarita population at the beginning of the largest flood in the last few years was 2,527 families, and taking into account 5 persons per family group, the whole population would be around 12,600. The "Conferencia Episcopal Paraguaya" published in 1983 the result of the flood effects of the Paraguay River. According to this report, the number of families in the Chacarita reached 2,297, with a total of 17,662 people. Obviously, the figures change according to the seasons the research was undertaken and specially the water level of Asunción harbor.

Most of the Chacarita people make their living in Microcentro, where they work in semi-qualified jobs, such as brick layers, domestic maids, newspaper boys, street vendors, carpenters and other jobs, without scheduled hours from early in the morning until late at night. This means that to carry out their work they need to live near the Microcentro. Because of their needs and the shortage of resources to have houses with minimum conditions to live near their working place, there is over crowding in the Chacarita.

So far, social projects have been carried out to relocate the Chacarita people. Through those projects, new settlement were set up outside the city of Asunción, such as in Aregua and Luque, where there are many houses that meet with the minimum conditions of health and sanitation programs of the Chacarita. Nevertheless, the distance between their new settlements and their usual work place, the lack of public transportation service, and added to this, the new expense for the use of that service made, many people return to the Chacarita.

According to the inspection made in the Chacarita, every lot of land has irregular dimensions, and is generally about 15 m^2. There are cases where five or six family groups live together in a lot, each one in an individual, precarious house.

The land is legally municipal property. Therefore their possession is illegal, and obviously their holders have no legal title to support their occupation of the lots. The holders possess "occupation right" that was given by the President of the Colorado party which they belong to and they are protected by them. This "occupation right" can be traded. The exchange transaction is made

through the political institution. The "occupation right" cost changes according to the house location, the material used and the size. According to the questionnaire made in the place, the transfer cost of the "occupation right" is around Gs. 600,000 to Gs. 800,000, reaching to Gs. 1,000,000 where the flood normally does not reach up to the property.

2.3 SITUATION OF PUBLIC WORKS PERFORMANCE

1) Public Works of the MCA

The projects to be executed and the sums to be invested in public works are established yearly in the Budget of the Municipality. The Financial Department is in charge of the elaboration of this budget.

The amount of investment and necessities of projects in every Department within MCA are yearly presented to the Financial Department in order to be included in the Budget of the Municipality which has to be prepared by October 31st of every year. According to these requirements and to the income estimated and available, the Financial Department elaborates the budget for projects in the next half year.

In case that all the budget is not expended, the remainder is allocated to unfinished public works which were not included in the initial budget or whose assigned budget was lower than the requirements.

The public works which have been executed and their budgets of year 1988 are shown in the TABLE 2-3-1.

TABLE 2-3-1 PUBLIC WORKS BUDGET OF MCA IN 1988

Description	Amount (mill.Gs.)
1. City Hall	480.0
2. City Workshop	5.0
3. City Clinic	40.0
4. City Market No.4	20.0
5. City Market No.5	10.0
6. Costanera Avenue	200.0
7. Pavement	10.0
8. Salamanca Erosion Control	15.0
9. R.Argentina Av. Maintenance	10.0
10. Fdo.de la Mora/R. de Francia & Gral. Santos Avenues	25.0
11. Molas López Av. Drainage	60.0
12. AMUAM	16.5
13. Other Pavement	260.0
14. Cap. Lombardo Bridge	4.0
15. Las Perlas Bridge	10.0
16. Dr. Weis Bridge	15.0
17. Bridge Maintenance	15.0
18. Mme.Lynch Canal Construction	60.0
19. F. Mora Av. & Bartolome de las Casas	10.0
20. Dr. Migone & P. Ramon	5.0
21. Fdo. de la Mora & 60th St.	18.0
22. Other Works	406.0
23. Median maintenance	25.0
24. Maintenance and Repairing of Equipment and Machines	154.0
25. Municipal Theater	20.0
Total	1,868.0

!.3. Road Projects by the Ministry of Public Works and Communications (MOPC)

The Department of Highways of MOPC is basically in charge of the works on the national, inter-department and inter-urban roads and the General Directorate of Road Commission is in charge of construction of roads and highways that are not included in the national road network. The Coordination and Integral Planning Office for Transportation (OPCIT) is in charge of the general planning, coordination and performance of research projects related to road and traffic. The organization chart of MOPC is as shown in the FIGURE 2-3-1.

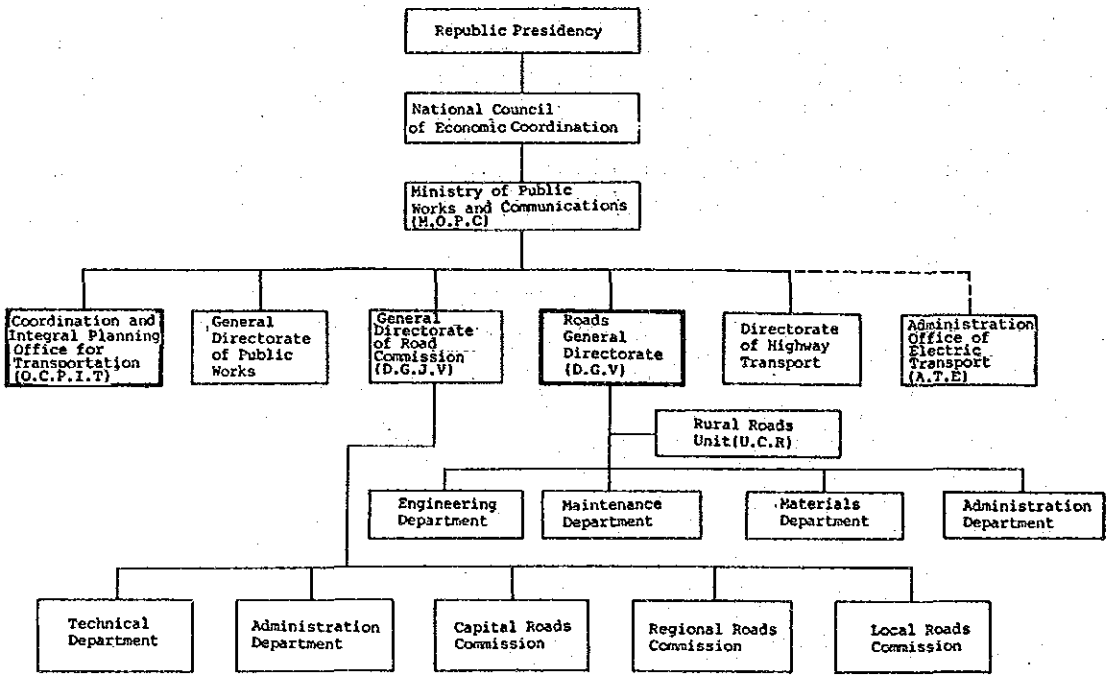


FIGURE 2-3-1 ORGANIZATION OF MOPC

According to the 1986-1990 National Transportation Plan, the investment for that period was elaborated within the general frame work of the 1985-1989 National Plan for Economic and Social Development, prepared by the Technical Planning Office (TPO). The plan was made based on the GDP (Gross Domestic Product) increment of 6% during 1986 and of 6.5% during the three year period 1987/1989, and a cumulative annual growth of 6.4% for the period 1986/1990. This was also presented in the Master Plan.

Following the same source, public investment would reach 5.6% of the GDP from which 1.53% would represent the transportation sector, in accordance with the Budget of the Ministry of finance.

In the MOPC investment plan, the total budget is divided in the following four sectors:

64.5%	road transportation
22.0%	air transportation
10.6%	fluvial transportation
2.9%	railway transportation

Therefore, the planned amount for the 1986/1990 period at constant price of 1985 is as shown in TABLE 2-3-2 and the investment details of road projects for the same period is as shown in TABLE 2-3-3. According to these Tables, there are two clearly different periods. The first period is from 1986 to 1987, which contains projects in operation, including the road works of MOPC within the metropolitan area of Asunción. The extension and improvement of the National Road No. 2, section San Lorenzo-Eusebio Ayala (km 64); the widening and pavement of José F. Bogado Av., the pavement of San Antonio access and repavement and waterway construction of Mme. Lynch Av. The second period (1988/1990) includes the improvement of the already paved roads, the projects not completed in the previous period and the new pavement projects.

TABLE 2-3-2 TRANSPORTING SECTOR INVESTMENTS (in million Gs.)

	Year	1986	1987	1988	1989	1990	Total
Road	Local	4,519.3	4,260.6	5,507.8	5,402.9	5,926.4	25,617.0
	Foreign	12,934.0	11,472.6	10,129.0	9,910.8	11,005.2	55,451.6
	Total	17,453.3	15,733.2	15,636.8	15,313.7	16,931.6	81,068.6
Fluvial	Local	1,364.5	781.0	1,595.0	535.0	440.0	4,715.5
	Foreign	5,942.4	1,848.1	1,780.0			9,570.5
	Total	7,306.9	2,629.1	3,375.0	535.0	440.0	14,286.0
Aerial	Local	99.5	299.5				
	Foreign	435.8	4,380.6	8,010.3	12,613.1	1,892.1	
	Total	535.3	4,680.1	8,010.3	12,613.1	1,892.1	27,730.9
Railway	Local	228.7	220.0	170.0	120.0	120.0	
	Foreign				695.0	2,085.0	
	Total	228.7	220.0	170.0	815.0	2,205.0	3,638.7
Total	Local	6,212.0	5,561.1	7,272.8	6,057.9	6,486.4	30,332.5
	Foreign	19,312.2	17,701.3	19,919.3	23,218.9	14,982.3	65,022.1
	Total	25,524.2	23,262.4	27,192.1	29,276.8	21,468.7	126,724.2

(Source) PLAN NACIONAL DE TRANSPORTE 1986/1990, MOPC

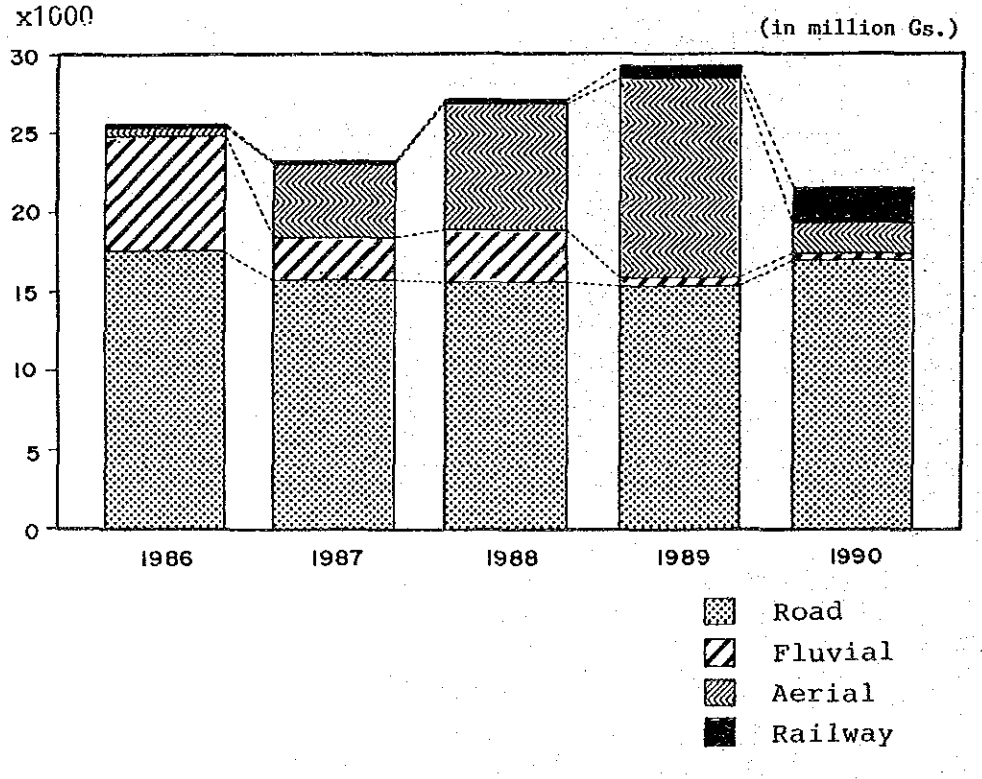


FIGURE 2-3-2 TRANSPORTING SECTOR INVESTMENTS

TABLE 2-3-3 ROAD WORKS OF MOPC

(in million Gs.)

	1986			1987			1988			1989			1990		
	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total
1. Bridge construction over Paraguay River in Concepcion		1536.3	1536.3		2169.8	2169.8									
2. Paving of the road Pozo Colorado/Puerto Militar		2342.3	2342.3		3692.5	3692.5									
3. Paving of road No. 5 Yby Yau/ Pedro Juan Caballero section	285.9	1060.8	1346.7												
4. Improvement of road No. 2, San Lorenzo/E. Ayala section	642.0	1117.0	1759.0	79.5	204.4	283.9									
5. Rehabilitation & paving of section No. 1 of the Tacuara/ Santa Rosa road	123.0	1335.0	1458.0	137.1	1031.6	1168.7	76.4	687.7	764.1						
6. Rehabilitation & paving of section No. 2 of the Tacuara/ Santa Rosa road	38.0	294.0	332.0	39.0	353.0	392.0	26.0	235.0	261.0						
7. Roads construction at Itapua area, 1418-P A.	35.8		35.8												
8. Caazapa 2087-P A project roads	113.0	585.3	698.3	465.1	1183.6	1648.7	397.0	1027.4	1424.4						
9. Urban & rural project roads of the Paraguari department	61.0	896.7	957.7	27.4	246.4	273.8									
10. Paving of the third section of the Transchaco road	758.0		758.0	706.2		706.2									
11. Side roads of the northern axis	150.0	704.6	854.6	685.9	1239.8	1925.7	719.7	1268.2	1987.9						
12. Paving of road No. 8, Villarrica/Numi section	98.0	420.0	518.0	141.5	424.5	566.0	137.6	412.6	550.2						
13. Side roads of Caaguazu	30.3		30.3												
14. Widening & paving of José F. Bogado & Gral. Santos Avenues	112.0		112.0	179.0		179.0									
15. Paving of the M.J. Troche/ Colonia Batrel Branch	77.5		77.5												
16. Re-paving of section km 118/ km 126 of road No. 2	33.4		33.4												
17. Paving of access road to San Antonio	38.0		38.0	38.0		38.0									
18. Rehabilitation & paving of La Rosada/Colonia Cesar Barrientos section	40.0		40.0	70.0		70.0	70.0		70.0						
19. Roads construction on Villa Oliva/Villa Franca section	24.9		24.9												
20. Re-paving & Construction of walls of Mac. Lynch Avenue	9.9		9.9	15.9		15.9	20.0		20.0						
21. Rehabilitation of roads affected by flood	50.0	2642.0	2692.0		927.0	927.0									
22. Roads maintenance	1398.7		1398.7	1400.0		1400.0	1400.0		1400.0						
23. Roads construction in Colonias Repatriacion, Gral. Stroessner & J.L. Mallorquin	19.4		19.4							1400.0		1400.0	1400.0		1400.0
24. Paving of road No. 1, on section km 229 to Sta. Maria	35.0		35.0	105.0		105.0									
25. Rehabilitation & paving of section road No 1 up to Cuartel la Victoria (empedrado type)	66.0		66.0	66.0		66.0									
26. Implementation & running of equipment for road paving	18.0		18.0												
27. Construccion & paving of access road of the international bridge Encarnacion - Posadas	161.5		161.5												
28. Construction of bridges & sewerages on various sections	55.0		55.0	55.0		55.0	55.0		55.0	55.0		55.0	55.0		55.0
29. Maintenance & improvement of the Transchaco road	37.0		37.0												
30. Paving of the Sta. Rosa/ Yby-Yau section							431.2	1108.8	1540.0	862.4	2217.6	3080.0	862.4	2217.6	3080.0
31. Paving of the Filadelfia/ Mcal. Estigarribia fourth section of the Transchaco road							224.6	524.2	748.8	449.3	1048.3	1497.6	449.3	1048.3	1497.6
32. Roads rehabilitation							1595.1	4101.9	5697.0	1595.1	4101.9	5697.0	1595.1	4101.9	5697.0
33. Widening & paving of road No. 1 on section San Lorenzo/ Paraguari															
34. Paving of Mbutuy/Curuguaty section							296.8	763.2	1060.0	563.6	1448.6	2012.0	563.4	1448.6	2012.0
35. Paving of Road No. 5 on the Yby Yau/Concepcion section										425.6	1094.4	1520.0	851.2	2188.8	3040.0
36. Paving of Road No. 4 San Juan Bautista/Pilar															
37. Paving of Numi/Caazapa section													150.0		150.0
38. Paving empedrado type of Road No. 2 Atyra (km 48)				55.0		55.0	58.4		58.4	58.4		58.4			
39. Construction of a park at the so-called Ñu Guazu sector	8.0		8.0												
TOTAL	4519.3	12934.0	17453.3	4265.6	11472.6	15738.2	5507.8	10129.0	15636.8	5409.2	9910.8	15320.0	5926.4	11005.2	16931.6

(Source) PLAN NACIONAL DE TRANSPORTE 1986/1990, MOPC

3) Public Works of CORPOSANA

The improvement works of Mme. Lynch Avenue have a very close relation with the recovery works of the channel that runs parallel. That study was carried out by CORPOSANA with the cooperation of JICA.

CORPOSANA (Sanitary Works Corporation), that is in charge of providing potable water and everything related to the drainage is an authorized public enterprise under the Ministry of the Interior. Also, as well as in MCA's case, the income, expenses, and investments are executed according to an Annual Budget.

According to the information given by the Technical Planning Department (STP), the revenue of CORPOSANA in 1986 was Gs. 4470 million and expenses were Gs. 4331.9 million. The available funds consisting of the Central Government fund, selling of assets and credits to the private sector, etc. was Gs. 3028.6 million, while capital expenditures were Gs. 7173.4 million, and deficit costs of that year were Gs. 4144.8 million. This amount has been paid mostly through foreign financing sources for the public sector.

The present projects according to the National Development Plan 1985/1990 are shown in TABLE 2-3-4. This information was also obtained through the STP.

It should also be noted that the indicated sums are subject to modification, since they are estimated budget amounts. Regarding the projects to be actually executed in 1988, the financing for the B.1 Project has been obtained, while the financing for the B.3 Project has not been requested yet. The JICA elaborated Storm Water Drainage Project is not yet indicated within the medium-term investments.

TABLE 2-3-4 PAY-OFF SCHEDULE OF CORPOSANA (in million Gs.)

	Year 1988			Year 1989			Year 1990		
	Internal	External	Total	Internal	External	Total	Internal	External	Total
A. Projects under execution	790.0	250.0	1040.0	700.0		700.0	800.0		800.0
1. Production & distribution of potable water in Asunción									
2. Production of potable water to rural cities	480.0	250.0	730.0	220.0		220.0	300.0		300.0
3. Asunción sewerage system									
4. Other investments	310.0		310.0	480.0		480.0	500.0		500.0
B. Projects to be executed	620.0	1060.0	1680.0	950.0	1300.0	2250.0	1100.0	1640.0	2740.0
B1. With fixed financing	420.0	610.0	1030.0	720.0	820.0	1540.0	850.0	890.0	1740.0
1. Director plan of expansion of the metropolitan area potable water system (stage 1)	420.0	610.0	1030.0	720.0	820.0	1540.0	850.0	890.0	1740.0
B3. Financing to be requested	200.0	450.0	650.0	230.0	480.0	710.0	250.0	750.0	1000.0
1. Production of potable water to rural cities	200.0	450.0	650.0	230.0	480.0	710.0	250.0	750.0	1000.0
Grand Total	1410.0	1310.0	2720.0	1650.0	1300.0	2950.0	1900.0	1640.0	3540.0

(Source) PLAN DE DESARROLLO NACIONAL 1985/1990, STP

2.4 FINANCIAL SITUATION OF MCA

The finance Department is in charge of elaboration and execution of the Budget of the Municipality.

Municipal income is divided into current income and capital income. Current income consists of rents, taxes and contributions and capital income consists of credits, private sector repayments and various charges. The expenses, are divided also in current and capital ones. The first consists of functioning expenses, purchase of fungible material, contracted services and payment to the private sector. Capital expenses are work investments, machines and goods acquisition, and debts repayment.

TABLE 2-4-1 shows financial evolution of the MCA in the last years. According to this Table, the current income shows a constant growth rate of 13 to 15% per annum and the investment for public works shows the rate of more than 20% per annum. The administration of the Municipality follows a policy of having less deficit in their projects, thus in most of the cases, they are executed with their own resources.

The local credit resources of the MCA are generally composed of small loans from official financial agencies such as Financial department, Central Bank of Paraguay, etc. to be repaid in a short term and with a low annual interest rate of around 8%. Such funds are designated to construction machines and equipment acquisition. The internal debt with the private sector is made of credit to commercial firms for the acquisition of equipment and machinery.

Foreign loans are generally made with the foreign suppliers of road equipment and materials.

The World Bank loan for the execution of the Study of the Municipal Development Project (PRODEMA), constitutes one of the most important foreign loan of the MCA, whose repayment started in 1985 and will end in 1989. The major investments are allocated for public works, and they generally represent 14% of annual growth rate (see TABLE 2-4-1). According to the Public Works Budget for 1988, which amounts to Gs. 1,868 million, the most important in terms of investment is the construction of the City Hall (Gs. 480 million investment for the present year and will end in 1989), and the Road Works investment (Gs. 1,139 million). Excluding the construction of Costanera Av., (Gs. 200 million), the Canal Construction of the Madame Lynch Av. (Gs. 60 million) is the biggest annual scheduled work, which will end within the present fiscal year.

TABLE 2-4-1 FINANCIAL DATA OF THE MCA

(in 1000 Gs.)

Year	1983	1984	1985	1986	1987	1988(Budget)
Income						
Common	2,473,478.0	2,778,348.9	3,119,673.9	3,590,280.6	4,702,562.7	5,135,243.0
Capital	421,463.0	575,179.4	530,338.1	987,207.0	1,030,498.4	1,543,231.1
Expenses						
Common	1,785,675.9	1,820,885.1	2,155,840.0	2,571,036.0	3,277,942.8	3,822,861.3
Capital	1,093,745.7	1,469,493.7	1,476,239.2	1,984,968.7	2,437,927.5	2,855,612.8
Financial Balance	15,520.0	18,752.0	17,932.8	21,482.6	17,190.8	
Public Works Investments	839,694.3	1,014,235.0	1,251,673.6	1,519,218.6	1,967,697.6	1,868,502.0
Debt Amortization						
Local						
Official	38,095.0	44,375.0	40,625.0	117,035.0	107,898.3	90,217.1
Private	118,793.0	11,957.0				
Foreign						
Financial			10,273.0	19,600.0	11,760.0	44,640.0
Non-Financial	20,180.0	30,694.0	22,291.0	22,667.8	23,850.5	17,943.1

(Source) MUNICIPALIDAD DE ASUNCION

2.5 REGULATIONS RELATED TO ROAD TRAFFIC RULE AND CONTROL

1) Legislation

The Municipal Act No. 1294, Art. 18, states as follows: "The function of the Municipality is to control and to supervise traffic, operation of passenger transportation, and all the remaining matters related to the vehicle circulation".

Also, Art. 46 and 66 state the duties and powers of the Municipal Council and the City Mayor respectively, concerning security and Traffic. According to those Art., the Municipal Council has duties and powers to establish regulations, while the City Mayor should carry out the regulations, norms and rules established by the Municipal Council concerning public transportation, pedestrian and vehicle safety and circulation, issuance of driver licenses and number plates, City Traffic Police training and functions and coordination with public or private sector entities, related the rail-road crossings, slopes and roads.

2) Organization for the Fulfillment of Regulations

The Transport Department of the MCA is in charge of the fulfillment of norms, rules and decrees related to pedestrian and vehicle safety and traffic, issuance of number plates and drivers licenses, inspection and approval of public passenger transportation units, etc.

3) Traffic Control and Supervision

The Security Department is in charge of the execution, supervision and control of Municipal traffic regulations, the application of fines and punishment, and the administration of the City Traffic Police. It is divided into three units: surveillance, vehicles and toll parking.

The surveillance and vehicle unit is composed of 96 inspectors and is in charge of the traffic control and the application of tickets and punishment to those who fail to follow established regulations. Every inspector or group of inspectors is assigned to their area of jurisdiction. They work especially during the "peak hours" but also non-peak hours they carry out sudden inspections, without any kind of schedule or systematization. The most strictly controlled traffic infractions are double parking and the non-observane of traffic light signals.

4) Parking Control

Parking on the streets is allowed in most of the streets of the Micro-centro of Asunción, but it is controlled from 7:00 - 12:00 and from 15:00 - 18:00. During that period, and at the streets where controlled parking signs are installed, parking must be done with the

showing of parking cards. This regulation is controlled is by the Toll Parking Unit.

The Toll Parking Unit is composed of 40 inspectors, divided into the same number of control sections and is in charge of selling parking cards and to issue inspection tickets. The streets where parking is prohibited by law are not included within the control zone of this unit.

Many drivers omit the showing of the card, which costs Gs. 50/parking hour, due to the value of the fine for non-observane of this requirement which is only Gs. 500. Furthermore, fines are not paid at the same time as the infraction but yearly, together with the vehicle's number plate seal renewal. Besides, the parking cards issued by the Toll Parking Unit inspectors, the Traffic Department and the City Mayor issue free parking cards, either way, for free or through request and payment of the corresponding rate to MCA, yearly or upon the request.

The Toll Parking Units do not receive a fixed salary for their jobs, but they get paid a certain percentage over the amount of sold parking cards. Therefore, it deteriorates into non-systematic control.

5) Issue of Drivers License and Road Education

At the Municipality of Asunción, the Drivers License Section, which belongs to the Technical Department of the Traffic Department, is in charge of the issue of drivers license.

There are two drivers license categories: the professional, for public transportation and commercial use vehicles; and the private.

Requirements to obtain the drivers license are to be above 18 years old, to pass a mental and physical health exam of the Department of Public Health and Welfare, and the theoretical exams (signals), practical (driving technique and elemental mechanics knowledge, as well as the psycho-technical exam (sensibility), prepared by the Traffic Department. These requirements are accessory in order to obtain a professional drivers license, even though in the case of a private drivers license, there are a lot of licenses issued without these requirements. Also, the requirements for the exams are more flexible than in the case of professional drivers license.

Roads education is carried out as programs or campaigns, through the Social Communication Department, employing the mass media, such as TV and radio stations. These campaigns are not scheduled and do not adhere to a fixed and systematic program, especially, due to the lack of necessary and available staff and financial resources.

3. PROJECTS

3. PROJECTS

3.1 Structure of Plan

3.1.1 Background

1) Land Use

In the Master Plan, which is to be accomplished by the year 2000, the establishment of the population with the adjacent cities is determined, together with the demographic increase of the city of Asunción. This means, parallel to the high rate of using the Microcentro of Asunción city, it presumes the sprawl phenomena.

On the other hand, the future perspective of the commercial activities of the Metropolitan area, the forming of commercial cores at the intersections formed by the main arteries is foreseen, as well as the development of the continuous commercial area along Eusebio Ayala Avenue. Also, concerning the distribution and transport installation, it has been planned in such way that they can be established along Mme. Lynch Avenue (See FIGURE 3-1-1).

Consequently, Eusebio Ayala Avenue (which joins the cities of Asunción and San Lorenzo), and Mme. Lynch Avenue (which crosses Asunción city limits with other municipalities), are the East-West and North-South axis of the Metropolitan area composed of 11 municipalities. Therefore, with the improvement of these two axis, the proper and adequate development of those areas can be expected.

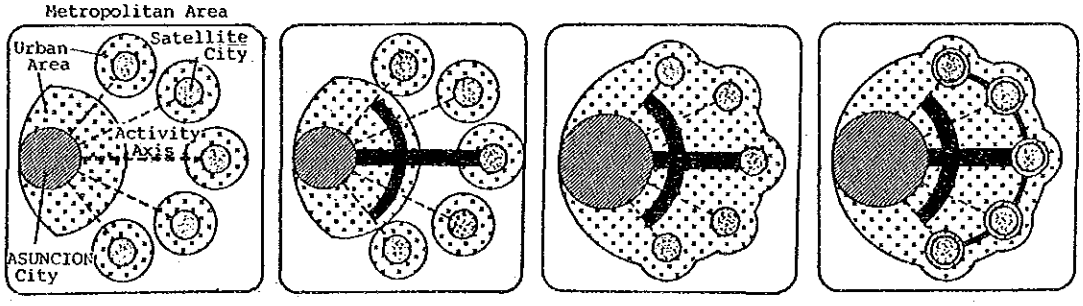


FIGURE 3-1-1 EXPANSIVE PATTERNS OF ACTIVITY IN METROPOLITAN AREA

2) East-West Axis (R. de Francia Av./Mcal. Estigarribia Road)

The East West axis is the principal access which links the cities of Asunción, Fernando de la Mora and San Lorenzo. In 1984, the 3 cities represented 74% of the population of the Metropolitan Area. According to the demographic projection for the year 2000 (carried out by the Survey Team), the 3 mentioned cities will gather 50% of the increased population.

Consequently, it stands to reason that the axis which links these 3 cities is of paramount importance in the urban scheme. At present there are several commercial activities sited along this axis in the sections between the cities of Asunción and Fernando de la Mora.

As mentioned above, it has been noticed that along the same axis, there is a tendency to form commercial centers in the areas adjacent to Mercado 4, the Municipality of Fernando de la Mora and the urban center of San Lorenzo. The degree of development decreases from west to east (the sites closest to the centre of Asunción show a greater degree of development), but the fast road which will join these 3 points on a straight line with the center would have a large impact on the formation of the aforementioned commercial centers.

On the other hand, the reactivation of the existing commercial activities along the access is also a matter of importance. It is therefore necessary to take into account the provision of marginal lanes and parking areas to benefit the commerce in the area.

The scope of the present project extends up to the boundary between the Municipality of Fernando de la Mora and San Lorenzo. However, considering the improvements to National Highways No. 1 and 2, and to avoid traffic passing through the City of San Lorenzo, it is necessary to construct the San Lorenzo bypass in order to alleviate the increased traffic load between these highways and the Metropolitan Area. Thus it is convenient to begin with compulsory purchase of the land before negotiations turn difficult.

3) North-South Axis (Defensores del Chaco Avenue/Madame Lynch Avenue)

The scope of the present study is one of the main parts of the above mentioned industrial axis creation but does not cover it in its entirety. If it is based only on that section of the project (from the junction with Eusebio Ayala Avenue) the most expected functions would be: to take in the traffic coming from the adjacent municipalities which have a constant demographic growth, and to distribute it to the 3 radial arteries crossing this avenue (Eusebio Ayala Av., Mariscal López Av., and España/ Aviadores del Chaco Avenue).

Disregarding the future industrial traffic plan, and due to setting and relocating large companies such as Pepsi Cola and Xerox, among others, and looking for the best option in cargo transport at the least land cost, it is beyond doubt that the project area provides

the best conditions for companies affected by aspects of transport extended beyond the present project area both to the North and to the South.

4) Microcentro

As the Microcentro is a symbol of the city of Asunción the theme of the urban planning should therefore be, in which part of this area the element which represents the Capital can be found, or in which manner it could be engineered to take on the aspect of the Capital.

The city of Asunción does not have neither remarkable structures which could be compared with those in Brazil or Argentina (Sao Paulo, Rio de Janeiro, Buenos Aires) nor outstanding historical monuments. It would not be appropriate to construct an access of more than 100 meters wide as has been done in Buenos Aires.

Unlike other big cities Asunción is safe, quiet and enjoys the advantage of Public Institutions, banks, offices and commercial centers being within walking distance.

In order to achieve a better exploitation of this characteristic, the city must maintain its attractiveness to enjoy walking. Therefore, it is necessary to carry out projects such as widening of footpaths and the center of the city must be set. The starting point will be determined by means of sectorial division of traffic and the adoption of parking areas for these sectors; and the centre of the city will be defined by the creation of a commercial center specializing in luxury products.

Certainly, it is convenient to take advantage of the potential of the river coast, which, at the moment comprises mainly private buildings and illegal dwellings. There are only a few green areas which are used mostly as parking lots. Therefore, every endeavor should be made to recover the river coast for the whole population.

5) *Urban Bus Terminal (Market No. 4)*

In reality, there exist many doubts as to the appropriateness of relying on buses as the only means of public transport in a city of one million inhabitants, but with the present economic situation in Asunción it would be difficult to implement a rail system. For this reason, the Master Plan proposes to overcome this problem by the rationalization of the operational bus system by restructuring the bus lines.

However, the proposed rationalization will require passengers to change buses more frequently. At the moment, the network requires 17% of passengers to change buses. This will increase to 47% with the proposed system (year 2000).

This problem could be summarized as follows:

a. Purchase of more than one ticket
b. Increase in waiting time
c. Increase in walking distance

Items a. and b. could be alleviated by modification of the system and an increase in frequency respectively. The solution to item c. would be to focus bus departures and arrival points in order to shorten passenger's walking distance, as well as guaranteeing them shelter against sun and rain. That is to say, the construction of a bus terminal is required.

FIGURE 3-1-2 shows an outline location for the bus station required in line with views mentioned above.

As described in the present study, with encouragement of specialist shops in the center area and the provision of general shopping facilities in the area adjacent to Market No. 4 in order to equate it with the expected increased demand.

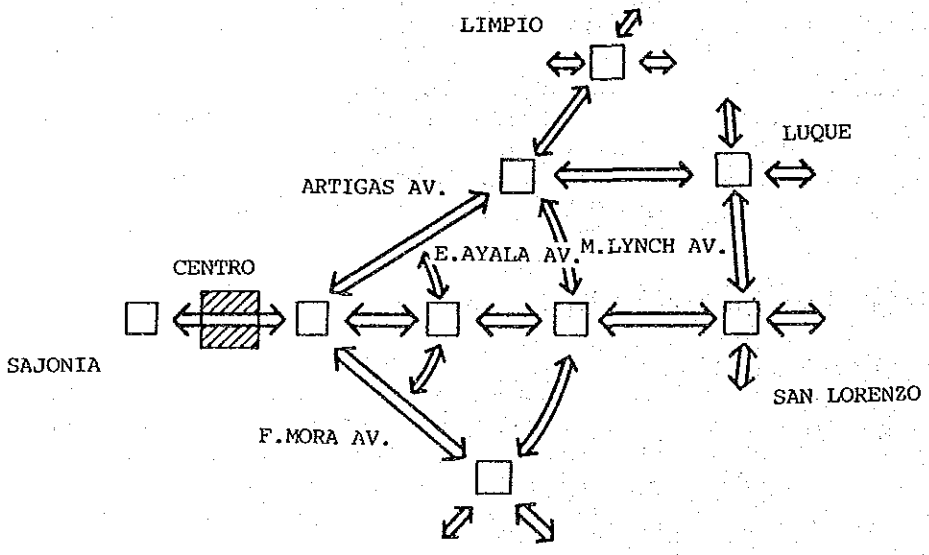


FIGURE 3-1-2 BUS TERMINAL LOCATION SCHEME

6) Objectives of the Study and the Traffic Aspects

As shown in FIGURE 3-1-3 the majority of traffic in Asunción and its Metropolitan Area originates between population zones and Asunción's Microcentro, and basically occurs in the 6 main radial arteries, especially in Eusebio Ayala, Mariscal López and Fernando de la Mora Avenues (PHOTO 3-1-1).

Considering the intermediary position of Eusebio Ayala Avenue between Mcal. López and Fernando de la Mora Avenues, and the relatively small separation of these three routes, an attempt will be made to reduce the load on these last two mentioned arteries by widening and improving Eusebio Ayala Avenue.

As shown in FIGURES 3-1-4 and 3-1-5 the traffic problems of Asunción and its Metropolitan Area will be resolved with the widening to 6 and 8 lanes for the years 1992 and 2000 respectively. Although it is not possible to clearly capture this idea from these figures, one can see that the result of widening Eusebio Ayala Avenue has an influence on the volume of traffic on España Avenue, as compared to case of "Do Nothing".

The first stage which will cover up to 1992, includes improvement of traffic in the Microcentre area (with the exception of the extension of España Avenue), widening Rodríguez de Francia Avenue (up to Perú Avenue) to 6 lanes, a connecting viaduct between R. de Francia and Eusebio Ayala Avenues, widening of the axis Eusebio Ayala Av. / Mariscal Estigarribia Road to 6 lanes and widening of Mme. Lynch Av. to 4 lanes. It is proposed all projects would be completed for the year 2000.

PHOTO 3-1-1 PRESENT TRAFFIC JAM ON E.AYALA AV.

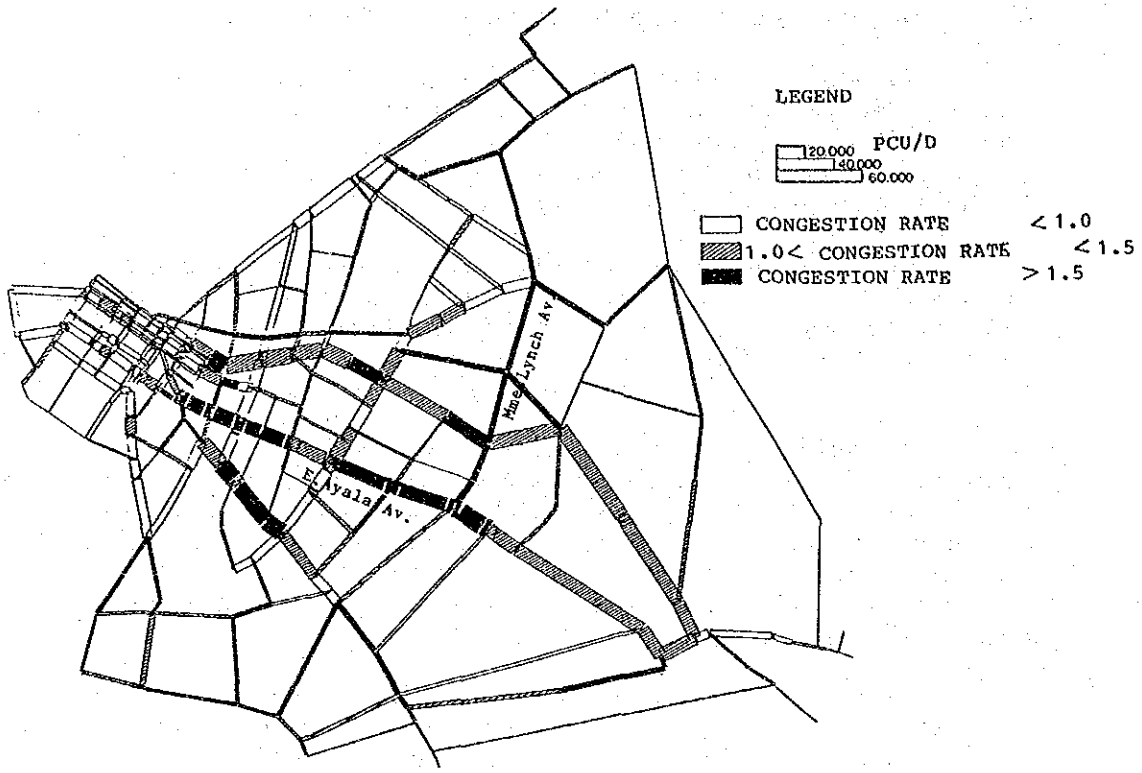


FIGURE 3-1-3 TRAFFIC FLOW IN YEAR 2000 (DO NOTHING CASE)

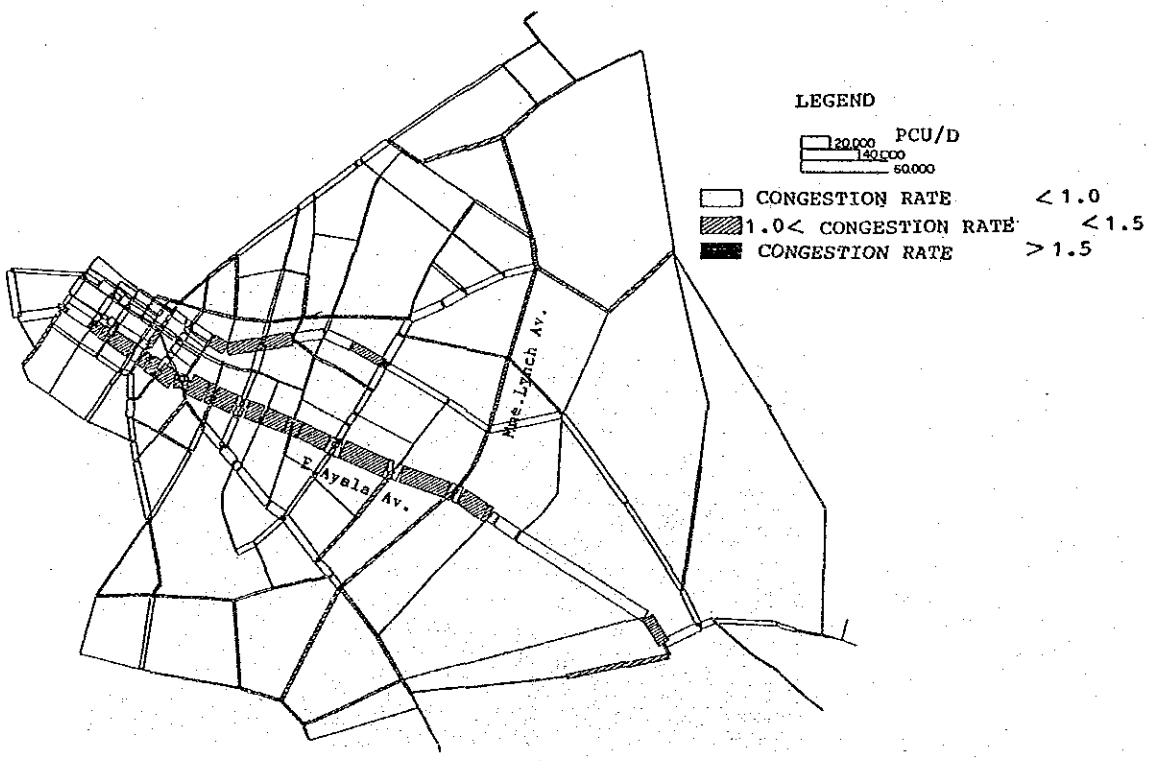


FIGURE 3-1-4 TRAFFIC FLOW IN YEAR 1992 (FOR 6 LANES ON E.AYALA AV.

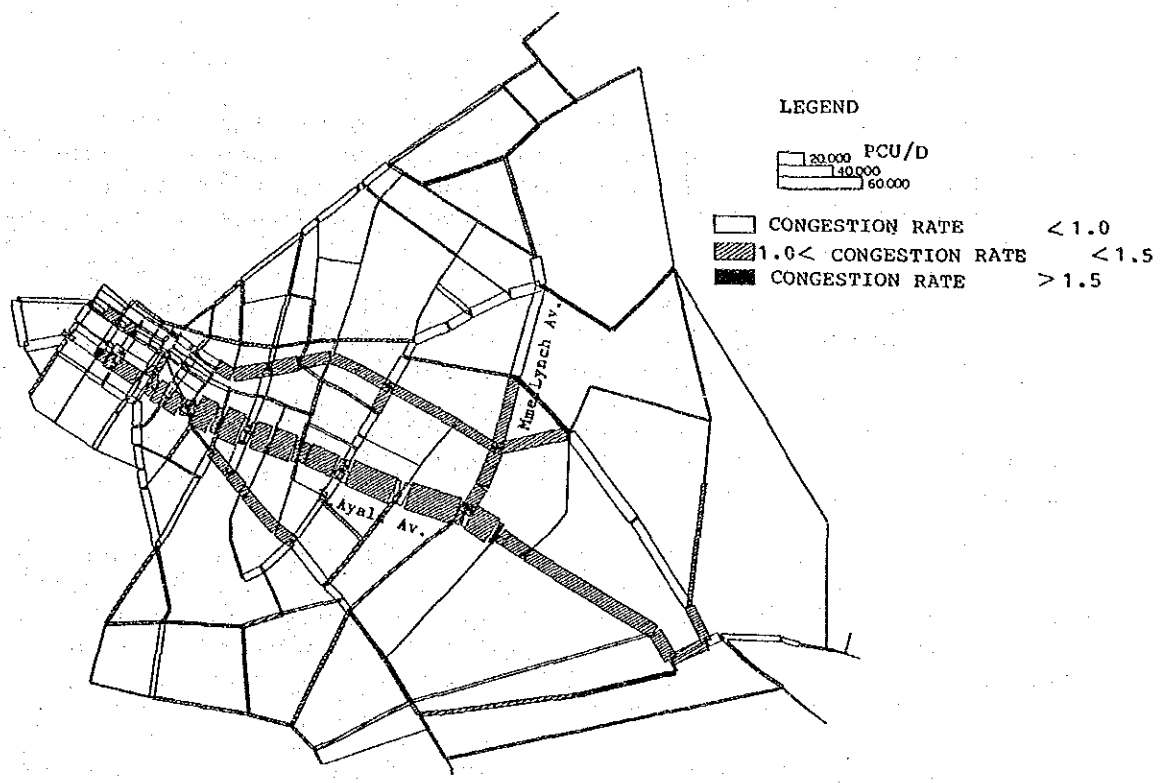


FIGURE 3-1-5 TRAFFIC FLOW IN YEAR 2000 (8 LANE ON E.AYALA AV. CASE)

3.1.2 Plan Elaboration Process

1) Criteria

As this is a Feasibility Study, the main objective is to arrive at a feasible plan rather than the most appropriate plan. There exist 2 points of view, objective and subjective, with respect to the feasibility of the plan execution, and these two must be considered together.

The study will put forward the alternatives for each project which is considered objectively feasible (i.e. the implementation of the project/s will generate greater benefits than the cost and at the same time will be physically feasible), and carry out a quantitative analysis of the same, in order to submit it to the Mayor of Asunción, who will decide its feasibility in terms of the political, social and financial points of view.

The same procedure applies as well, to the technical part. Within the technical margin of tolerance the preference has been to focus on the aspect of the feasibility of implementation, e.g. will the execution be by concession, which standards will be used to determine new pavement or resurfacing, at how many meters from the road will it be feasible to expropriate land, etc.

Due to the project's implementation according to the above mentioned process, too many alternative combinations come up when not proceeding to determine one by one, starting from the most important points. At present, the projects were defined as indicated in FIGURE 3-1-6 (from the top to the bottom).

Besides, in order to determine the number of lanes of the arteries, the daily traffic capacity of one lane was analyzed according to the following arteries characteristics shown in TABLE 3-1-1: 2 lane artery, multiple lane artery, land use of the artery location area and design speed.

TABLE 3-1-1 DAILY CAPACITY OF THE ARTERIES

Lane No.	Design speed (km/h)	Daily traffic capacity (pcu)
More than 4 lanes	60	10,000 unit/day x lane
	40	10,000 unit/day x lane
2 lanes (two way)	60	10,000 unit/day/2lanes
	40	9,000 unit/day/2lanes

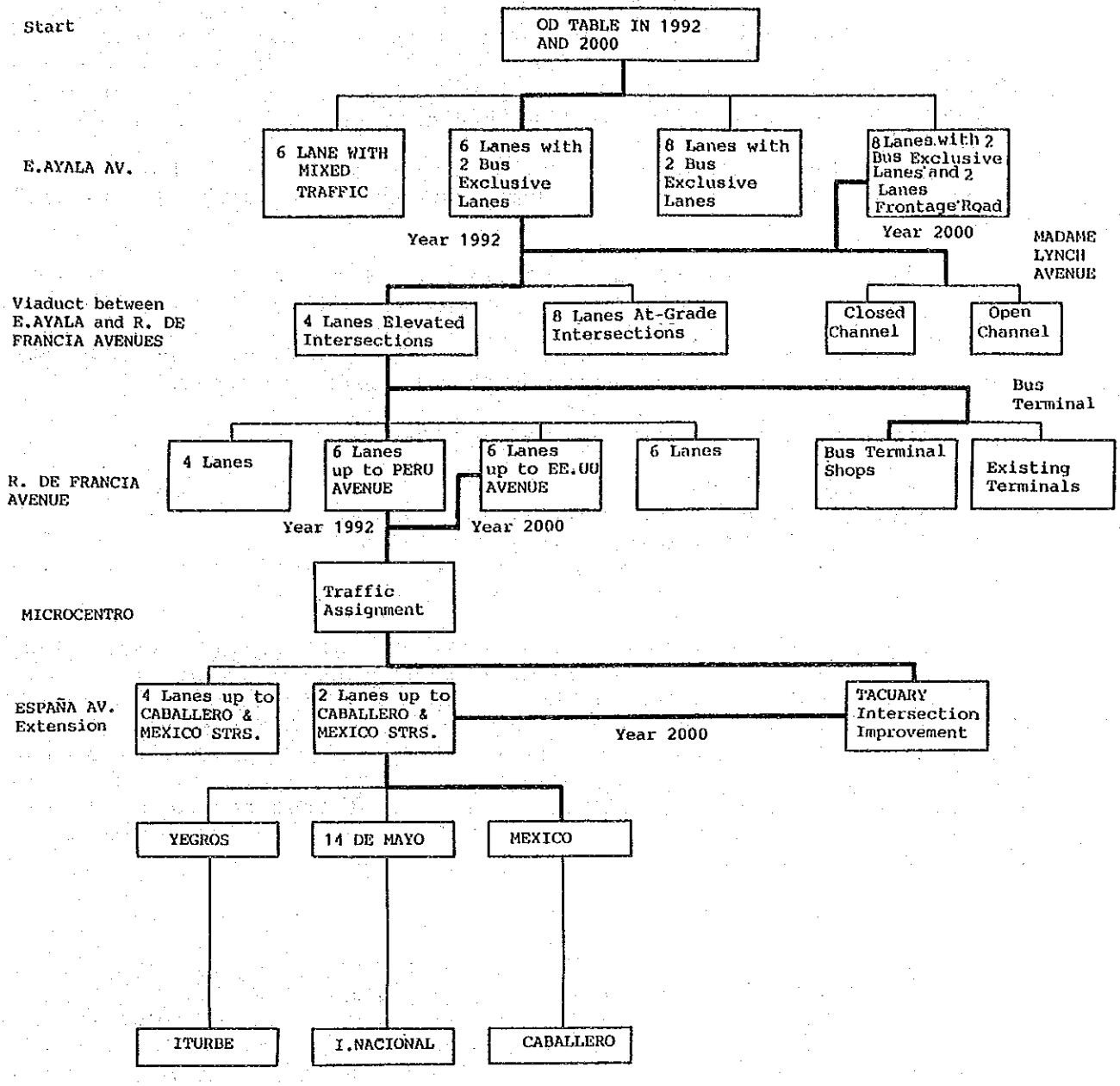


FIGURE 3-1-6 PLANNING PROCESS

2) Eusebio Ayala Av.

The axis of Asunción and its Metropolitan Area is the main route which originates from the Microcentro of the City, crosses the Municipality of Fernando de la Mora and heads towards San Lorenzo. The basic criteria is to alleviate the loads on the other radial arteries by means of improving this metropolitan axis.

From that point of view, the primary decision is the determination of the number of lanes that the Eusebio Ayala Av. will have.

When the congestion rate of the radial arterials is evaluated, specially when it is related to España Av., which shows a maximum congestion rate of 1.5 or more as a parameter, it is clarified that: with the enlargement of 6 and 8 lanes for the years 1992 and 2000, the congestion rate would stay below the level indicated above.

There were four alternatives for the cross section:

Alt.1: 6 mix lanes
Alt.2: 6 lanes, 2 exclusively for bus use
Alt.3: 8 lanes, 2 exclusively for bus use
Alt.4: 8 lanes, 4 used by mix traffic, 2 exclusively for bus use and 2 for local traffic

And in relation to the prediction results of the year 2000, Alternative 4 is the one that presents the smaller index of: "Total traffic load/vehicle x km)" and "Total travel time/vehicle x hour". This alternative also admits the major traffic volume within all the others. Alternative No. 4 is acceptable from the point of view of the traffic absorption from the zones of the E. Ayala Av. And the performance of the marginal lane, is convenient from the point of view of the land use along the E. Ayala Av., where the commercial activities are set in the form of coin piles.

For these reasons we reached the conclusions that:

In the first stage, which corresponds up to the year 1992, the arterial way will be improved to 6 lanes (4 mix and 2 for buses) using the actual right of way. The Municipality disposition establishes the Municipal Line 35 meters to 50 meters (cross section of Alternative No. 4) for the year 2000 (second stage). For this effect, the 6 lanes built in the year 1992 will be used as central lanes of the 8 lanes for the year 2000.

The intersections which require elevated crosses for the year 2000 will be built on the first stage, up to the year 1992, and for building reasons, the 6 ways in the same period.

3) Connection Viaduct of Eusebio Ayala and R.de Francia Avenues

The assignment of the demand for the year 1992 will be 18,600 vehicles per day. And to satisfy this demand, 2 alternatives have been

thought:

Alt.1: Viaduct with 4 lanes
Alt.2: A cross at the level of 8 lanes used exclusively for left turns

According to the saturation flow rate, there is a certain difficulty to order the traffic by means of a level crossing, so a viaduct will be chosen.

4) Dr. Gaspár R. de Francia Avenue

Four Alternatives have been considered:

Alt.1: 4 lanes in all its extension
Alt.2: 6 lanes from the viaduct to Perú Av. and 4 lanes in the resting ground
Alt.3: 6 lanes from the viaduct to the EE.UU Av. and 4 lanes in the resting ground
Alt.4: 6 lanes from the viaduct to Colón Av.

From the assignment volume point of view, none of them get to 1.5 times the lanes capacity. But the avenue width will be projected in 32 meters of 6 lanes, including the slip road, up to where the viaduct ends, because the viaduct was projected to 4 lanes. That width will continue up to two blocks before Perú Avenue.

According to the traffic volume of the intersection, the saturation flow rate of the cross of Perú Av. in the year 1992 will overpass 1,0. This will occur if the width of R. de Francia Av. stays at four lanes.

For the moment, the plan is to enlarge the 2 squares mentioned to 26m., but with this the saturation rate of this intersection will overpass 1.0 in the year 2000, so for this year the enlargement of the avenue will be extended up to Estados Unidos Avenue (26m of width).

5) Madame Lynch Avenue

The requirement of Madame Lynch Av. presupposes the enlargement to 6 lanes of Eusebio Ayala Av. in the year 1992. The enlargement up to 4 lanes of this avenue is presupposed for the year 1994 or 1995.

The reforms of Madame Lynch Av. are classified in:

Alternative 1: Closed channel in the section between Eusebio Ayala and Santa Teresa Avenues and open channel of the section between Santa Teresa and Aviadores del Chaco Avenues, this was proposed by the JICA study for the reforms of the Drainage System.

Alternative 2: Open channel overall

From the point of view of the land expropriation, Alternative 2

is sub-divided in:

Alternative 2-1: Expropriation of the East side of the channel, corresponding to the Fdo. de la Mora Municipality

Alternative 2-2: Expropriation of the west side of the channel of Asunción City

The problem of Madame Lynch Av. is the existence of various executing Institutions. The actual situation is as follows:

a. The channel corresponding to CORPOSANA
b. The road that corresponds to the MCA. But in case of Alternative 2-1, the newly widened section will correspond to the MOPC.

According to the total construction cost point of view, Alternative 2 offers the major advantages. In case that Corposana executes the closing of the channel, preceding the road works, Alternative 1 will be cheaper economically for the MCA.

In relation to the selection of the best Alternative, it will depend much on what the coordination of MCA and CORPOSANA determine. The JICA Study Team for the Urban Traffic proposes alternative 2-1.

6) Microcentro Traffic

(1) Road Characterization

The urban road plan will be ruled by giving major preference to pedestrian traffic than to vehicular traffic. The central zone will be divided in blocks in consideration of future land use, and with these premises the characterization of each one of the roads has been determined.

a. With respect to public transport the 8 present bus itineraries will be confirmed with some modifications in those of the north-south direction. Nevertheless the boarding and getting off of passengers outside the bus stops, which will be provided every 500 meters, will be prohibited.

b. Palma street will be the axis of pedestrian traffic, in east-west direction. Therefore, considering the pedestrian access from the bus stops to the aforementioned axis, 3 north-south access roads, preferentially pedestrian will be provided.

c. Vehicular traffic will be principally transferred to the north-south arteries. However, the extension of España Avenue will not be executed according to the Master Plan. Therefore traffic flows in the east-west direction will be diverted to Cnel. Bogado and Eligio Ayala Streets.

(2) Traffic Lights

The objectives will be to give preference to vehicular arteries and to the orientation of traffic flows towards the preferential arteries, and in addition, to provide safe crossings where pedestrian and vehicular traffic meet. The exploitation of the existing traffic light system has been taken as premise.

(3) Parking

The parking demand has been determined by dividing the central zone into 14 blocks (sub-division of traffic sectors). The provision of this installation has been planned in those zones where the demand will exceed the capacity of road parking.

7) España Avenue Extension

From the point of view of the number of lanes there are 2 alternatives for the extension of España Avenue.

Alt.1: 2 lanes
Alt.2: 4 lanes

According to the projected traffic volume, 2 lanes would be sufficient, provided that España Avenue is not widened.

On the other hand, according to the routing of said extension, 2 alternatives for the junction with the Microcentro are presented.

Alt.1: Yegros and Iturbe
Alt.2: 14 de mayo and Independencia Nacional
Alt.3: México and Caballero

From the aspect of the relationship with the road plan of the Microcentro, alternative 3 would be adopted, considering the low cost of implementation in relation to the result and also its minor effect concerning the Chacarita. However, this routing will cross the population area with illegal dwellings for which it is estimated that it will much take much time to expropriate the land and to carry out the works. On the other hand, the Microcentro road plan is a project of most urgency. Before the extension of España Avenue is undertaken, the improvement of the intersection Tacuary will be necessary to overcome congestion problems which could arise following the aforementioned extension.

The result obtained demonstrates that with the Tacuary intersection, traffic congestion up to the year 1992 can be managed, even though it will reach its maximum limit. Therefore this conclusion will be considered in the timetable of implementation. For the year 2000, the extension up to México and Caballero Streets will be carried out.

8) Bus Terminal (Area of Market No. 4)

Objectives of the Installation of Bus Terminal are:

a. Reducing vehicle congestion of the arteries
b. Reducing the number of buses which enter the Microcentro (in the future)
c. Providing a safe and pleasant facility for passengers waiting for or changing buses
d. Urban redevelopment

In order for point (b) to be possible, likewise the Bus Terminal for the Market 4 zone, another terminal is required nearby Plaza Uruguaya. This point will have to be studied after the installation of the second Bus Terminal.

Corresponding to the demands projection, the capacity of the project of the Bus Terminal will be set at 12,000 buses/day.