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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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MINISTRY OF PUBLIC HEALTH AND SOCIAL WELFARE  
THE REPUBLIC OF PARAGUAY

THE STUDY  
ON  
THE SOLID WASTE MANAGEMENT  
FOR  
METROPOLITAN AREA OF ASUNCION

FINAL REPORT  
VOLUME III  
ANNEX

AUGUST 1994

KOKUSAI KOGYO Co., Ltd.

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**THE STUDY  
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THE SOLID WASTE MANAGEMENT  
FOR  
METROPOLITAN AREA OF ASUNCION**

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## **PROFILE OF THE STUDY AREA**

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## **A.1 Definition of the Study Area**

The study area was stipulated that the whole area under the jurisdiction of the Metropolitan area of Asuncion is to be covered, which consists of 15 municipalities, members of the AMUAM (Association of Municipalities of the Metropolitan Area) except for San Antonio and Ypane municipalities, and is limited to the urbanized areas of the 15 municipalities. The Study Area is shown in Figure A.1a.

As a result of the field survey, the 15 municipalities in the Study Area are classified into the following three categories, as shown in Figure A.1b.

- a. **Highly Urbanized Municipalities:**  
2 Municipalities; Asuncion and Fernando de la Mora.
- b. **Urbanized Municipalities:**  
6 Municipalities; Lambare, San Lorenzo, Capiata, Luque, M.R. Alonso and Villa Elisa.
- c. **Less Urbanized Municipalities:**  
7 Municipalities; Nemby, J.A.Saldivar, Ita, Aregua, Limpio, Villa Hayes and Benjamin Aceval.

In this study, the formulation of a MSWM master plan was conducted in accordance with the above mentioned categories. As such the WACS (Waste Amount and Composition Survey) and POS (Public Opinion Survey) were carried out by selecting one sample municipality from each category, in order to obtain basic data for planning. Consequently, the forecast of future waste amount and composition is based on the data obtained from each category.

The total population in 1992 of the 15 municipalities is tabulated in Table A.1a.

Table A.1a Population of the Study Area in 1992

Municipality	Population		
	Urban Area	Rural Area	Total
<b>Highly Urbanized Municipalities</b>			
1. Asuncion	502,426	0	502,426
2. F. Mora	95,349	0	95,349
Subtotal	597,775	0	597,775
<b>Urbanized Municipalities</b>			
3. Lambare	99,990	0	99,990
4. San Lorenzo	133,405	0	133,405
5. Capiata	83,898	0	83,898
6. Luque	84,885	31,419	116,304
7. M.R. Alonso	39,422	0	39,422
8. Villa Elisa	29,918	0	29,918
Subtotal	471,518	31,419	502,937
<b>Less Urbanized Municipalities</b>			
9. Nemby	27,234	11,532	38,766
10. J.A. Saldivar	2,016	18,976	20,992
11. Ita	14,275	22,625	36,900
12. Aregua	6,335	18,565	24,900
13. Limpio	26,396	9,129	35,525
14. Villa Hayes	11,843	11,690	23,533
15. Benjamin Aceval	6,203	4,892	11,095
Subtotal	94,302	97,409	191,711
<b>Total :</b>	<b>1,163,595</b>	<b>128,828</b>	<b>1,292,423</b>

In the relation to MSWM, the characteristics of the above-mentioned 3 categories of municipalities are summarized as follows:

**a. Highly Urbanized Municipalities**

Almost all area under the jurisdiction of the municipalities are urbanized. As such, it seems to be impossible to find a future landfill within the jurisdiction of the municipalities. Due to high urbanization, the present collection ratio is high.

**b. Urbanized Municipalities**

This category of municipalities has a densely populated area within their jurisdiction. However, it is possible to find a future landfill within the jurisdiction of each municipality; the present collection ratio is relatively high.

**c. Less Urbanized Municipalities**

Even the urbanized areas of these municipalities are not densely populated and it seems straight forward to find future landfills within their areas. As such, the present collection ratio is low and final disposal is less of a problem.

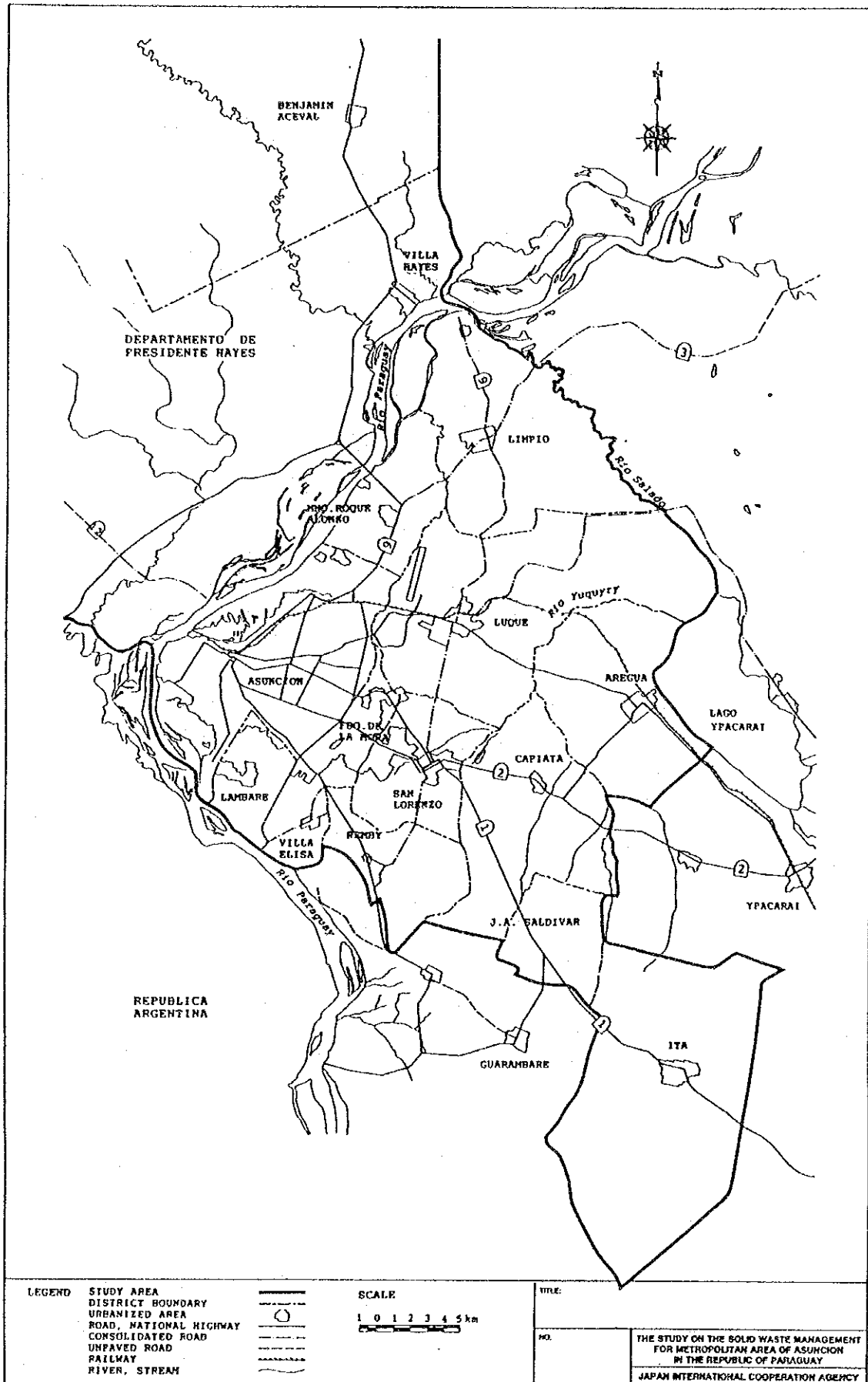


Figure A.1a Study Area

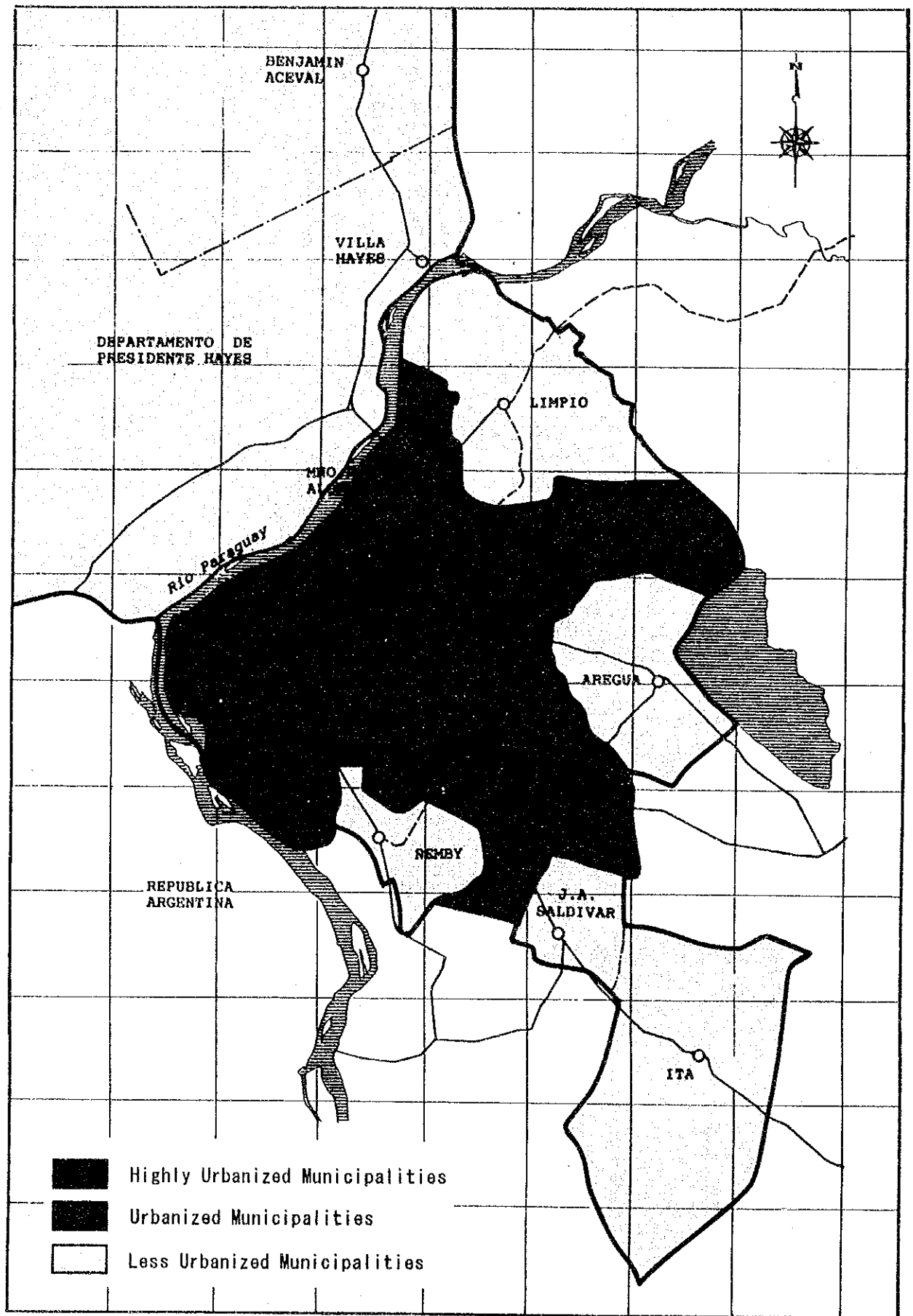


Figure A.1b Classification of Municipalities in the Study Area

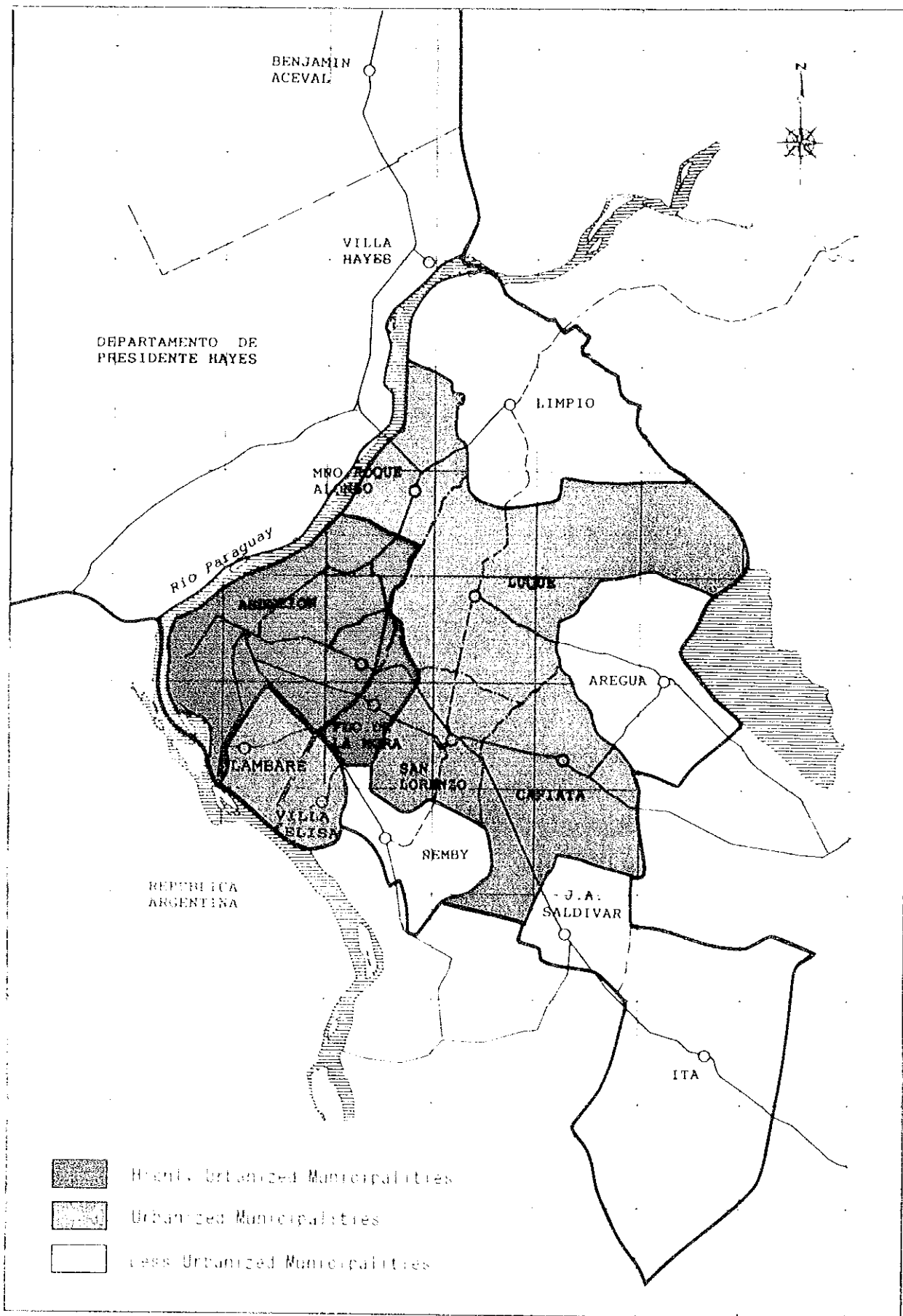


Figure A.15 Classification of Municipalities in the Study Area

## **A.2 Natural Conditions**

### **A.2.1 Location and Area**

The Republic of Paraguay is an inland country located at the center of the South American Continent and is surrounded by three countries, Bolivia to the north, Brazil to the west and Argentina to the south and the west. It is situated between 19° and 28° latitude and between 54° and 63° longitude. Paraguay is mainly a lowland country and there are no mountains exceeding 800 m above sea level. The ocean is located 1,500 km down the Paraguay/La Plata River. The area of Paraguay is 406,752 km<sup>2</sup> and the population is 4,519,327 (in 1992), with 98 % living on the east side of the Paraguay River (39 % of total area).

There is a big difference in the natural environment between the east and the west of the Paraguay River, which runs through the center of the country from north to south. This greatly affects the distribution of the population and their production activities.

The area to the west of the Paraguay River (Chaco area) occupies nearly 60% of the total land. The annual average temperature is at around 25°C, and in the summer, humidity is extremely high. Flooding is frequent due to the low permeability of the soil over the flat land. A large portion of the area is used as pasture land, since it is difficult to irrigate because of the salty groundwater. With such natural conditions, the population on the western side of the Paraguay River is less than 2% of the national total.

On the other hand, the eastern side of the Paraguay River comprises nearly 40% of the total land. To the east of the Caaguazu Mountains, running from north to south, is the drainage basin of the Paraguay River. The annual average temperature of this area is lower than that of the western side at 21°C to 23°C, with annual precipitation being greater at 1,400 to 1,800 mm. The topography is characterized by undulation, and the soil is productive. For this reason, 98% of the total population lives on the eastern side and most of production activity is in this area.

Vast marshes called, Pantanal, surround the Paraguay River which runs through the center of the territory, and marsh coppice develops on the eutrophic soil. In the rainy season, the water area expands remarkably including the stream running over the marsh coppice.

The 13 municipalities in the Study Area including Asuncion is located on the east



side bank near the confluence of the Paraguay River and the Pilcomayo River and its topography is generally flat. The total area is approximately 1,250 km<sup>2</sup> and the population is approximately 1.28 million.

## A.2.2 Climate

Paraguay is located in the sub-tropical zone and its climate is characterized by its drastic changes.

The average annual temperature is 22.5 °C. At its hottest, the average monthly temperature is 27.5 °C in January, and the coldest is 16.8 °C in July, and the difference is 10.7 °C. The highest of the average maximum temperature is 33.5 °C in January. The lowest of the average minimum temperature is 12.6 °C in July.

The average annual humidity is 73.2 %. At its highest, the average monthly humidity is 80 % in April and May, and the average lowest monthly humidity is 68 %. The average monthly humidity in autumn is higher than in spring.

The average annual precipitation is 1,356.3 mm. The yearly fluctuation of precipitation in summer is bigger than winter. The precipitation in April is the most, covering 15 % of the total yearly precipitation.

The average annual wind velocity is 2.4 m/s. The yearly fluctuation of wind velocity in winter is bigger than summer. The southerly winds prevail.

Table A.2.2a Climate Data of Asuncion

Month	Air Temperature			Humidity	Rainfall	Wind	
	Avg	Max	Min			Speed	Direction
	°C					%	mm/month
Jan	27.5	33.5	22.8	71.0	143.3	1.9	South
Feb	26.5	32.5	22.1	74.0	135.7	2.2	U
Mar	25.8	31.6	21.4	75.0	123.3	1.4	U
Apr	22.7	28.1	18.9	80.0	213.5	2.2	East
May	19.5	24.5	15.8	80.0	115.1	2.8	East
Jun	17.5	22.6	13.5	78.0	68.9	3.3	N.East
Jul	16.8	22.4	12.6	74.0	49.6	2.8	South
Aug	18.5	24.2	14.1	71.0	71.3	2.5	South
Sep	20.0	25.9	15.5	69.0	95.3	2.2	South
Oct	23.3	29.2	18.6	69.0	110.2	2.8	South
Nov	25.3	31.2	20.4	68.0	90.1	2.8	South
Dec	26.7	32.7	21.8	69.0	140.0	1.9	S & U
Annual	22.5	28.2	18.1	73.2	1,356.3	2.4	

Note: U stands for unobtainable as the wind is calm and no specific direction can be determined. For December both southerly and calm winds occurred in the same proportion.

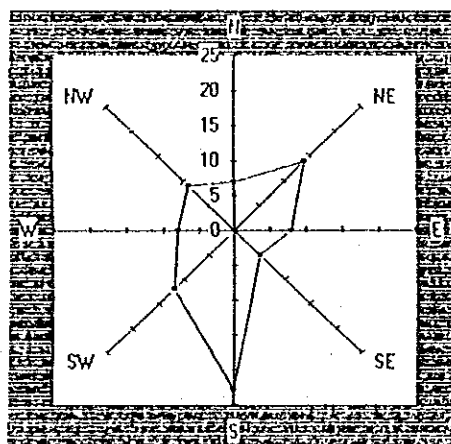
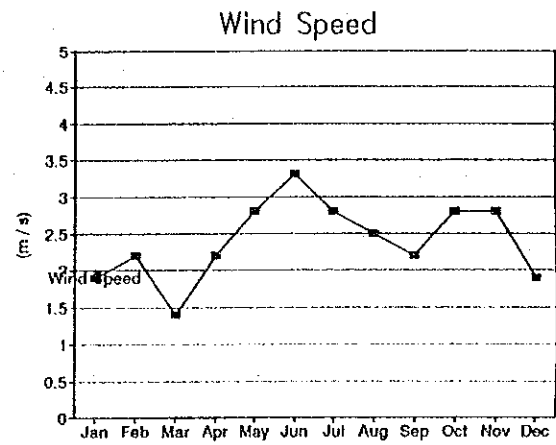
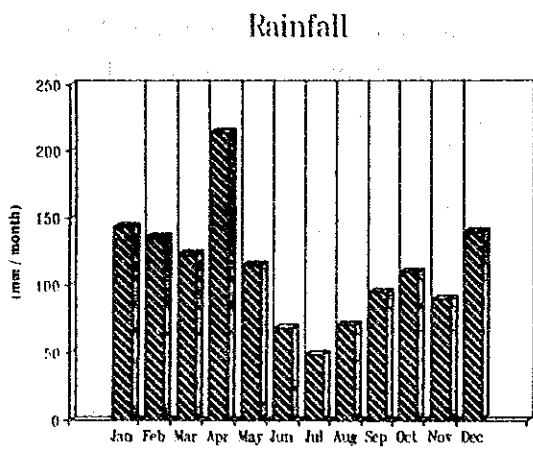
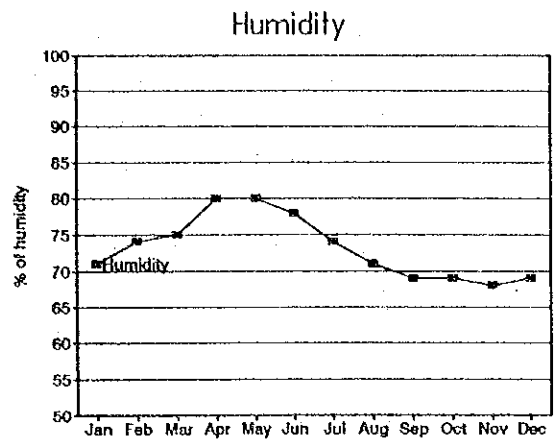
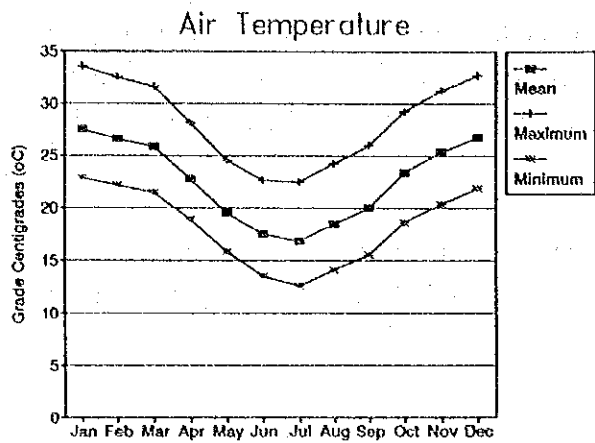


Figure A.2.2a Climate Data of Asuncion

### **A.3 Social Conditions**

Paraguay is a free and an independent republic since 1811. Like most of its Latin American neighbors, it recently experienced a process of redemocratization, beginning in 1989, after 38 years of military rule and it can be considered today as a typical western democracy.

This southern latin american country figures as one of the nations in the economic and social developing stage. The country Gross National Product per-capita in 1992 was US\$ 1,254.00 and total exports of US\$ 994 million a year.

Racially and culturally Paraguay is a very homogeneous country, with a population almost entirely composed of european-guarani descendants, with very few remaining aborigines. Like its neighboring countries, however, it's population bears a highly biased wealth distribution, which is reproduced in the social and economical conditions of the people, as presented ahead.

#### **A.3.1 Administration**

According to it's 1967 National Constitution, the Government is divided into three powers: the Executive branch, headed by a President of the Republic, directly elected by the people for a five year term, the Legislative branch, composed of a Representative Chamber and the Senate, both constituting the "National Congress", and the Judiciary, constituted by the Supreme Court and the corresponding Tribunals.

The incumbent President has been recently elected, following another also freely elected by the people, and the main political parties are, the "Partido Colorado" and the "Partido Liberal", the former being the ruling party since 1947.

The country is administratively divided into 19 Departments, and more than 500 municipalities. The Departmental division did not exist until recently, and only now the Departments are being implemented by the first time elected "Governors". Governmental actions and powers are thus, basically, exercised by the National and Municipal governments.

Although being autonomous, municipalities are submitted to a general "Municipal Organic Law" issued in 1987 by the National Congress. This law manages their relations with the people and with other governmental powers.

Each municipality has its own autonomous administration, headed by an elected mayor serving a 5 year term, this mayor being controlled and supervised by a Municipal Council whose members are also elected by the citizens for the same period of time. The number of councilmen of each municipality is in the range of 9 to 24, depending upon the amount of the city budget.

Some municipalities are strong and well organized, like the Asuncion municipality, with a budget of over US\$25,000,000.00 (twenty five million) while others are very poor, comprising no more than 3 (three) permanent employees and a budget of less than US\$25,000.00 (twenty five thousand) a year.

### **A.3.2 Customs and Religion**

Predominantly an european-guarani population; it's cultural patterns are highly influenced by western lifestyle, from the guarani culture only a few vestiges remain, the most important being the guarani language, which is spoken by almost all the population. Together with spanish they are the official languages of the country.

The most popular beverage is a natural herb infusion called "tererere" when drank cold and "mate" when hot. Manioc, an edible vegetable root, is never missing on the table of the Paraguayans, together with corn and meat or meat derived products.

The country is officially Roman Catholic, with more than 90% of the population professing it. An example of the influence of catholicism in the country are that all the churches bear on their front wall the Paraguayan Republic coat-of-arms and being catholic was, until last year, a required condition to a citizen to be elected president of the republic.

### **A.3.3 Public Health**

The Public Health status of the country as a whole, reflects the situation of an average developing country. Most important problems are the gastrointestinal, diarrhea, parasitic, acute respiratory and malnutrition diseases, as well as those preventable by vaccine. Besides these diseases however, other characteristic illnesses of industrial countries like alcoholism, cardiopatics, tumors and accidents also have a high incidence on the mortality rates.

This situation is derived from a deficiency of environmental sanitation, a lack of sanitary education and a poor health services system, aggravated by the very low income of a significant part of the population.

The health sector is organized under the supervision and coordination of the Social Welfare and Public Health Ministry, presenting three subsectors: Public, Paraestate and Private.

The Public subsector comprises of the Social Welfare and Public Health Ministry, the Armed Forces, Police and Municipal health systems, CORPOSANA – the National Sanitation Corporation, and the Asuncion National University Hospital. This subsector is responsible for servicing over 60% of the total population. The amount charged to clients is minimal, almost symbolic.

The paraestate subsector corresponds to the Social Security Institute (Instituto de Previsión Social) which cares for employed non-public workers, which is less than 20% of the population. The insured workers receive the service for free.

The private subsector comprises the private health insurance companies, hospitals, pharmacies, medical laboratories, medical and dental surgeries and clinics. This subsector renders paid service to between 15 to 20 % of the population. A significant portion of the poorest population also relies on traditional and folkloric medicine.

Here are some health status indicators:

. Average life expectancy:	66.9 years
. Medical doctor availability :	1/1800 inhabitants
. Average daily protein consumption:	78.6/g/cap
. Average daily energy intake:	2,873/kcal/cap/day

### **A.3.4 Sanitation and the Environment – Policies, Legislation, Enforcement and Activities**

#### **a. Policies and Legislation**

Sanitation and environmental protection policies and legislation are set by the National Government through the Ministries of Social Welfare and Public Health and the Ministry of Agriculture and Livestock, and by the National Congress. The "green side" of the environment is cared by the Undersecretary of National Resources and the Environment, an agency of the Ministry of the Interior.

Municipalities also have a role in sanitation and environmental protection, since the "Municipal Organic Law" awards them the right to legislate on matters like water supply, sewerage, recreational waters and control of industrial activities considered to be unhealthy, dangerous or improper in respect to public health.<sup>1</sup> These rights however, have been very rarely practiced by the municipalities so far.

#### **b. Enforcement and Activities**

Corresponding enforcement of legislation and actions are taken by different institutions belonging to the National Government. The most important institutions regarding sanitation are CORPOSANA – The National Sanitation Works Corporation (Corporación de Obras Sanitarias de Nación), tied directly to the Ministry of the Interior and the SENASA – National Service of Environmental Sanitation (Servicio Nacional de Saneamiento Ambiental), belonging to the structure of the Social Welfare and Public Health Ministry.

CORPOSANA is responsible for water supply and sewerage to cities over 4,000 inhabitants, and SENASA takes care of the remaining smaller cities. Besides providing water, SENASA also cares about general sanitation and environmental control services for cities, regardless of their size.

On average, the coverage of potable water supply by means of public systems is 48.3% of all the urban population of the country, reaching 70% if we consider only Asunción and the Lambaré cities.<sup>2</sup>

<sup>1</sup>LEY No. 1294/87-"Organica Municipal"- Organizacion Paraguaia de Organizacion Municipal (OPACI), 1993

<sup>2</sup>Perfil de Salud del País – Ministerio de Salud Publica y Bienestar Social y Organizacion Panamericana de la Salud, 1992. (MIMEO)

Concerning sewerage, only six cities in the country have this waste water collection and disposal system, three of them in the study area, Asuncion, Luque and San Lorenzo. For all the other cities and the rural area, the most common excreta disposal method is the dry pit, which represents a high sanitary risk.

River pollution is due primarily by domestic sewage and by effluent from agricultural industries such as sugar and alcohol refineries, tanneries, vegetable oil and meat processing industries. Mercury contamination in the Paraguay river due to gold mining in its Brazilian stretch should also be mentioned.

Air pollution and soil pollution are not reported as serious problems, although there are some emissions from selected agro-industries and pesticides which might represent a potential menace, since there is not much control in the country so far.

Environmental impacts due to economic development projects are found only in the case of the building of hydroelectrical dams, as in the case of the Itaipú and Yaciretá dams.

The municipal role on sanitation and environmental matters, so far, is limited to provision of public health centers, solid waste management, parks and gardens management and to public spaces disinfection, restaurants and food dispensers control and care about some zoonosis, like canine rabies.

### **A.3.5 Employment**

The employment situation in Paraguay reflects the economic crisis leading to a recession that plagues, since the last decade, most of the countries of the latin american region. This circumstance has affected the labor market negatively and the social conditions of these countries. In Paraguay, for instance, the total unemployment, affecting the economically active population reaches, 8.6 %.

It should also be stressed, that the age group most affected by the lack of jobs are the young (16.1% for 15 to 19 years old), and besides the unemployment there is also an underemployment problem, estimated as 20.7% for the Asuncion Metropolitan Area.<sup>3</sup> This phenomena derives from the fact that Paraguay has a very homogenous economy, relying heavily in the rural cattle and agricultural sectors to generate employment. Thus, two thirds of the labor force belongs to low

<sup>3</sup>del Cid, Miguel - Situacion del Empleo e Ingressos en el Paraguay, Facultad de Ciencias Economicas, Administrativas y Contables de la Universidad Nacional de Asuncion, 1993

income and low productivity activities, with a high level of underutilization of its work force. This represents a high level of underemployment, rather more significant in the rural areas.

Concerning income distribution, the Paraguayan situation is about the same as its neighboring countries: the country shows a high concentration of personal income, where 10% of the wealthiest families receives 42% of all earnings, the poorest 10% earn only 1% of the national income. As a result, 30 to 60% of the families, depending of the estimation criteria, figures below the absolute poverty line.<sup>4</sup>

## **A.4 Population**

The population information presented in this Section were obtained from the national statistics data from Statistics, Survey and Census General Bureau (Dirección General de Estadísticas, Encuestas y Censos -DGEEC) under the Technical Secretariat of Planning.

### **A.4.1 Present Population**

The area of Paraguay is 406,752 km<sup>2</sup>, which is administratively divided into 19 departments.

The population census of Paraguay has been conducted every 10 years since 1962, and the population was 1.819 million in 1962, 2.358 million in 1972 and 3.030 in 1982. The population in 1992 was 4.123 million according to the Dirección Nacional de Estadísticas, Encuestas y Censos (DGEEC).

Like other developing countries, Paraguay went through a period of high population growth (1962-1972) where an annual growth rate of 2.63 was observed. This growth rate increased to 3.13 % between 1982-1992, and still continues to do so. Table A.4.1a shows the population every 10 years since 1962 and average annual growth rates.

The population in 1992 was estimated at 4,123,550, resulting in a density of 10.1 persons per km<sup>2</sup>. However, the geographic population distribution is extremely uneven as eastern Paraguay accounts for 39 percent of the land area and over 95

<sup>4</sup>Sauma, P. - La distribución del ingreso en Paraguay, Facultad de Ciencias Económicas, administrativas y Contables de la Universidad Nacional de Asunción.



percent of the total population, while western Paraguay accounts for 61 percent of the land but less than 5 percent of the total population.

As for population by region, the Central Region is noted to have had a growth rate of 4.82.% (1972-1982) mainly due to increase in migrants from rural areas. This rate was observed to have gradually increased to 5.7 % in 1982-1992 due to increase in number of migrants, which probably resulted from the sub-urban settlements around the Metropolitan Area of Asunción. These suburban settlements are the most rapidly growing areas in the country, not only in population but also in capital investment and employment. Furthermore, regional demographic trends and the major differences in urban and rural incomes indicate that migration towards urban areas is likely to continue in the future and probably accelerate.

#### **a. Population of the Study Area**

Table A.4.1a shows the total population and the annual growth rate by districts.

According to this table, the population in the Study Area rose from 483,508 in 1962 to 1,292,423 in 1992, increasing about 1.4 times every ten years. The Study Area accounted for 31.34 % of the country's total population, and during the 1982-1992 period, the population growth rate was 3.70 % per annum.

As for population by districts, the population of the Highly Urbanized Area in 1992 was 597,775, which is about 46.25 % of the total Study Area population with an average growth of 1.37 % during 1982-1992 period. The population of Asuncion and F.Mora were 502,426 and 95,349 persons and their percentage coverage 38.86% and 7.83%, respectively.

Among the fifteen (15) municipalities in the Study Area, during the period between 1982-1992, four cities Ñemby, Mariano R. Alonso, Villa Elisa and Limpio showed high annual growth rates of 12.43 %, 10.42 %, 9.53 % and 8.28 %, respectively.

The population growth in the suburban areas of the Metropolitan Area of Asunción, is influenced by the increase in the number of migrants from rural areas.

The population density in 1992 was estimated at an average of only 10.1 persons per square kilometer in the whole country and 805 persons per square kilometer in the Study Area (municipal area).

In the same year, Fernando de la Mora was the most densely populated municipality (4,767 persons per square kilometer) within the Study Area. It is followed by

Asunción, Lambaré and San Lorenzo, which showed comparatively high average population densities of 4,294, 4,166 and 3,032 persons per square kilometer respectively, with the lowest densities shown in Villa Hayes (59 persons) and Benjamin Aceval (44 persons). The urban-rural population, household and density by district is shown in Table A.4.2a.

#### **b. Urban Area Population**

As a result of the field survey, the 15 municipalities in the Study Area are classified into the following three categories :

- Highly Urbanized Municipalities : Asunción and Fernando de la Mora
- Urbanized Municipalities : Lambaré, San Lorenzo, Capiatá, Luque, Mariano Roque Alonso and Villa Elisa
- Less Urbanized Municipalities: Ñemby, J. A. Saldívar, Itá, Areguá, Limpio, Villa Hayes and Benjamín Aceval

Table A.4.1b shows the urban area population and the annual growth rates.

The population of the urban area within the Study Area rose from 403,925 in 1962 to 1,163,595 in 1992, increasing 1.42 times every ten years.

##### **ba. HUM (Highly Urbanized Municipalities)**

As mentioned in Section A.4.1 (a. Total Population by Districts), the urban area population of the H.U.M. comprising Asunción and Fernando de la Mora coincide with the population by district because all the district area is considered as an urbanized area.

The population of H.U.M. rose from 303,401 in 1962 to 597,775 in 1992, increasing 1.26 times every ten years, and cover 51.37 % of the total urban area population.

##### **bb. UM (Urbanized Municipalities)**

The urban population of all UM (Lambaré, San Lorenzo, Capiatá, Mariano R. Alonso and Villa Elisa) conform with the total population by municipalities, except Luque, which is divided into urban and rural areas, and only the urban area is considered for the Study.

Among the (6) municipalities, three (Luque, Mariano R. Alonso and Villa Elisa)

showed high growth rates of 13.04 %, 10.42 % and 9.53 %, in the period 1982–1992 respectively, and the least growth was observed in Lambaré.

The population of U.M. rose from 80,151 in 1962 to 471,518 in 1992, increasing 1.81 times every ten years. 40.52 % of the total urban area population is covered by the U.M.

Of the municipalities comprising the U.M., the most densely populated areas were Lambaré (4,166), San Lorenzo (3,032) and Villa Elisa (1,662) as shown in Table A.4.1d.

#### **bc. LUM (Less Urbanized Municipalities)**

All the municipalities of the L.U.M. have both urban and rural areas. And as mentioned above, only urban areas are considered for the Study.

In 1992, the most populated areas within the L.U.M. were Ñemby and Limpio (27,234 and 26,396 respectively). The least populated area was Benjamín Aceval with only 6,203 inhabitants.

Among these (7) municipalities, only Ñemby showed a high population growth rate (8.55 %) in the 1982–1992 period. The others (J.A. Saldívar, Itá, Areguá, Limpio, Villa Hayes and Benjamín Aceval) vary between 2 % and 5 %.

The population of L.U.M. rose from 20,373 in 1962 to 94,302 in 1992, increasing 1.7 times every ten years, and cover only 8.10 % of the total urban area population.

Of the municipalities comprising the L.U.M., the most densely populated areas were Villa Hayes (3,948), Limpio (1,320) and Benjamín Aceval (1,034), and the least Ñemby (648) as shown in Table A.4.2b.

Details of the population density by districts are shown in Figure A.4.1a, and urban population growth of every municipality in the Study Area are shown in Figures, H.1.2a, 2b, 2c and 2d (refer Section H.1.2).

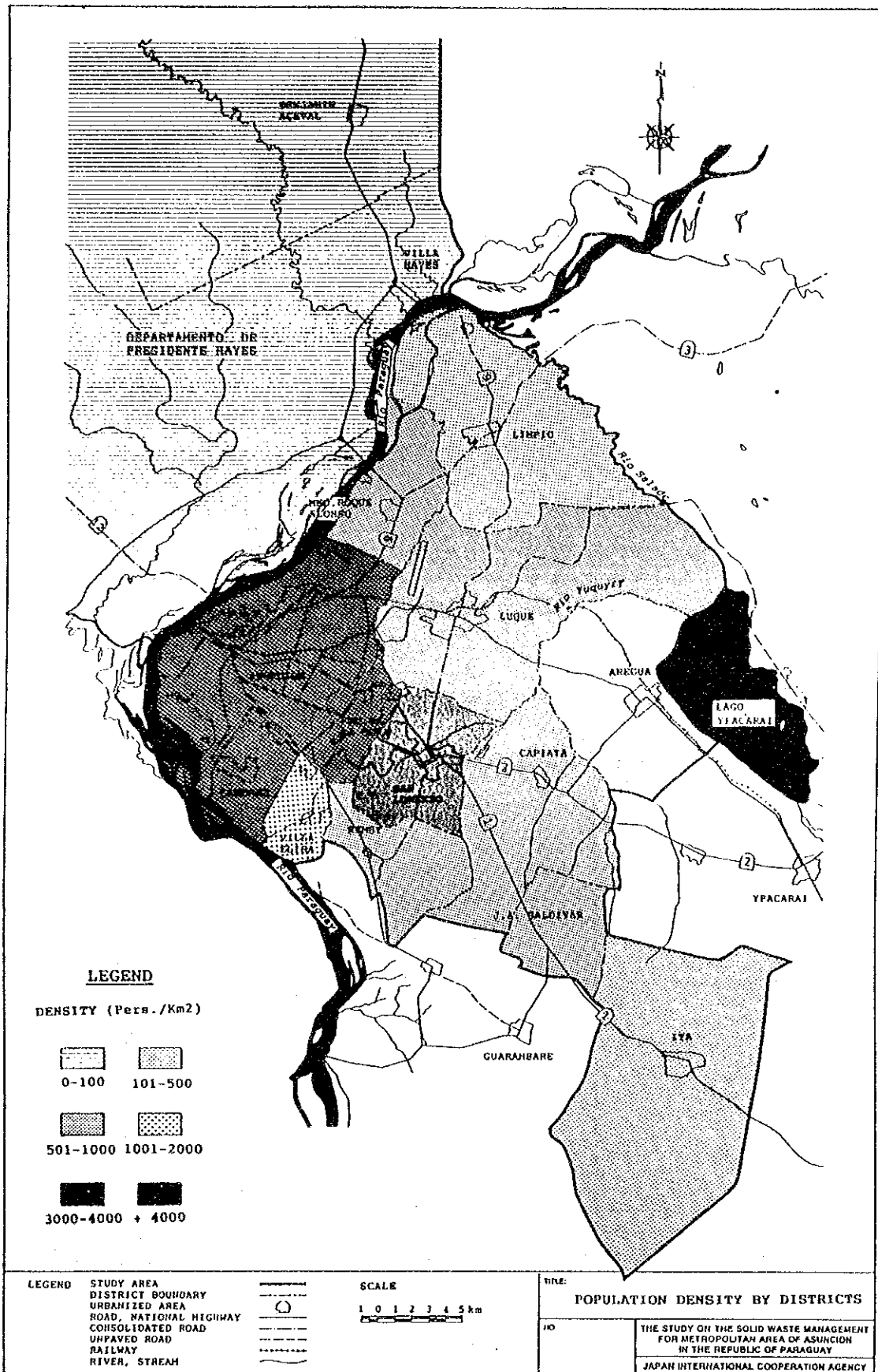


Table A.4.1a Total Population and Growth rate by Municipalities : 1962, 1972, 1982,1992

District/ Municipality	Population				Average Annual Growth Rate (%)		
	1962	1972	1982	1992	1962- 1972	1972- 1982	1982- 1992
<b>Country</b>	1,819,103	2,357,955	3,029,830	4,123,550	2.63	2.54	3.13
<b>HUM</b>							
Asuncion	288,882	388,958	454,881	502,426	3.02	1.58	1.00
F. Mora	14,519	36,892	66,810	95,349	9.77	6.12	3.62
Subtotal	303,401	425,850	521,691	597,775	3.45	2.05	1.37
<b>UM</b>							
Lambare	20,778	31,732	67,168	99,990	4.33	7.79	4.06
San Lorenzo	18,573	36,811	74,552	133,405	7.08	7.31	5.99
Capiata	20,892	26,417	45,716	83,898	2.37	5.64	6.26
Luque	30,834	40,677	64,288	116,304	2.81	4.68	6.11
M.R. Alonso	5,686	7,388	14,636	39,422	2.65	7.08	10.42
Villa Elisa	3,214	4,774	12,038	29,918	4.04	9.69	9.53
Subtotal	99,977	147,799	278,398	502,937	3.99	6.54	6.09
<b>LUM</b>							
Nemby	5,984	6,899	12,014	38,766	1.43	5.70	12.43
J.A. Saldivar	-	-	-	20,992	-	-	-
Ita	23,863	25,201	28,457	36,900	0.55	1.22	2.63
Aregua	10,287	11,202	14,558	24,900	0.86	2.66	5.51
Limpio	10,126	12,767	16,036	35,525	2.34	2.31	8.28
Villa Hayes	23,457	31,656	19,929	23,533	3.04	-4.52	1.68
Benjamin Aceval	6,413	6,783	7,429	11,095	0.56	0.91	4.09
Subtotal	80,130	94,508	98,423	191,711	1.66	0.41	6.89
<b>Total</b>	483,508	668,157	898,512	1,292,423	3.29	3.01	3.70

Source: Direccion General de Estadística, Encuestas y Censos. Secretaria Técnica de Planificación

Table A.4.1b Urban Area Population and Growth Rate : 1962, 1972, 1982, 1992.

Municipality/ Urban Area	Population				Average Annual Growth Rate (%)		
	1962	1972	1982	1992	1962- 1972	1972- 1982	1982- 1992
<b>HUM</b>							
Asuncion	288,882	388,958	454,881	502,426	3.02	1.58	1.00
F. Mora	14,519	36,892	66,810	95,349	9.77	6.12	3.62
Subtotal	303,401	425,850	521,691	597,775	3.45	2.05	1.37
<b>UM</b>							
Lambare	20,778	31,732	67,168	99,990	4.33	7.79	4.06
San Lorenzo	18,573	36,811	74,552	133,405	7.08	7.31	5.99
Capiata	20,892	26,417	45,716	83,898	2.37	5.64	6.26
Luque	11,008	13,921	24,917	84,885	2.38	5.99	13.04
M.R. Alonso	5,686	7,388	14,636	39,422	2.65	7.08	10.42
Villa Elisa	3,214	4,774	12,038	29,918	3.97	9.76	9.53
Subtotal	80,151	121,013	239,027	471,518	4.21	7.04	7.03
<b>LUM</b>							
Nemby	796	861	11,994	27,234	0.79	30.14	8.55
J.A. Saldivar	-	-	-	2,016	-	-	-
Ita	6,265	7,069	9,311	14,275	1.21	2.79	4.37
Aregua	3,699	3,916	5,177	6,335	0.57	2.83	2.04
Limpio	1,438	2,232	16,036	26,396	4.49	21.80	5.11
Villa Hayes	4,712	4,795	7,420	11,843	0.17	4.46	4.79
Benjamin Aceval	3,463	2,881	3,935	6,203	-1.82	3.17	4.66
Subtotal	20,373	21,754	53,873	94,302	0.66	9.49	5.76
<b>Total :</b>	403,925	568,617	814,591	1,163,595	3.48	3.66	3.63

Source: Direccion General de Estadística, Encuestas y Censos. Secretaria Técnica de Planificación

- The following Municipalities were considered as populated districts:  
1962: (F. Mora, Lambare, San Lorenzo, Capiata, M.R. Alonso and Villa Elisa)  
1972: (Capiata, M.R. Alonso, and Villa Elisa);  
1982: (Capiata and M. R. Alonso)
- \*\* Estimated urban population (Nemby and Limpio)

# ASUNCION & FERNANDO DE LA MORA

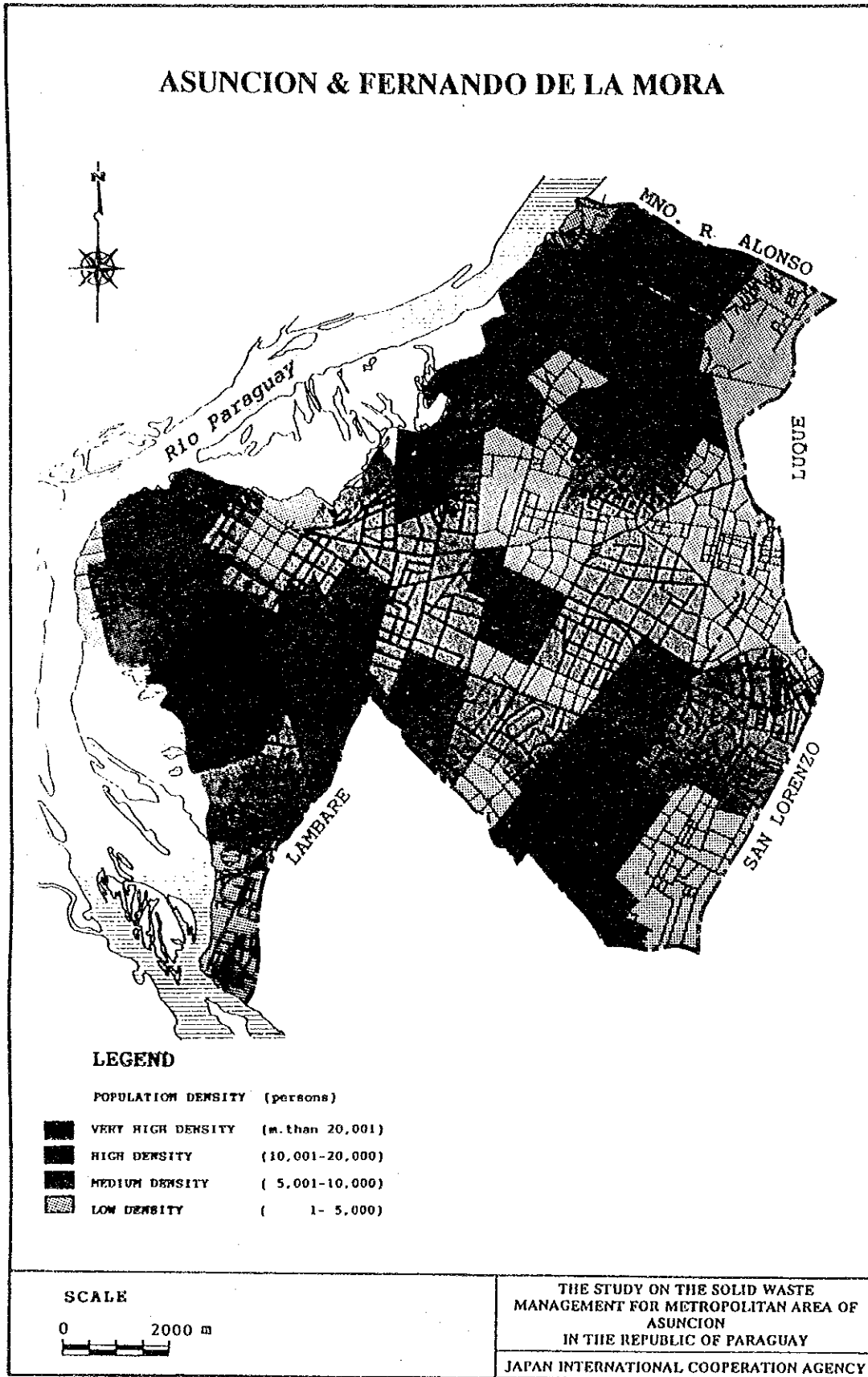


Figure A.4.1b Population Density of HUM

## A.4.2 Household

According to the statistical data of the Direccion General de Estadisticas, Encuestas y Censos (DGEEC), Paraguay had about 868,284 households in 1992 with 4.7 persons per household on average; in the Study Area the number of households has reached 280,456 households (32.30 % of the nation) with 4.6 persons per household.

As of 1992, the bulk of the population in the Study Area is concentrated in H.U.M., where about 111,972 households reside in Asunción and 20,884 in Fernando de la Mora, with an average of 4.5 persons per household in Asunción and 4.6 persons Fernando de la Mora. The least number of households is found in Benjamín Aceval, where there are only 2,234.

Total households within the Study Area are distributed as follows: 47.37 % for HUM, 38.14 % for UM and 14.49 % for L.U.M. as shown in table A.4.2a.

Table A.4.2a Urban – Rural Population, Household, Density by Municipality (1992)

Item/ Municipality	Area (km <sup>2</sup> ) (*)	Population			Density (p/km <sup>2</sup> )	Total Hhold	Pers/Hh- old.
		Urban	Rural	Total			
<b>HUM</b>							
1. Asuncion	117	502,426	0	502,426	4,294	111,972	4.487
2. F. Mora	20	95,349	0	95,349	4,767	20,884	4.566
Sub-Total	137	597,775	0	597,775	4,363	132,856	4.499
<b>UM</b>							
3. Lambare	24	99,990	0	99,990	4,166	21,022	4.756
4. San Lorenzo	44	133,405	0	133,405	3,032	28,955	4.607
5. Capiata	89	83,898	0	83,898	943	17,921	4.682
6. Luque	150	84,885	31,419	116,304	775	24,323	4.782
7. M.R. Alonso	54	39,422	0	39,422	730	8,266	4.769
8. Villa Elisa	18	29,918	0	29,918	1,662	6,469	4.625
Sub-Total	379	471,518	31,419	502,937	1,327	106,956	4.702
<b>LUM</b>							
9. Nemby	42	27,234	11,532	38,766	923	8,258	4.694
10. J.A.	34	2,016	18,976	20,992	617	4,557	4.607
Saldivar	173	14,275	22,625	36,900	213	7,800	4.731
11. Ita	81	6,335	18,565	24,900	307	5,155	4.830
12. Aregua	108	26,396	9,129	35,525	329	7,817	4.545
13. Limpio	396	11,843	11,690	23,533	59	4,823	4.879
14. Villa Hayes	255	6,203	4,892	11,095	44	2,234	4.966
15. Benj. Aceval							
Sub-Total	1,089	94,302	97,409	191,711	176	40,644	4.717
Total	1,605	1,163,595	128,828	1,292,423	805	280,456	4.608

Source : Direccion General de Estadisticas, Encuestas y Censos (DGEEC)  
(\*) by the Study Team based on cadastral map

Table A.4.2b Urban Area Population, Household, Density (1992)

Items Municipalities	Urban Area (km <sup>2</sup> ) (*)	Urban popu- lation	Density (P/km <sup>2</sup> )	Urban Household	Pers/Hhold.
<b>HUM</b>					
1. Asuncion	117	502,426	4,294	111,972	4.487
2. F. Mora	20	95,349	4,767	20,884	4.566
Sub-Total	137	597,775	4,363	132,856	4.499
<b>UM</b>					
3. Lambaré	24	99,990	4,166	21,022	4.756
4. San Lorenzo	44	133,405	3,032	28,955	4.607
5. Capiatá	89	83,898	943	17,921	4.682
6. Luque	60	84,885	1,415	17,590	4.826
7. M.R Alonso	54	39,422	730	8,266	4.769
8. Villa Elisa	18	29,918	1,662	6,469	4.625
Sub-Total	289	471,518	1,632	100,223	4.705
<b>LUM</b>					
9. Nemby	42	27,234	648	5,894	4.621
10. J.A. Saldivar	4	2,016	504	440	4.582
11. Ita	20	14,275	714	3,071	4.648
12. Aregua	9	6,335	704	1,359	4.662
13. Limpio	20	26,396	1,320	5,796	4.554
14. Villa Hayes	3	11,843	3,948	4,823	2.456
15. Benj. Aceval	6	6,203	1,034	2,234	2.777
Sub-total	104	94,302	907	23,617	3.993
<b>Total</b>	<b>530</b>	<b>1,163,595</b>	<b>2,195</b>	<b>256,696</b>	<b>4.533</b>

Source : Dirección General de Estadísticas, Encuestas y Censos (DGEEC)  
 • By the Study Team based on cadastral map.

### A.4.3 Population Forecast

In the formulation of the study on the SWM and a physical development plan for the Metropolitan Area of Asunción, the most crucial factor is the population to which it applies. The following is the result of the analysis of the demographic features of the metropolitan area population over the past thirty years.

The population projections are used as basic data for development planning and estimation of future solid waste generation amount for the MSWM in the Metropolitan Area of Asunción.

The population projection was conducted based on the National Statistics Census data and the results of the field survey made by the Study Team.

The projections by Municipality within the Study Area are given in Table A.4.3a.

According to the Table, it is noted that the 1992 population of H.U.M. (Asunción and Fernando de la Mora), U.M. (Lambaré, San Lorenzo, Capiatá, Luque, Mariano



R. Alonso and Villa Elisa) and L.U.M. (Ñemby, J.A. Saldívar, Itá, Areguá, Limpio, Villa Hayes and Benjamín Aceval) represents 46.25 %, 38.92 % and 14.83 % respectively, of the total population. However, by the year 2006 the figure is expected to be reduced to 31.63 % for H.U.M., and increase for the rest of the districts to about 50.30 % and 18.07 % for U.M. and L.U.M. respectively.

According to Table A.4.1a, the population growth rate by municipalities reached 3.70 % in the 1982–1992 period. Based on the statistical data, the population growth rate is expected to slow down to 3.66 % during the 1992–2002 period. Given this growth rate, the population of the Study Area is expected to increase 1.68 times of the present population between 1992 and 2006, reaching a total population of 2,173,985 persons.

Table A.4.3a Population Projections of the Study Area (1992 – 2006)

No.	Population Municipality	Population			Average Annual Growth Rate %
		1992	2002	2006	1992–2002
	Country Total	4,123,550	5,595,745	6,322,554	3.10
	<b>HUM</b>				
1	Asuncion	502,426	544,098	561,720	0.80
2	F. Mora	95,349	116,230	125,811	2.00
	Subtotal	597,775	660,328	687,531	1.00
	<b>UM</b>				
3	Lambare	99,990	148,010	173,150	4.00
4	San Lorenzo	133,405	217,303	264,133	5.00
5	Capiata	83,898	150,249	189,685	6.00
6	Luque	116,304	208,283	262,952	6.00
7	M.R. Alonso	39,422	85,109	115,790	8.00
8	Villa Elisa	29,918	64,591	87,875	8.00
	Subtotal	502,937	873,543	1,093,586	5.68
	<b>LUM</b>				
9	Nemby	38,766	76,259	99,959	7.00
10	J.A.Saldivar	20,992	37,593	47,461	6.00
11	Ita	36,900	49,591	55,815	3.00
12	Aregua	24,900	44,592	56,297	6.00
13	Limpio	35,525	63,620	80,319	6.00
14	Villa Hayes	23,533	28,687	31,051	2.00
15	Benjamin Aceval	11,095	18,073	21,967	5.00
	Subtotal	191,711	318,414	392,869	5.20
	<b>Total</b>	<b>1,292,423</b>	<b>1,852,285</b>	<b>2,173,985</b>	<b>3.66</b>

Source: Projections made by the Study Team.

Projections for the period 2002–2006 were estimated using the 1992–2002 rates.

## **A.5 Urban Structure**

### **A.5.1 General**

The reference data is based on the review of existing data, field survey and observation carried out in different sectors during the first stage of the study.

The Metropolitan Area includes most of the cities and towns within a travel distance of 45 minutes from Asuncion, which have an intensive interaction of basic services and employment with the capital. The whole Study Area covers approximately 1,600 km<sup>2</sup>, and comprises the whole area under the jurisdiction of the Metropolitan Area of Asuncion but limited to the urbanized areas of municipalities, divided as follows:

<b>Highly Urbanized Municipalities</b>	: Asunción and Fernando de la Mora
<b>Urbanized Municipalities</b>	: Lambaré, San Lorenzo, Capiatá, Luque, M.R. Alonso and Villa Elisa
<b>Less Urbanized Municipalities</b>	: Nemby, J. A. Saldívar, Itá, Areguá, Limpio, Villa Hayes and B. Aceval

This division is shown in Figure A.5.1a.

Great differences are found among the 15 municipalities, such as population size, economic strength, employment opportunities, etc. Since the olden days, the demographic, social and economic leadership has been held by Asunción, which has never been overtaken by the other municipalities.

The fact that Asunción is at the center of the Metropolitan Area and strongly dominates other municipalities in the area, results in uneven population and economic distribution; 43.18% of the metropolitan urban population live in Asunción and the majority of the jobs are also to be found there, so that there is an even greater unequal distribution of economic factors due to the concentration of tertiary activities.

The Metropolitan Area is characterized by gradual and progressive urbanization leading to serious problems in rendering services such as sewerage, drainage, waste disposal and other related utilities.

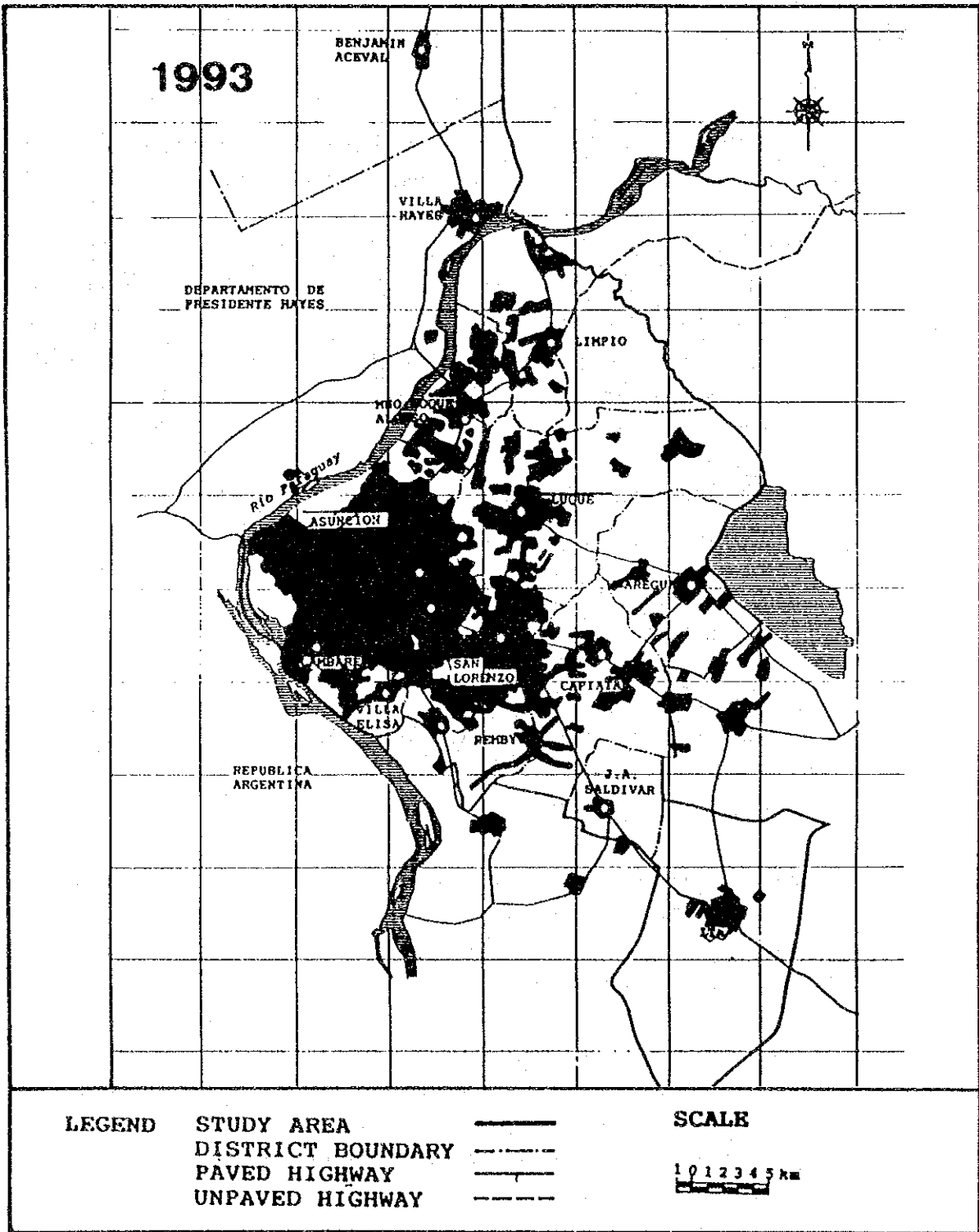


Figure A.5.1a Distribution of the Urbanized Areas

## **A.5.2 Land Use**

### **a. Regulations on Land Use**

Efficient land use is a vital instrument in guiding urban growth towards a healthy and aesthetically pleasing community. But land use planning and zoning is worthless in effecting a rational urban development unless backed up with a zoning ordinance.

The Municipalities of the Metropolitan Area continue to grow randomly towards the outskirts, due to the lack of the Master Plan or General Guidelines concerning global policies on urban development for Asunción and its Metropolitan Area. Many activities were located and grouped according to convenience or attracted by main roads.

Therefore, only sectorial and priority problems on existing or on going situations were regulated within the urban guidelines.

Within this scenario, bylaw decrees were created to regulate the development growth of Asunción, concerning zoning and land use, and building height.

The Regulator Plan made by the Municipality of Asunción in 1978, and with the objective to preserve and guide city development, divides the city and its influential area in zones according its uses: residential, industrial and commercial, based on the existing settlement trends. This criteria is reflected in the present proposal and actions of the government.

A tentative master plan (Development Guidelines for Asunción and its Metropolitan Area) was elaborated by the Municipality of Asunción in 1985, however the plan was never made official because of the opinion differences among the government staff.

According to the present Regulator Plan (Decree No. 19/1993) established by the municipality of Asunción, all of the municipal territory of Asunción is considered as an Urban Zone (UZ), and is classified as an Urban Zone or Programmed Urban Zone and Special Zone or Programmed Urbanizable Zone.

Regulations and definitions are presented in the above mentioned decree, however no objectives are formulated in the Plan.

In the Metropolitan Area of Asunción, the Asunción Urban Development Office and some vicinity municipalities (Lambaré, M.R. Alonso, etc.) are making specific plans on urban development, however, it is considered difficult for municipalities

in general, including the Municipality of Asunción, to realize the plans, because of the manpower shortage and other related issues.

#### **b. Present Land Use**

The land use presented here, shows the whole Study Area, special attention shall be paid to urbanized municipalities.

The present land use map (1993) was prepared based on aerial photographs, cartographical maps, cadastral maps and field survey carried-out by the Study Team. This map is shown in Figure A.5.2a.

The total land area of the Metropolitan Area (Study Area) is estimated at 1,605 km<sup>2</sup>, where 137 km<sup>2</sup> (8.54 %) correspond to H.U.M., 379 km<sup>2</sup> (23.61 %) to U.M. and 1,089 km<sup>2</sup> (67.85 %) to L.U.M.

The land area is classified into the following categories:

• Urban area:	340 km <sup>2</sup>
• Industrial area:	3 km <sup>2</sup>
• Cultivated area:	128 km <sup>2</sup>
• Pasture area:	559 km <sup>2</sup>
• Forest area:	255 km <sup>2</sup>
• Others (low lands and vacant areas):	320 km <sup>2</sup>

The urbanization of the Metropolitan Area of Asunción is influenced mostly by low rise buildings development.

High rised buildings, such as office buildings and condominiums are often found in the area around the central city (Micro-centro).

During the last 5 years, the number of housing settlements has increased considerably in the vicinity of Asunción (Capiatá, Luque, Areguá, etc.), responding to the low income population increase.

All areas of Asunción and Fernando de la Mora, and 80% to 90% of Lambaré and San Lorenzo, excluding the low-lying flooded area, are urbanized. And if the urban zones of Luque excluding the airport zone and the eastern part, M.R. Alonso, Villa Elisa excluding the petroleum refinery area and part of Capiatá is added, the urbanized areas will cover about 380 km<sup>2</sup>, comprising the defined Highly Urbanized and Urbanized Municipalities.

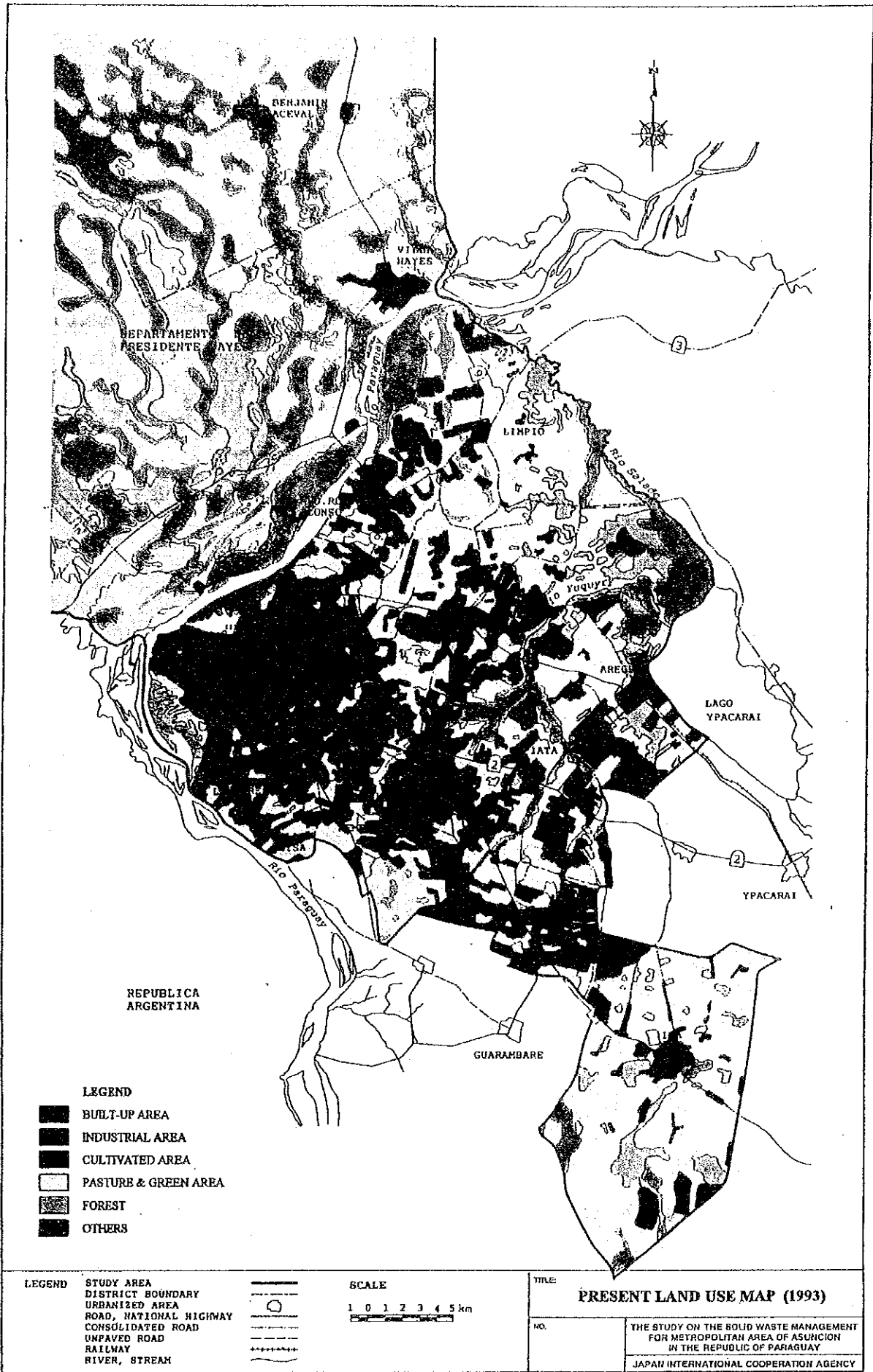


Figure A.5.2a Present Land Use Map

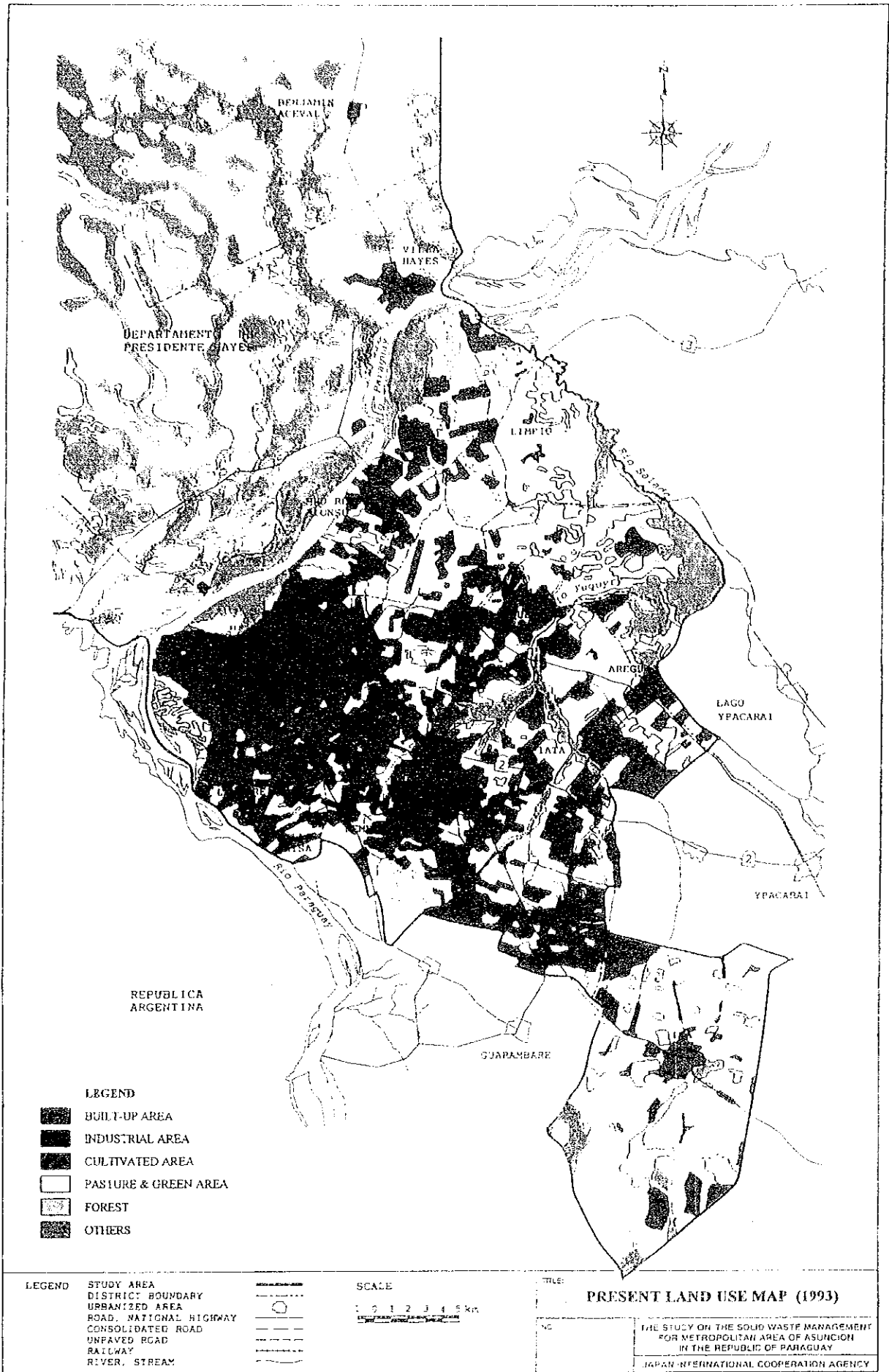


Figure A.5.2a Present Land Use Map

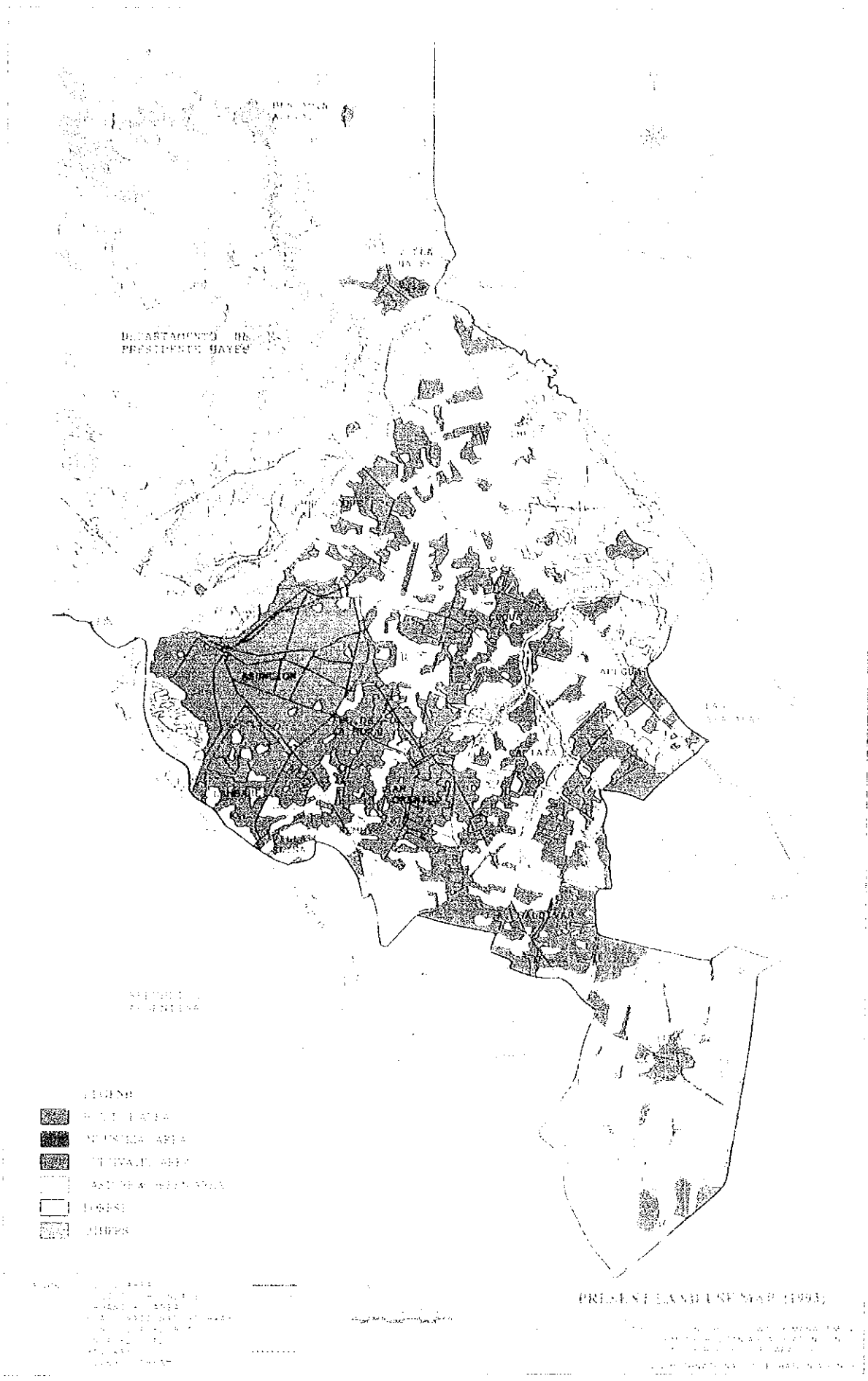


Figure A.5.2a Present Land Use Map





Capiatá was included among the Urbanized Municipalities, because the whole district area is considered urbanized, however as noted on the land use map, only half of its land can be classified as an urban municipality.

As is observed on the present land use map, the urban area category is dominant in the Highly Urbanized Municipalities, where 51.37% of the total population is concentrated, followed by the Urbanized Municipalities with 40.52% of the total urban area population.

In contrast, agricultural areas are the dominant categories among the Less Urbanized Municipalities.

Other categories consists of special areas and vacant areas. Special areas consists of flooded areas and low-lying coastal lands located at the north part of the Metropolitan Area in the Department of Villa Hayes (Chaco region) and along Paraguay, Salado, Yuquyry rivers, and many streams scattered in the Study Area.

These areas can be utilized as future sanitary land-fill sites and to use as recreational areas (parks, sports grounds such as soccer pitches), facilities construction site, etc.

Table A.5.2a Land Use Area

Municipality	Land Use Area (km <sup>2</sup> )										Urban Use (%) of Total Urban District				
	Build-up	Industrial (*)	Cultivated Land	Pasture/ Green	Forest	Others	Subtotal	Build-up	Industrial (*)	Cultivated Land		Pasture/ Green	Forest	Others	Subtotal
Asuncion	95.80	-	-	8.20	5.00	-	117.00	95.80	-	-	8.20	5.00	-	117.00	81.88
F.Mora	17.60	-	-	2.24	0.16	-	20.00	17.60	-	-	2.24	0.16	-	20.00	88.00
Subtotal	113.40	-	-	10.44	5.16	-	137.00	113.40	-	-	10.44	5.16	-	137.00	82.77
Lambare	19.00	-	-	4.00	1.00	-	24.00	19.00	-	-	4.00	1.00	-	24.00	79.17
San Lorenzo	34.00	-	0.50	7.30	1.40	0.80	44.00	34.00	-	0.50	7.30	1.40	0.80	44.00	71.27
Capiata	24.00	-	20.00	34.50	5.00	5.50	89.00	24.00	-	20.00	34.50	5.00	5.50	89.00	26.97
Luque	30.00	-	12.20	75.50	16.30	16.00	150.00	30.00	-	12.20	75.50	16.30	16.00	150.00	20.00
M.R.Alonso	18.00	-	-	33.00	0.30	2.70	54.00	18.00	-	-	33.00	0.30	2.70	54.00	33.33
Villa Elisa	12.30	0.64	0.21	4.20	0.65	-	18.00	12.30	0.64	0.21	4.20	0.65	-	18.00	68.33
Subtotal	137.30	0.64	32.91	158.50	24.65	25.00	379.00	137.30	0.64	32.91	158.50	24.65	25.00	379.00	36.23
Nemby	12.00	-	4.00	23.80	2.20	-	42.00	12.00	-	4.00	23.80	2.20	-	42.00	28.57
J.A.Saldivar	4.00	-	15.50	12.30	2.20	-	34.00	4.00	-	15.50	12.30	2.20	-	34.00	11.76
Ita	12.50	-	12.00	122.80	17.50	8.20	173.00	12.50	-	12.00	122.80	17.50	8.20	173.00	7.23
Aregua	10.00	-	18.00	36.10	10.10	6.80	81.00	10.00	-	18.00	36.10	10.10	6.80	81.00	12.35
Limpio	13.00	-	-	68.00	10.00	17.00	108.00	13.00	-	-	68.00	10.00	17.00	108.00	12.04
Villa Hayes	7.50	1.40	-	110.00	120.60	156.50	396.00	7.50	1.40	-	110.00	120.60	156.50	396.00	1.89
Benjamin Aceval	2.40	-	-	149.00	18.60	85.00	255.00	2.40	-	-	149.00	18.60	85.00	255.00	0.94
Subtotal	61.40	1.04	49.50	522.00	181.20	273.50	1089.00	61.40	1.04	49.50	522.00	181.20	273.50	1089.00	5.64
Total	312.10	2.04	82.41	690.94	211.01	298.50	1605.00	312.10	2.04	82.41	690.94	211.01	298.50	1605.00	19.45

Source : Study Team  
 (\*) Only large industries were considered

### **c. Estimation of the Future Urban Land Use according the Trends**

The future land use in the Highly Urbanized Municipalities may have no major changes from the present one. The only change could be the expansion of the commercial area toward the southeast, especially areas surrounded by Eusebio Ayala and Fernando de la Mora avenues.

As mentioned in Section A.4.1, the population growth in the Urbanized Municipality areas was influenced by the increase in the number of migrants from rural areas. Also, the proximity to Asunción, land availability, average land cost, housing settlements for low income residents carried-out by the National Housing Council (CONAVI) has contributed to its growth. Therefore, agricultural lands may be changed into urban areas to receive the future growth.

The future land use in the Less Urbanized Municipalities as in the H.U.M., may have no major changes, except its possible expansion toward the existing urban periphery.

### **A.5.3 Housing**

Housing, according to the 1982 census (census of 1992 was not available), were mostly (96%) independent units, multi-family units such as apartments accounting for only around 4%. Nearly half of houses have brick walls, while 30 % have board walls. Roofing materials consist of roof tiles (urban areas) and straw (rural areas). Earth floors are most prevalent in rural areas of the L.U.M., followed by terrazzo floors and tiled floors.

Within the Study Area, 51.76% of houses are located in H.U.M. areas, 39.04% in U.M. areas and only 9.20% in L.U.M areas. The average number of rooms per house is 2.9 for the whole country, 3.6 for urban areas and 2.3 for rural areas. There are 4.6 persons per house on average, yielding 1.7 persons per room. The most frequent housing situation consists of 4 persons living in a two-room house in densely populated and in rural areas.

Adjustment towards significantly reducing deficiencies and improving unsatisfactory housing conditions in the metropolitan area, particularly in the depressed areas, workable strategies shall be explored to stimulate the participation of the private sector. Increased local government participation in the upgrading of slums shall be encouraged.

#### **A.5.4 Infrastructure**

##### **a. Transportation**

##### **aa. Road Network**

The transportation network in Paraguay is characterized by paved, unpaved (rubble or crushed stone) and consolidated roads. The national road networks are administered by the Ministry of Public Works and Communications (MOPC), however the periphery of Asunción is under the responsibility of the Municipality of Asunción.

In the Study Area the major road network is as shown in Figure A.5.4a. The major roads connecting Asunción to different directions within the study area are :

- National road 1, to the southeast
- National road 2, to the east
- National road 9, to the north

The need for a much improved transportation system, introduction of computer-operated traffic control, improvement of existing roads and bus transport operation and port facilities shall be pursued. New ring roads to induce development in the metropolitan areas must be considered.

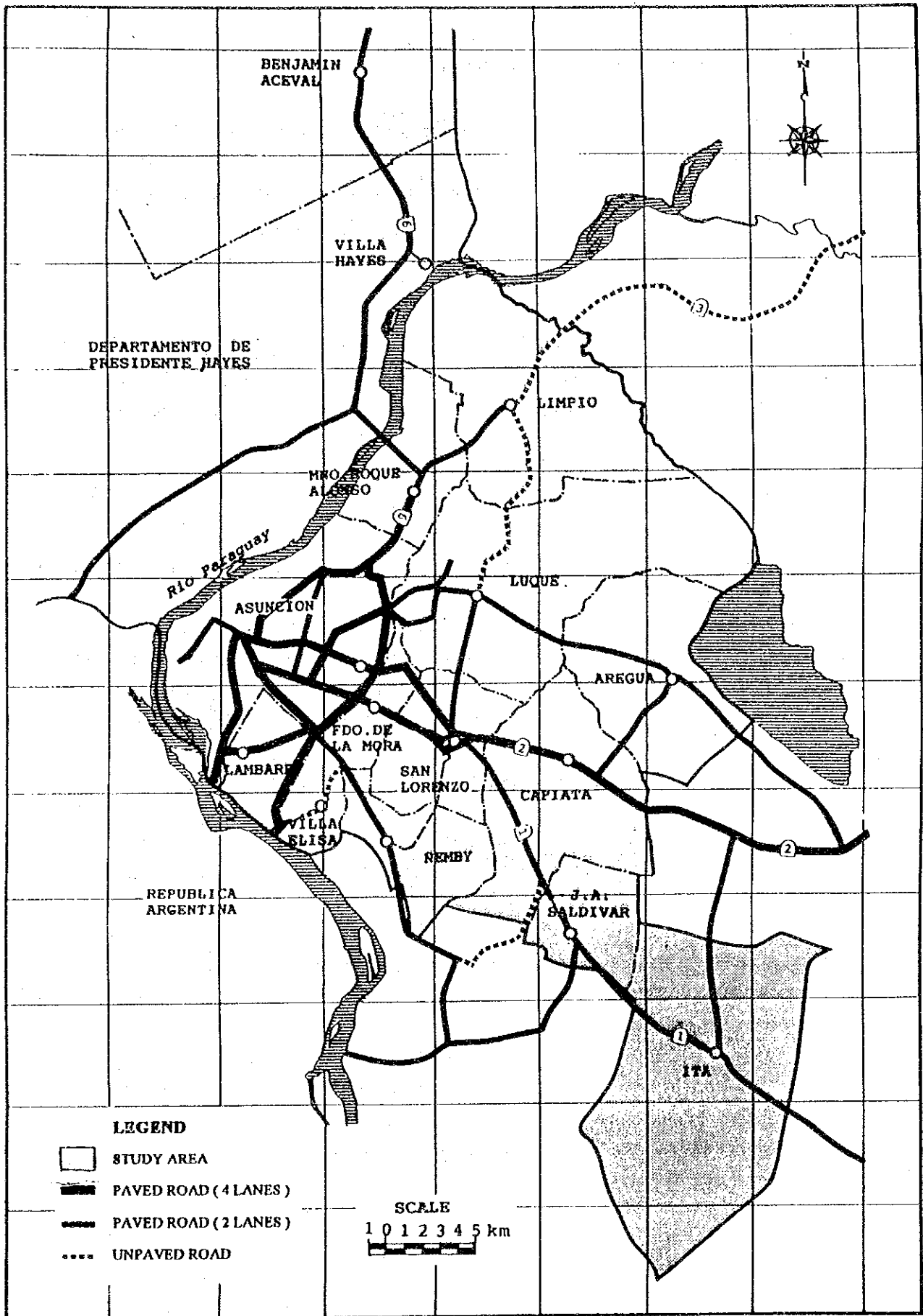


Figure A.5.4a Road Network

**ab. Inland Water Transportation**

The Paraguayan history and especially of Asunción, are deeply related to the Paraguay river.

At present, although the road transportation was intensified considerably, the river keeps its importance as commercial transportation and a way of communication.

**ac. Railway**

Rail transport administered by the Ministry of Public Works and Communications, is less consolidated than the road network, and the operation length of the Central Railway is 372 km covering the distance from Asunción to Encarnación.

**b. Water Supply and Sewage System**

Two specialized agencies take responsibility for specific areas in the water supply:

CORPOSANA took responsibility over Asunción, Fernando de la Mora, Lambaré, San Lorenzo, Luque and M.R. Alonso. The rest of the municipalities are under the responsibility of SENASA, except Itá, which is supplied by private enterprises. Many municipalities, in addition to the government agencies are also served by private enterprises.

The public water supply system serve about 55% of houses, while wells and springs are water sources for 45%.

It is essential that the development of water supply for the metropolitan area coincides with the pattern of urbanization not only to meet needs but also to affect a good match with the demand.

The sewage system is partially served only in Asunción, Lambaré, San Lorenzo and Luque by CORPOSANA. The rest of the municipalities discharges its waste water into septic tanks and wells.

Only 15% of houses are connected to the public sewage system.

To bring the areas a wastewater disposal system to a satisfactory level, the existing sewer in Asunción and vicinity municipalities must be improved as well as sanitation conditions in densely populated areas.

Table A.5.4a Situation of Infrastructure Service in the Municipalities

Municipality	Drinking Water	Sewerage	Solid Waste Collection	Street Sweep- ing	Solid Waste Disposal
Asuncion	CORPSANA	CORP.part (2)	Municipal	Municipal	Municipal
F.Mora	CORP/Priv	No service	Private	Munici/part(3)	Contracted
Lambare	CORPSANA	CORP.part (2)	Municipal	Munici/part(3)	Municipal
San Lorenzo	CORPSANA	CORP.part (2)	Municipal	Munici/part(3)	Municipal
Capiata	SENASA	No service	Municipal	No service	Municipal
Luque	CORP/Priv	CORP.part (2)	Private	No service	Private
M.R.Alonso	CORP/Priv	No service	Municipal	No service	Municipal
Villa Elisa	SENA/Priv	No service	Private	No service	Municipal
Nemby	SENA/Priv	No service	Private	No service	Municipal
J.A.Saldivar	SENA/Priv.wells	No service	No service	No service	No service
Ita	Private/wells	No service	Municipal	No service	Municipal
Aregua	SENA/Priv	No service	No service	Munici/part	No service
Limpio	SENA/wells	No service	Private	Munici/part	Private
Villa Hayes	CORP/SENA	No service	Private	No service	Private
Benjamin Aceval	SENASA	No service	No service	No service	No service

- (1) Priv - Private artesan well supplier  
 (2) CORP/Part - CORPSANA, only part of the city  
 (3) Munici/Part - By the municipality, only part of the city

## A.5.5 Urban Development

### a. Evolution of the MAA (Metropolitan Area of Asuncion)

Asunción, the capital of Paraguay, is the seat of administrative government, center of commerce and trade, port, service, economic and cultural activities, and lie at the East shore of the Paraguay River.

The geographical spread of the metropolis has increased from the Paraguay riverside "micro-centro" in the northwestern part of the MAA with a population of about 110,000 in 1930 and 126,000 in 1950. From the above figures, it can be noticed that the MAA and its vicinity has expanded both in area and population along the main routes, especially to the east and southeastern corridors.

In 1992, MAA covered a total area of about 1,600 km, with an urban area of about 530 km<sup>2</sup> or 33.1 % of the total area and a population of 1.29 million or 31.3 % of the total population of Paraguay.

The present city structure of Asunción has increased from the "micro-centro" to the southeast corridor, along Mariscal López Avenue, Eusebio Ayala Avenue and Fernando de la Mora Avenue, taking a fan shape development, as shown in Figure A.5.5a.



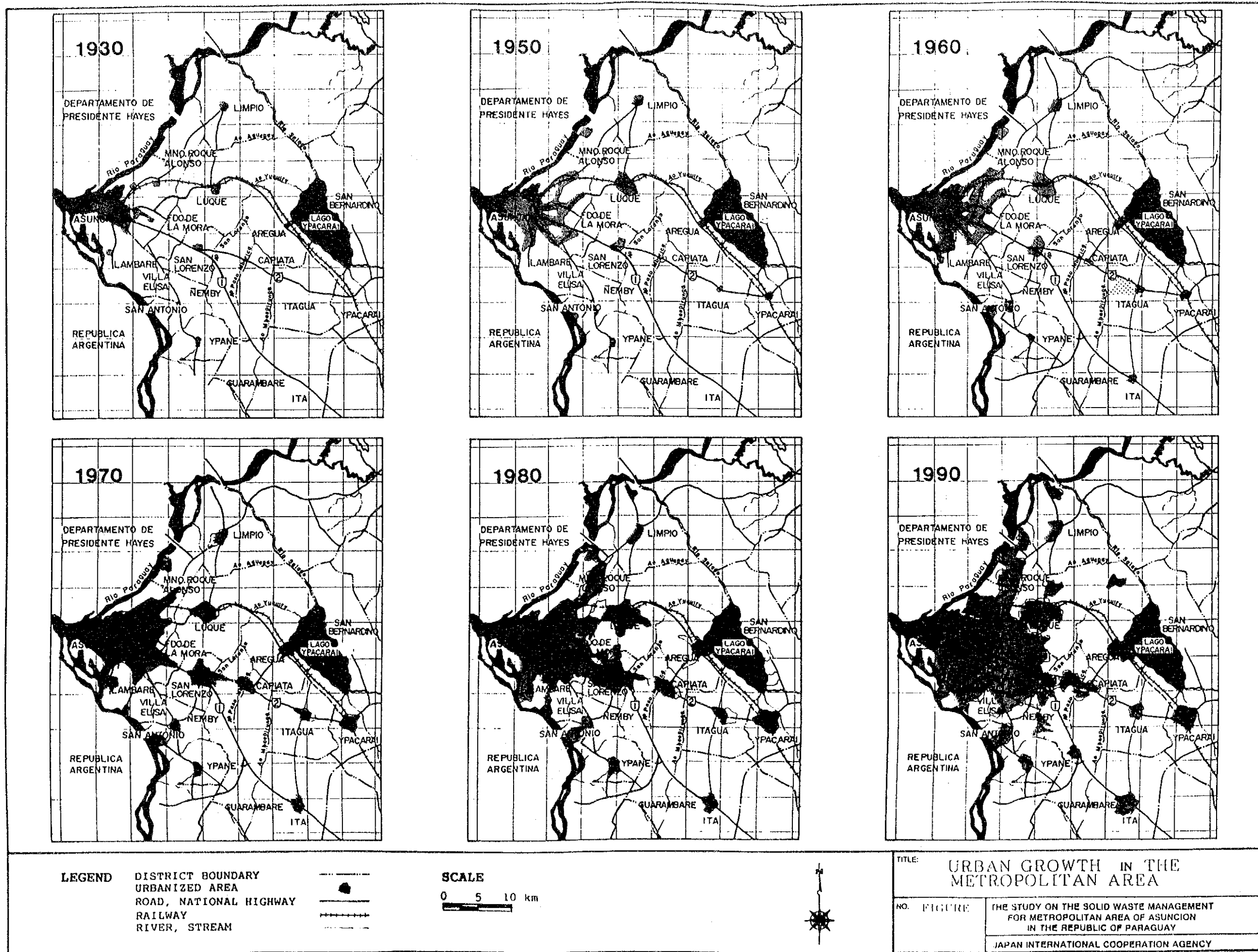


Figure A.5.5a Urban Growth of the Metropolitan Area



## **b. Urbanization Trend of the MAA**

Asunción's small area (71.100 Ha), rapid population growth, high cost of the land and shortage and high demand of properties led to development of co-urban areas around the capital.

The urbanization of the MAA is influenced by housing development, commerce, administration and increasing number of slum locations around the suburban areas and along the riverside of Paraguay river where no upper class residential area is located.

The residential areas of the surrounding districts such as Lambaré, Fernando de la Mora and San Lorenzo started in the 1960s, and at present are almost urbanized. From these, the most integrated districts were Lambaré and Fernando de la Mora. This integration tends to continue to San Lorenzo and Luque. The integration of these districts to Asunción may form the future Greater Asunción metropolitan area.

Upper class residential areas can be found 3 to 5 km from the "micro-centro" towards the south-east corridor, between Generalísimo Franco - General Genes Avenue and Mariscal López Avenue, around Zamora town.

Also middle and upper class residential areas are located at the south corridor, in the Lambare district, 6 to 7 km from the "micro-centro" of Asunción.

From the olden days, the micro-centro of Asunción was the major commercial center, however, the present trend indicates a continuous increase towards the south-east corridor along major transport routes like Pettrossi and Eusebio Ayala Avenue, where highly intensive commercial activities can be found. This trend toward the periphery of Asunción involving Fernando de la Mora, Lambaré, San Lorenzo, part of M.R. Alonso districts may be connected up to the year 2006 (refer to Figure A.5.5b).

In Asunción city, small industrial establishments are collocated. However, since 1976 the industrial development within the city was regulated under Decree no. 25,029/76, therefore, establishment of diversified industries were banned within a 20 km radius of Asunción, especially along the coastal and watershed areas.

Since the promulgation of law 550 in 1975, the encouragement of the promotions and investments in new industrial establishments outside the urban core, and the difference in cost of land prices between the urban lands and the surrounding areas has caused many factories to abandon its narrow lands in the city to establish in areas more suitable and cheaper for industrial development outside the urban areas.



The government objective of industrial decentralization not only encouraged the industrial sector but facilities like the central market, bus terminal, new city hall, were established outside the urban core.

#### **c. Review of Previous Reports**

Previous reports were reviewed in order to evaluate urban development conditions in the metropolitan area.

Since 1981, the Municipality of Asunción, with its aim of metropolitan integration, has worked on urban development plan for Asunción and its metropolitan area, laying down substantial objectives for the present and future development of the city within the calculated restriction of a physical and economic nature.

In this sense, the first study "Basis for the Implementation of the Development Plan in the Metropolitan Area of Asunción (1981)" was conducted by the Municipality of Asunción with the cooperation of the Interamerican Development Bank (BID). This study presents basic information on metropolitan area development, which constitute the first link for the arrangement and development of the metropolitan region. The preliminary proposals for the development of the metropolitan area were based on the results of this study.

In the second part of the study, "Project on Municipal Plan for Asunción (1984)", basic guidelines were established for the development of Asunción and its metropolitan area, and for specific sectoral projects.

#### **d. Proposed Study and Specific Projects**

The development plan for Asunción and its metropolitan area, as a desired territorial development and based on the mentioned studies, proposes programmed studies and specific projects of metropolitan, regional and/or national nature within the metropolitan area environment.

In the study, the following are proposed as the contents of the plans:

##### **- Loading Terminal**

To concentrate the products and goods coming from the different regions and its redistribution by land, air or water, a loading terminal at the north-east zone of the Paraguay river, in the Municipality of Asunción, was planned.

**- Port Terminal**

To provide a terminal at the western side of Remanso Bridge (Chaco) in order to cope with the transport of import-export goods from neighboring countries at the Transchaco route.

**- North and West Coastal Roads**

To create an alternative access and interconnect similar activity areas (loading terminal, fish market, other ports) to Asunción City.

The proposed sites for construction of these roads are the Paraguay river coastal zones from Remanso Bridge in the north to San Antonio- Ypane intersection route.

**- Interconnecting and Inner Municipal Roads**

Construction and improvement of municipal interconnecting roads and improvement of municipal inner roads.

**- Public Transportation**

Improvement of public transportation according to the urban needs is planned.

**- Living Conditions**

To establish a balanced population distribution through local Regulation Plans according to the proposed urban structure.

To promote sectoral studies of slum areas, and organize the marginal areas and housing shortage problems, and provide housing program with social benefits.

**- Metropolitan Services**

Improvement and/or relocation of the following services were considered:

- . Cemeteries
- . Parks and spa areas
- . Sanitary landfill sites

**e. Master Plan for Urban Development**

The Municipality of Asunción has been the central agency responsible for preparation of city plans and for coordination with other governmental agencies, and it is recognized that it will continue to be the leading agency in an improved system for city planning and urban development in the Metropolitan Area.

In the Metropolitan Area, Asunción (Urban Development Office) and some municipalities within the vicinity (Lambaré, M.R. Alonso, etc.) are making specific plans on urban development, however, it is considered difficult for municipalities in general, including the Municipality of Asunción, to realize the plans, because

of shortage in manpower and other related issues.

Therefore, and unfortunately, guidelines for the magnitude and focus of the city plan within the metropolitan area do not exist, and thus the determination of development features becomes a speculative process based on general and natural trends observed in many sectors of the metropolitan area.

The land usage of the municipalities in the Metropolitan Area continues to grow randomly towards the outskirts, due to the lack of a Master Plan or General Guidelines concerning global policies and integrated plans on city planning and urban development for Asunción and its Metropolitan Area. Many activities were located and grouped according to convenience or due to the presence or availability of major roads.

Therefore, only sectoral and priority problems on existing or ongoing situations were regulated within the urban guidelines.

Within this scenario, bylaw decrees were created to regulate the development of Asunción, with respect to zoning, land use, and building height.

A tentative master plan ("Development Guidelines for Asunción and its Metropolitan Area") was prepared by the Municipality of Asunción in 1985. The plan, however, was never made official because of the opinion differences of the government officials.

According to the present Regulation Plan (Decree No. 19/1993) established by the municipality of Asunción, the entire municipal territory of Asunción is considered as an urban zone (UZ), and classified as an Urban Zone or a Programmed Urban Zone and Special Zone or a Zone for Programmed Urbanization.

Regulations and definitions are presented in the above mentioned Decree, however no clear objectives and integrated city planning are formulated in the Plan.

## **f. Urban Development Plan**

### **fa. Basic Structure Plan**

As the Metropolitan Area of Asunción continues to attract migrants due to its inherent attraction, the existing pressure on urban services and facilities reflected by high population density, which in return causes blighted areas (coastal zones along Paraguay riverside), housing shortage, traffic congestion, etc. The transition area between the inner core and outlying area of Metropolitan Area is seen to provide enough space for expansion while retaining a medium intensity of

development. It shall have a balanced distribution of population densities, encouraging concentrations of activities at selected centers along lines of accessibility.

The areas outside the Metropolitan complex are expected to absorb a considerable amount of urban growth. The emphasis is seen, however, on urban concentration at selected centers (satellite cities) of activity along major transport routes, projecting a linear-cellular pattern.

Urban nucleation in the north, east and south-east are expected to develop multi-functional activity centers providing expanded opportunities in housing, employment and social services, as well as educational and cultural facilities. In lying areas between the corridors of growth shall, however, be subjected to development guidelines to ensure retention or conservation of major open spaces, forest, watershed, reserve zones and prime agricultural areas.

Further growth is anticipated in the south-east corridor because its greater absorptive capacity and the activity of the private sector. As mentioned in Section A.5.6 (b), increase in commercial and urban activities is expected to extend toward the south-eastern areas, linking Asunción with San Lorenzo, Luque and a part of Capiatá, due to the availability of highly accessible transport routes.

While the development along the north-eastern corridor at present has not gained much progress due to geographical and road conditions and lack of attraction, etc. (Limpio and eastern area of Luque), it is expected that rational programming will, nevertheless, push its development through. Also, intensive housing development will be expected in the near future.

The northwest part of the Study Area (Department of Villa Hayes) is underdeveloped, because its low lands, adverse soil conditions and climate, are not favorable for urbanization. Therefore, there is limited probability for medium and long term development. At present, it is more suitable to execute sanitary landfill and gradual filling for future land development.

By utilizing the dominant influence of transportation on urban growth in bringing about desired densities of development, the planned development for the outer areas is envisioned to bring about maximum benefits.

#### **fb. Urban Development Plan of M.A.A.**

The urban development plan for the Metropolitan Area of Asunción is made based on the foregoing results and the premises outlined by the Municipality of Asunción.



The plan is, in essence, materialization of the planning policies and principles.

The factors considered in the plans are:

- Present and future population growth
- Land use condition
- Natural development trends
- Regulations in force

The commercial areas are arranged hierarchically according to influence, e.g. main commercial area, lineal commercial sectors along the transportation network and zone commercial centers at town scale.

Relocation of small and medium scale industries in areas lying between the municipalities of Luque and San Lorenzo, and the proposed establishment of an industrial park in Villa Hayes are planned.

Also, conservation of open spaces (green and recreational areas), improvement in health, education, prime agricultural areas and special reserve zones of the city are considered to obtain a good urban environment.

This plan is reflected schematically in Figure A.5.5c.

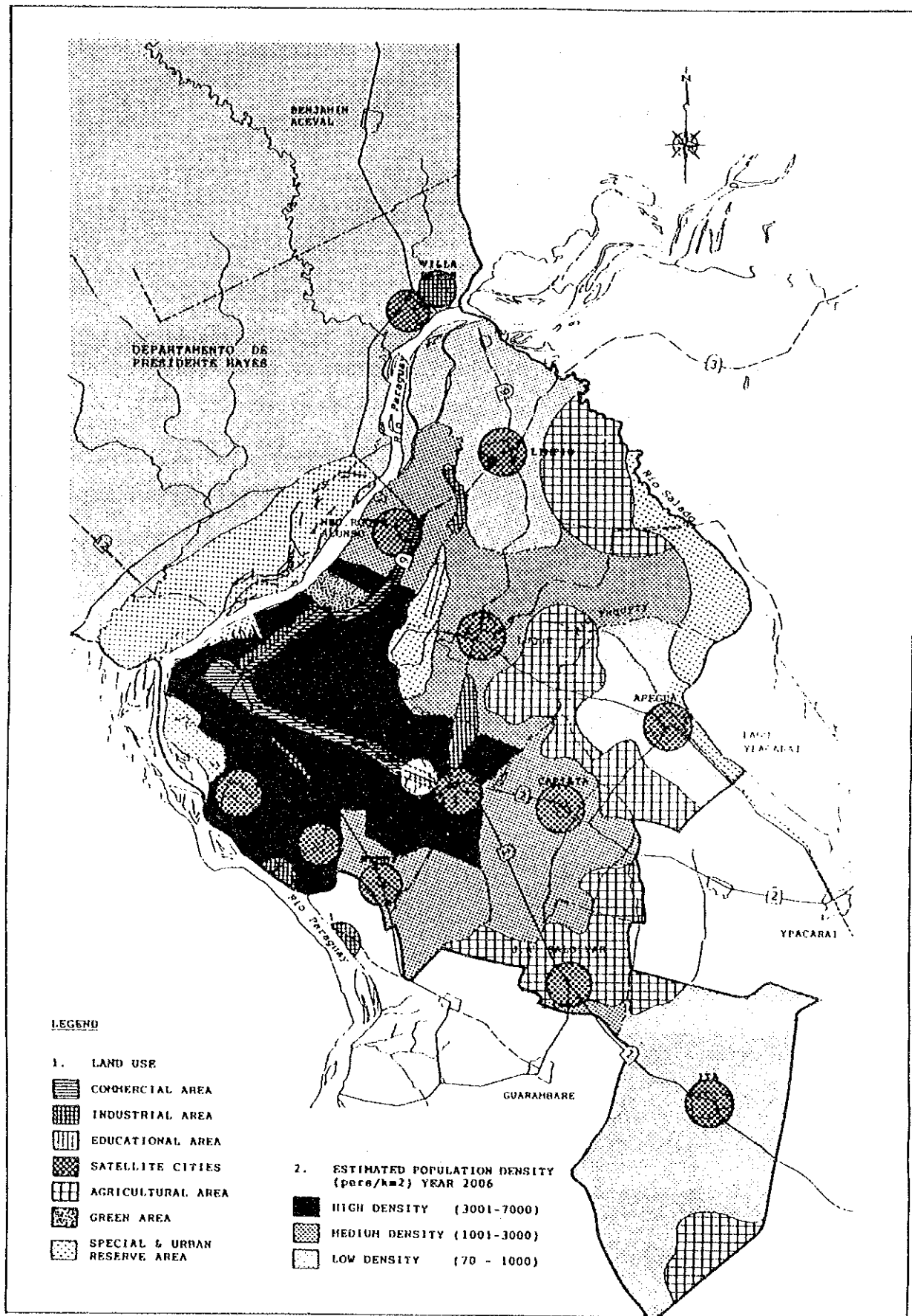


Figure A.5.5c Draft Urban Development Plan by the Study Team

### **A.5.6 Complementary Data**

Up-to-date urban area maps based on available cadastral maps of the 15 municipalities were prepared and annexed in a separate Volume (Figures A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10, A-11, A-12, A-13, A-14 and A-15).

Some districts of the Metropolitan Area have no data or information concerning their own municipality, therefore, the above complementary maps will be utilized for future planning or other study purposes.

### **A.5.7 Recommendations**

A master program should be formulated to provide sufficient space to meet the population growth and the city expansion.

Implementation of a master plan to guide the urbanization process, measures, land use, zoning building control, and subdivision control is an urgent concern. As previously stated, general plans are formulated but aiming to their implementation. For instance, the practical measures enforcing the land use plan have not been institutionalized. Consequently, efforts to improve city planning in the Metropolitan Area must emphasize on concrete implementation. Moreover, measures concerning institutionalization and coordination of the Master Plan shall be considered for urban development.

A master plan dealing with the basis of a societal consensus must be easy to understand. Thus, the objectives, process, and methods used should be clear, and the plan should be expressed in quantitative terms to the greatest extent possible. To prepare a persuasive city plan that effectively promotes public welfare, it is of the utmost importance to establish a standardized city plan system relying on technical methods and planning standards based on studies of actual physical and socioeconomic conditions.

To achieve the above mentioned objectives, the following measures should be implemented:

- Standardization of plan contents that will encompass an integrated physical plan, including both social and economic elements
- Establishment of planning standards and guidelines as references for analysis

and planning

- Specification of common premises for the formulation of goals and objectives
- Distribution of population for medium and long term periods according to the available area of urban open spaces and rural areas
- Improving coordination among planners of different sectors and with those belonging to other agencies
- Establishment of a common city planning database

A master plan concerning city planning and urban development is not formulated in the present report. However, as stated above, the responsible agencies are recommended to take immediate measures, and standard procedures proposed for the implementation of the master plan are summarized below.

Plan preparation starts with determination of the planning area. When a revision of an existing (tentative) city plan is prepared, the existing planning area will be altered, for instance by taking the recent expansion of the urbanized area into account. Once the city planning area is determined, the map is updated. Based on the updated map, all necessary data are collected and existing conditions (areal socioeconomy, land use, and urban facilities, including transportation facilities) are analyzed.

The planning process from the setting of goals and objectives to the determination of urban policies and future urban structure should involve elaboration of the city's future in quantitative terms. This process has been frequently based on the arbitrary judgments of planners or uncertain standards. From now on, a rational and rigorous preparation process shall be established.

Analysis and planning procedures for the preparation of an integrated physical plan is graphically illustrated below.

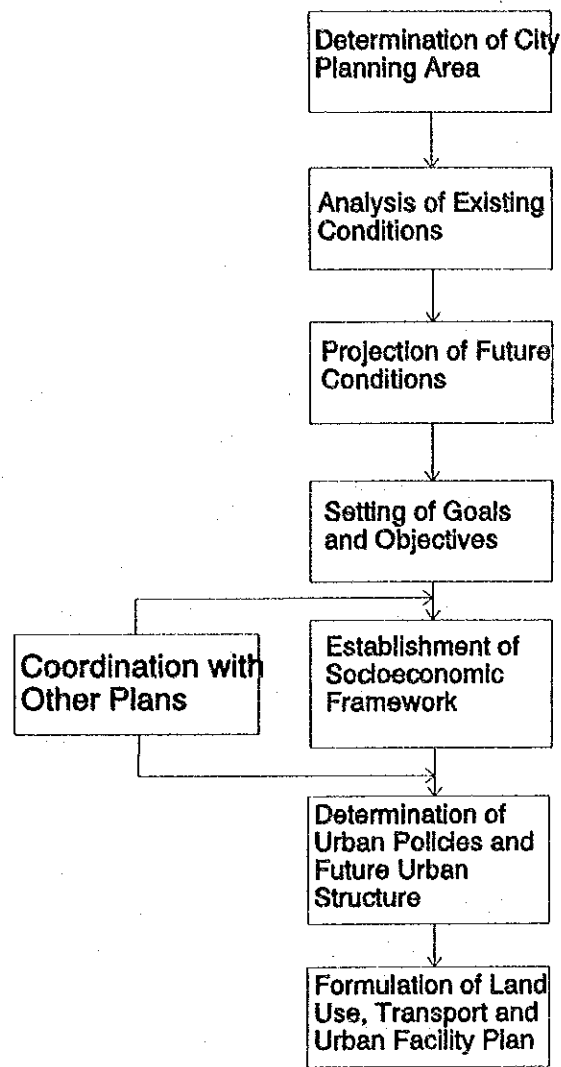


Figure A.5.7a Planning Procedure for Integrated City Planning

## **A.6 Economic Conditions**

### **A.6.1 National Economy**

#### **a. Past and present**

The country is blessed with plentiful natural resources relative to its population, thereby providing the basic condition for an agricultural based economy. During the 1970s, the Paraguayan economy grew at 8.5% per annum, one of the highest growth rates in Latin America, assisted by an expanding agriculture and the construction of the Itaipu dam. The agricultural expansion was based on opening of new lands to implement a large scale mechanized farming program that sought self-sufficiency in wheat production. Soybeans, although introduced as a rotation crop to wheat, turned out to be the more successful crop, and its cultivated area expanded enormously during the decade. Soybeans and cotton enjoyed high demands in the international market, thus resulting in the two pillars of Paraguayan exports.

The world recession in the early 1980s reduced the demand for Paraguayan exports, thereby exacerbating the weakening domestic economy resulting from the completion of the Itaipu dam. The multiple exchange rate policy had a practical effect of an export tariff, thereby penalizing exports. The weakening of the economy continued up to 1986, but the gross domestic product (GDP) grew at 5.1% annual rate during 1987 and 1989, resulting from a combination of factors such as the recuperation of international prices of Paraguayan exports, favorable weather conditions for agricultural production, and a new exchange rate policy. The unified and floating exchange rate policy, in effect since February 1989, eliminated the tax burden on exports, thereby encouraging production of tradeable goods. As a result, exports increased while imports were brought under control. According to the World Bank, the Paraguayan economy during the 1980s grew at 1.6% annual rate, while the population grew at an estimated 3.2%, thereby indicating a decade with deteriorating living standards.

Table A.6.1a shows the minimal growth of the GDP during the first three years of the 1990s, having grown 2.5% in 1991 and 1.8% in 1992. It can be seen that the decline in agricultural production could not be compensated for by the increased production in livestock, forestry, hunting and fishing. The service sector performed better than the production sector, especially electricity which grew 10.5% in 1991 and 12.8% in 1992. Other sectors showed a rather flat growth.

Tables A.6.1a and A.6.1b show that in 1992 the primary sector accounted for around 40% of the economically active population (EAP) and 28% of GDP, the secondary sector for around 20% of EAP and 22% of GDP, and the tertiary sector for around 30% of EAP and 50% of GDP. The relative importance of the primary sector has been declining, while that of the tertiary sector has been increasing. The manufacturing sector consists mainly of processing agricultural products.

The significance of the primary sector in the Paraguayan economy is underlined in Table A.6.1c which contains a long list of agricultural products and derivatives as main export items. The decline in the export of cotton lint, both in absolute and relative terms, is obvious. In addition, uncertain soybeans exports, coupled with the flat export of wood products and the drastic decline in livestock products, paint a rather gloomy picture for the traditionally important Paraguayan export products.

On the other hand, the growth in the export of vegetable oil and its byproducts (expeller, pellet) and leather may signal the beginning of exports based on more industrialized products. Also, the large increase in fruit exports, in relative terms, may be interpreted as the reflection of the benefits that can be derived from a crop diversification policy. On the import side, Table A.6.1.(d) shows that the main import items are fuel, transportation vehicles and equipments, chemicals, iron, machinery and motors. These are not only final consumption products, but also intermediate and capital goods.

A great effort was made in 1992 to reduce the foreign debt through cancellation of arrears with the Paris Club. As a result, foreign debt went down from US\$1,637 million at the end of 1991 to US\$1,249 million at the end of 1992. The effort was made to normalize relations with foreign credits so as to open channels for the inflow of foreign capital needed to finance development projects.

According to the Central Bank of Paraguay, the consumer price index (CPI) fluctuated between 21.8% and 31.7% during the 1985-89 period, it was 38.2% in 1990, 24.3% in 1991, and 15.1% in 1992. Unemployment during the past three years was 7.5% in 1990, 10.4% in 1991 and 8.7% in 1992. The national income per capita was estimated at US\$1,219 in 1992.

In summary, although the Paraguayan economy is still heavily dependent on agriculture, efforts seem to be underway to diversify crop production. This strategy can result in a healthy expansion of the Paraguayan export base, thereby making it less vulnerable to fluctuations in international prices of a couple of export products. Also, there seems to be efforts to export products with higher industrial contents. Other favorable developments are reductions in foreign debt arrears and efforts to bring inflation under control, which should create an environment

appropriate for investments.

**b. Future Perspective**

A new President and his Cabinet were inaugurated on August 15, 1993. During the second week in office, the new administration made public a policy to reactivate the stagnant economy. The policy includes a diversity of measures to be applied on several fronts.

**i. Economic measures**

- balanced budget
- inflation control
- minimum price regulation
- market based economy
- privatization of state companies
- promotion of investment: local and foreign
- unrestricted capital flow
- unrestricted import and export
- deregulation of the economy
- reorganization of the public sector
- diversification in agricultural production
- active participation in regional common markets

**ii. Fiscal measures**

- low and uniform export taxes
- simplification of the tax system
- severe penalty for tax evasion

**iii. Financial measures**

- special credit line for agriculture, small and medium size businesses
- heavy investment in communication, transportation, energy and basic sanitation
- reorganization and rationalization of the financial sector
- interest rate to stimulate savings and investments

The above mentioned measures were designed to pull the economy out of



stagnation and are expected to achieve a 3.5% growth of GDP in 1994. Thereafter, the economy is expected to keep growing at a satisfactory rate in a self-sustained manner.

Table A.6.1a Gross Domestic Product

Unit : Million Gs. Constant 1982

	Economic Sector	1990	1991	1992
Production Goods	<b>Agricultural Product</b>			
	Agriculture	159,082	152,080	150,061
	Livestock	69,847	74,108	75,066
	Forestry	25,201	26,319	27,562
	Hunting & Fishing	1,255	1,285	1,324
	<b>Sub-total</b>	<b>255,385</b>	<b>253,792</b>	<b>254,013</b>
	<b>Other Goods</b>			
	Mining	43,00	4,515	4,741
	Manufacturing	149,045	150,684	151,287
	Construction	48,486	49,940	52,437
	<b>Sub-total</b>	<b>201,831</b>	<b>205,139</b>	<b>208,465</b>
	<b>Total Production Goods</b>	<b>457,216</b>	<b>458,931</b>	<b>462,478</b>
Production Service	<b>Basic Services</b>			
	Electricity	25,960	28,686	32,355
	Water & Sewer	3,974	4,026	3,894
	Water & Communication	42,546	44,673	45,790
	<b>Sub-total</b>	<b>72,480</b>	<b>77,385</b>	<b>82,039</b>
	<b>Other Services</b>			
	Commerce & Finance	244,732	255,425	256,958
	Government	41,774	43,027	46,382
	Housing	24,100	24,944	26,690
	Other Services	87,015	90,496	92,765
<b>Sub-total</b>	<b>397,621</b>	<b>413,892</b>	<b>422,795</b>	
	<b>Total Production Services</b>	<b>470,101</b>	<b>491,277</b>	<b>504,834</b>
<b>Gross Domestic Product</b>		<b>927,317</b>	<b>950,208</b>	<b>967,312</b>

Source : Cuentas Nacionales 1982 /1992, No 29, Julio 1993, BCP, Asuncion.

Table A.6.1b Economically Active Population (EAP)

Economic Activity	EAP			Percentage		
	1989	1990	1991	1989	1990	1991
Employed EAP						
- Agric. & Livestock	599,838	609,481	593,294	40.1	39.6	37.5
- Mining & Quarrying	3,022	3,124	3,290	0.2	0.2	0.2
- Manufacturing	162,151	164,487	165,540	10.8	10.7	10.4
- Electricity & Water	4,548	4,747	4,900	0.3	0.3	0.3
- Construction	136,467	138,260	132,477	9.1	9.0	8.4
- Commerce & Finance	186,881	192,103	198,599	12.5	12.5	12.5
- Transp. & Communication	45,757	48,084	51,671	3.0	3.1	3.3
- Services	203,792	205,155	206,620	13.6	13.3	13.0
- Unspecified	54,726	59,726	62,866	3.7	3.8	4.0
Total	1,397,182	1,425,167	1,419,257	93.3	92.5	89.6
Unemployed EAP	100,130	114,858	164,217	6.7	7.5	10.4
Total EAP	1,479,312	1,540,025	1,583,474	100.0	100.0	100.0
EAP / Total Population	-	-	-	36.0	36.0	36.0

Source : Boletín Municipal 1992, Dirección de Planificación, Municipalidad de Asunción.

Table A.6.1c Main Export Products

Unit : US\$ 1,000 Constant 1982 No

Export Products	1990	1991	1992
- Livestock Product	130,700	55,278	44,365
- Vegetable	2,254	1,751	1,749
- Fruit			
Fresh	403	616	1,072
Processed	13	8	178
- Coffee & Mate Tea	11,919	5,120	1,081
- Grain	37,636	111	769
- Oil Seed	140,195	88,373	125,700
- Vegetable Oil	14,669	22,716	38,638
- Expeller, Pellet	11,598	18,223	49,845
- Essential Oil	9,242	10,461	13,458
- Sugar	1,964	3,187	2,332
- Palm Heart	1,412	1,157	2,603
- Tobacco	5,344	6,194	6,410
- Stone	41	192	321
- Tannin	4,774	4,202	3,512
- Soap	41	53	73
- Leather	12,107	10,406	33,598
- Wood	46,281	56,939	44,858
- Cotton lint	307,776	288,333	198,928
- Others	409,721	412,823	424,542
TOTAL	1,148,090	986,143	994,032

Source : Cuentas Nacionales 1982 / 1992, No 29, July 1993, BCP, Asunción

Table A.6.1d Main Import Products

Unit : US\$ 1,000 Constant 1982

Import Products	1990	1991	1992
Registered Import			
- Livestock	418	573	1,059
- Foodstuff	17,948	21,850	32,396
- Beverage	33,295	44,925	44,277
- Tobacco	16,859	31,298	32,431
- Fuel	128,612	100,064	122,407
- Paper, Cardboard	18,099	20,741	23,951
- Chemicals	41,328	50,540	52,470
- Pharmaceutical	0	14,403	21,403
- Truck, Bus	25,169	30,255	47,874
- Automobile, Jeep	27,834	47,933	55,749
- Tractor	124	750	800
- Transportation Equipment	38,843	48,707	39,960
- Textiles	22,273	22,402	19,515
- Farm Machinery	12,143	10,096	8,923
- Iron	43,313	39,561	39,410
- Others Metals	8,662	13,154	12,464
- Machinery & Motor	359,384	188,517	242,628
- Electrical Equipment	32,541	19,233	81,882
- Precision Instruments	27,420	15,538	9,981
- Precious Metal And Stone	700	172	464
- Others	100,914	103,816	34,545
Sub-total	955,879	824,528	924,589
Unregistered Import	20,718	110,542	58,169
<b>TOTAL</b>	<b>976,597</b>	<b>935,070</b>	<b>982,758</b>

Source : Cuentas Nacionales 1982 /1992, No 29, Julio 1993, BCP, Asuncion.

## A.6.2 Regional Economy

The capital city Asuncion and its metropolitan area (MAA) is undoubtedly the most urbanized area of Paraguay, concentrating some 31% of the country's population. As the capital city, Asuncion serves as home to the central government, and the MAA shows the highest concentration of industries, commerce, and the best the country can offer in services such as health care and education. In other words, the MAA is a concentration of opportunities, thereby exerting a strong magnetic effect on the migration from rural areas. This rural to urban migration was reportedly interrupted during the 1970s, when construction of the Itaipu dam and the strength of the agricultural sector induced a predominantly rural to rural migration.

The MAA accounts for around one-third, or slightly over half a million, of the economically active population (EAP) of the country. Table A.6.2.(a) shows the

characteristics of the EAP in the MAA in 1990 and 1991. Around 60% of the EAP are male. Those with full employment increased from 78.1% in 1990 to 85.4% in 1991. Fully employed males surpassed females, absolutely and relatively, but both increased in 1991 if compared with 1990 (male 81% to 87%, female 74% to 83%).

Unemployment declined from 6.6% in 1990 to 5.1% in 1991, showing a steeper decline for females (6.5% to 4.7%) than for males (6.6% to 5.4%). Underemployment also declined from 15.4% in 1990 to 9.5% in 1991. While both open and disguised underemployment decreased for males, open underemployment increased slightly for females.

Table A.6.2b shows the breakdown of sectoral employment in the MAA in 1990 and 1991 shows some half a million fully and underemployed EAP. The most important employment sources in 1991 were services (165,558), commerce (132,178) and manufacturing (78,100), followed by construction (45,356), finance (33,520), transportation and communication (28,074). These data clearly show the weight of the service sector in the MAA. As expected, agriculture and mining are negligible in the MAA.

While the mining industry is the principle employer of the male labor force, sectors with heavy predominance of male workers are agriculture, construction, electricity and water, and transportation and communication. The female labor force predominates in services, while a balance between male and female workers is seen in commerce and finance.

From 1990 to 1991, employment declined in agriculture, manufacturing, electricity and water, and services, while increased in mining, construction, commerce and finance. Employment remained stationary in transportation and communication.

Table A.6.2c shows employment categories in the MAA in 1990 and 1991 for fully employed or underemployed EAP. What calls immediate attention is the high proportion of unskilled workers which comprised 25% (121,380) in 1990 and 29% (151,874) in 1991. Another point of interest is the high proportion of self-employed workers comprising nearly one-fourth of total employment (123,872 in 1991). This probably reflects the small job market, even in the MAA, thereby forcing the labor force to create their own employment.

The categories of unskilled labor and self-employed together comprised around one-half of the total labor force. In addition, about 10% of the total labor force (25% of the female labor force) work as domestic staff, while less than 1% work as unpaid family labor. In other words, around 60% of the labor force probably