1. CURRENT SITUATION

1.1 TRANSPORTATION NETWORK

(1) Roads

There are three categories of roads in Paraguay: National Roads (Red Nacional), Departmental Roads (Red Departamental), and Rural Roads (Red Caminos Vecinales). National Roads are defined as roads connecting the capital with other departments, or with other countries in MERCOSUR; they include 12 routes covering a total distance of 4,490 km. These roads are under the control of the Road Bureau (Dirección de Vialidad), Ministry of Public Works and Communications (MOPC). Departmental Roads are defined as roads covering the whole or a major part of one department, connecting departmental capitals, connecting National Roads with departmental capitals, connecting two or more National Roads, or connecting departmental capitals with the border; these cover a total distance of 4,621 km. These roads are under the sub-control of each department, and under technical guidance and supervision of the Road Bureau, MOPC. Rural Roads are roads connecting local towns, or connecting departmental roads. They are planned and maintained by the District Road Bureau (Dirección de Caminos Vecinales), MOPC. Departments or municipalities provide service under technical guidance and supervision of the Road Conservation Department (Departamento de Conservación).

Table 1 shows the extent of roads by category and by type of pavement as of 1999. The total distance of all kind of roads is about 56,000 km of which National Roads account for 8.0%, Departmental Roads for 9.4%, and Rural Roads for 82.6%. Only 5.9% of the total distance of roads is paved: 57.6% of National Roads, 11.2% of Departmental Roads, and a remarkably low 0.3% of Rural Roads.

Table 1 Extent of paved roads by category

		Pav.	Stone Pav.	No Pav.	Total	%
National Roads	km	2,584.8	0.0	1,904.9	4,489.7	8.0
	%	57.6	0.0	42.4	100.0	
Departmental Roads	km	584.7	203.3	4,438.7	5,226.7	9.4
	%	11.2	3.9	84.9	100.0	
Rural Roads	km	123.9	13.0	46,019.8	46,156.7	82.6
	%	0.3	0.0	99.7	100.0	
Total	km	3,293.4	216.3	52,363.4	55,873.1	100.0
	%	5.9	0.4	93.7	100.0	

Source: MOPC

Figure 2 shows the variations in the extent of paved roads, based on the "Annual Report on Transport Statistics." The extent of paved roads increased from 817 km in 1970 to 4,585 km in 1998; the extent of paved road per capita also increased from 0.34 m/person to 0.88 m/person. If this trend continues, the extent per capita will achieve 1.10 m/person by 2010, and the total extent will reach 7,700 km.

Figure 1 Distribution of Paved Roads

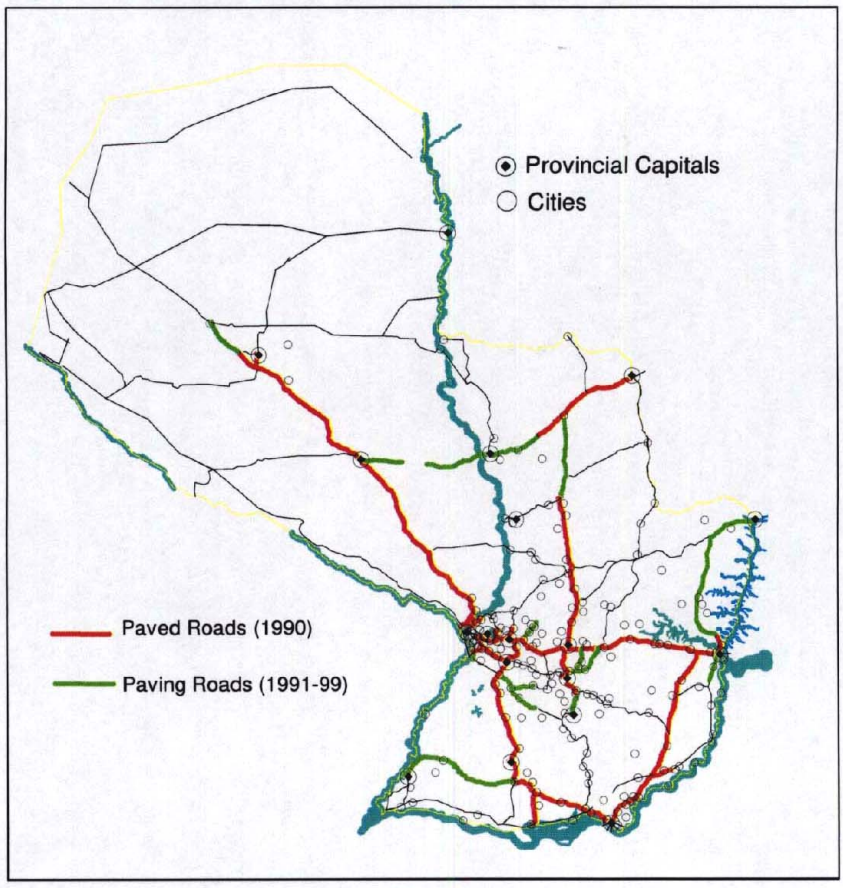
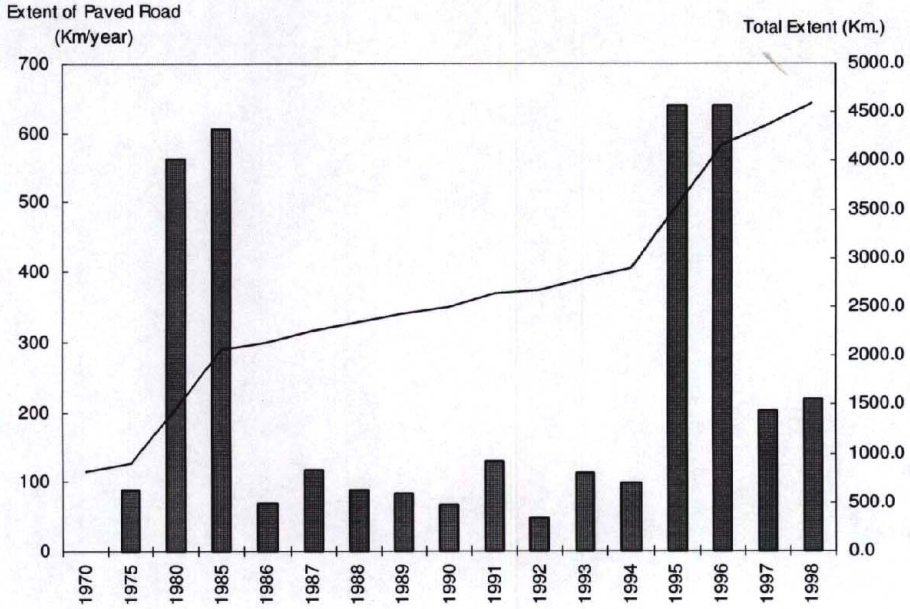


Figure 2 Variation in Extent of Paved Roads



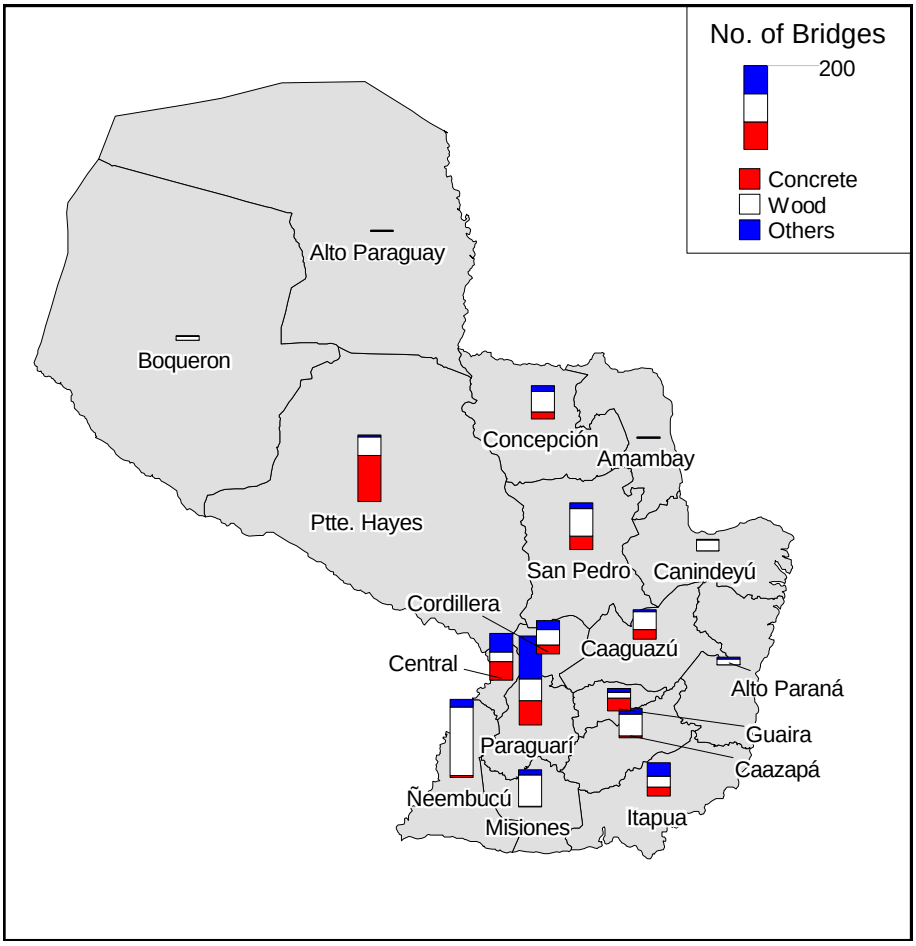
About 23,000 km of roads are covered by the Bridge Inventory of the MOPC. Table 2 shows the outline of existing bridges, according to the Inventory. Among the 1,370 bridges, wood bridges account for 51%, or slightly more than half. The departments of Presidente Hayes, Paraguarí, and Ñeembucú have a large

number of wood bridges, but in Presidente Hayes there are many concrete bridges while in Ñeembucú almost all the bridges are made of wood.

Table 2 Current Status of Bridges (1999)

Class	Concrete	Wood	Others	Total	%
1. 0m – 5m					
No.	63	343	128	534	39.0
Long.	239	1,112	490	1,841	8.9
2. 6m –10m					
No.	125	180	104	409	29.9
Long.	884	1,269	746	2,899	14.0
3. 11m –40m					
No.	133	152	60	345	25.2
Long.	3,007	2,752	1,035	6,794	32.9
4. 41m –					
No.	53	24	5	82	6.0
Long.	7,246	1,399	487	9,132	44.2
5. Total					
No.	374	699	297	1,370	100.0
%	27.3	51.0	21.7	100.0	
Long.	11,376	6,532	2,758	20,666	100.0
%	55.0	31.6	13.3	100.0	

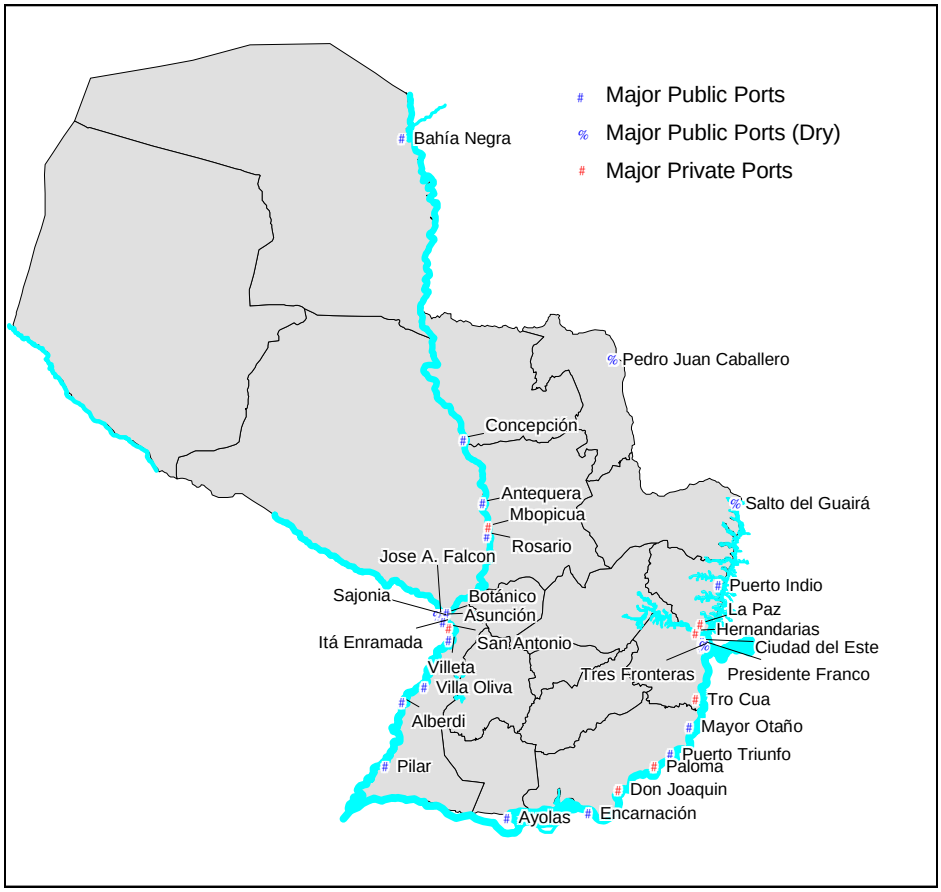
Figure 3 Distribution of Bridges



(2) Ports/waterways

There are both public and private ports in Paraguay. The public facilities include two categories: river ports and land ports. The main ports are controlled by the National Administration of Navigation and Ports (Administración Nacional de Navigación y Puertos), under the control of the Ministry of Public Works. Paraguay borders two international rivers, Paraná River and Paraguay River, that have a large number of ports: 78 (including 13 public) ports along Paraguay River and 78 (including 13 public) ports along Paraná River (refer to Figure 4).

Figure 4 Distribution of the Main Domestic Ports



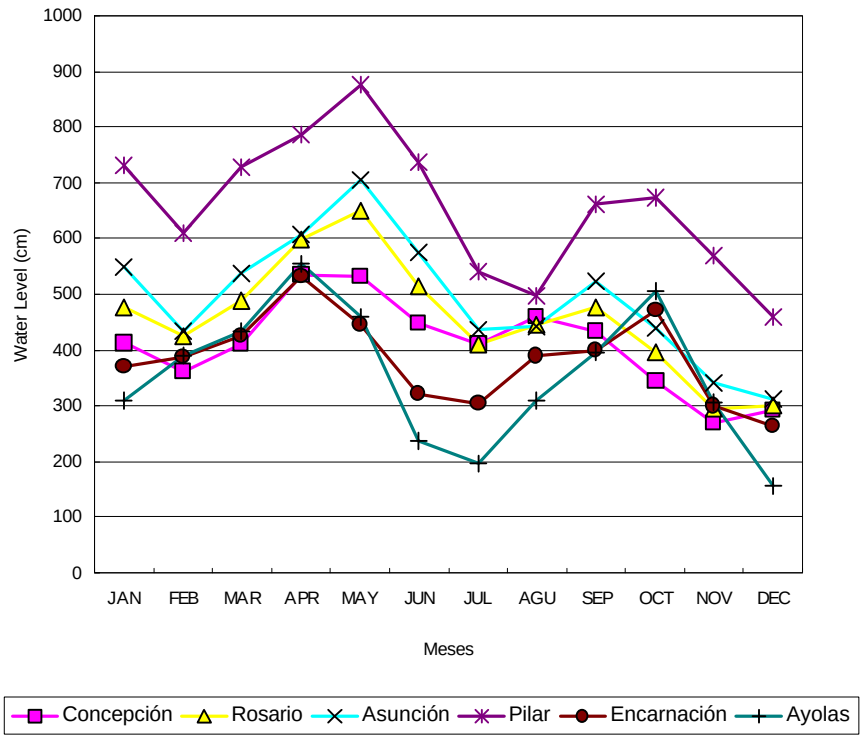
Paraguay also has facilities that function as free ports outside the country, according to agreements made with neighbor countries. These include Santos, Paranaguá, and Rio Grande in Brazil; Buenos Aires and Rosario in Argentina; Montevideo and Nueva Palmira in Uruguay; Antofagasta in Chile; etc. Santos, Paranaguá, Buenos Aires, and Montevideo are now being used, while the remaining ports have no facilities and are hardly ever used.

Paraguay River has its origin in the southwest region of Brazil and ends at the junction with Paraná River, which is the border between Argentine and Paraguay. The navigable section is 2,200 km, from the junction to port Cáceres in Brazil. The volume of water in Paraguay River varies considerably between

the rainy season and dry season, rising in April - September and falling with the drought in October – March (refer to Figure 5). The fall of the water level at the drought, and the sedimentation of earth and sand due to the big difference in the volume of water between the wet and dry seasons constitute obstacles for water transport.

Paraná River starts from the junction of Paranaíba River and Grande River, forms the border between Paraguay and Brazil, and with Argentina, then runs through Argentina to La Plata River. Its total extent including Paranaíba River and Grande River is 4,000 km. The aspects of the waterway until near Encarnación and then down from there are completely different. The river runs through mountains and hills until Encarnación, and its width is narrow resulting in a fast flow, and forming an obstacle for water transport. On the other hand, it's deep, with many places having a depth of more than 30 m. Down from Encarnación, however, the land is flat and the river increases its width, forming a slow current.

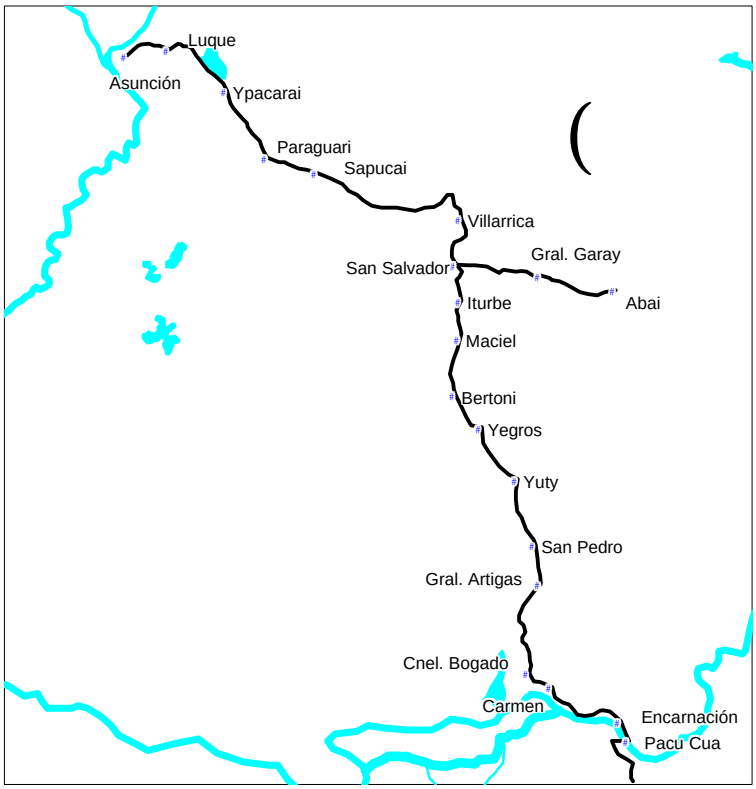
Figure 5 Variations of River Water Level



(3) Railroads

Paraguay's railroad system (Ferrocarril Presidente Carlos Antonio Lopez) consists of a route going 370 km southward from the capital Asunción to Encarnación, the south border with Argentina, and another route branching off from San Salvador and running 64 km to the east, until Abai. However, only two sections are now operating: from Asunción Station to Ypacarai Station and from Encarnación Station to Pacu Cua Station. Connection with the Argentine railroad is made at Pacu Cua, where only the locomotive is changed while the train is transferred to the Argentine railroad.

Figure 6 Railroad Map



1.2 TRAFFIC MOVEMENT

(1) Changes in traffic demand

1) Freight transport

Statistics on freight transport volume are not available, but it can be estimated as follows, provided there is no loss in product processing:

Transport volume = domestic consumption + export + import
= (production – export + import) + export + import
= production + import x 2

Table 3 shows the estimated transport volume for 10 years (1989-1998), based on data from the Central Bank. Traffic transport increased during these 10 years from 27,761,000 ton to 35,643,000 ton, an increase of 28%. This increase rate is almost the same as the increase of 25% in GDP for the same 10-year period.

Table 3 Changes in Traffic Transport Volume

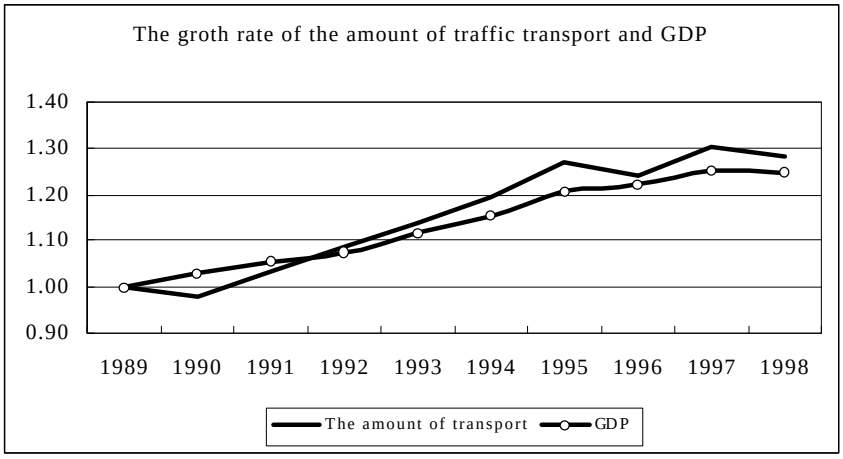
(Unit:1000 tons)

Year	Production						Export	Import	Domestic consump-tion	Amount of transport
	Agricul-ture	Stock raising	Forestry	Mining	Industry	Total				
1989	10,549	1,201	5,587	4,280	3,846	25,463	2,837	1,149	23,775	27,761
1990	10,069	1,262	5,707	3,472	4,251	24,762	2,762	1,232	23,232	27,226
1991	10,280	1,423	5,896	4,319	3,764	25,682	2,110	1,501	25,073	28,684
1992	10,768	1,484	6,070	4,787	3,903	27,012	2,127	1,578	26,463	30,167
1993	11,201	1,514	6,233	4,792	4,298	28,037	2,692	1,803	27,148	31,642
1994	11,026	1,564	6,429	5,063	4,440	28,522	2,533	2,318	28,308	33,159
1995	12,030	1,628	6,579	5,285	4,682	30,205	2,768	2,541	29,978	35,287
1996	11,685	1,641	6,544	5,175	4,576	29,621	3,272	2,417	28,766	34,455
1997	12,786	1,749	6,650	5,266	4,569	31,020	4,002	2,588	29,605	36,195
1998	12,922	1,698	6,681	4,880	4,554	30,734	4,417	2,455	28,772	35,643

Source: "Cuentas Nacionales", Banco Central del Paraguay

Remark: The amount of production of the stock raising and the industry was calculated by presuming standard weight by the list of articles.

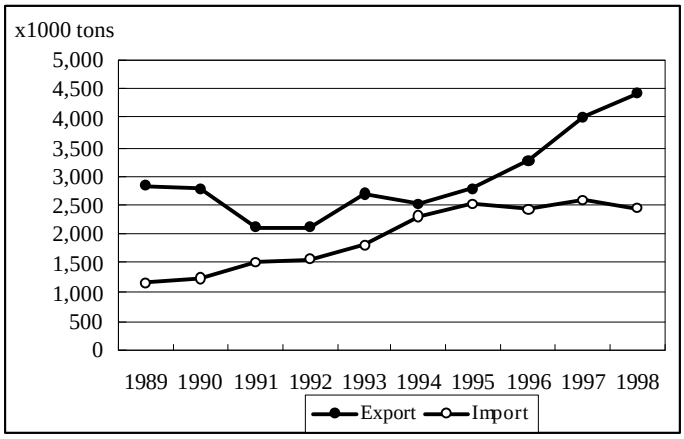
Figure 7 Growth of Economy and Transport Demand



2) Export and import volume

The volume of export/import corresponds to 15-20% of the traffic transport volume. Exports dropped in 1991-1992, but has been increasing since then. On the other hand, imports increased steadily until around 1994, but have leveled off since then. Export volume in 1998 reached 4,417,000 tons, which is 1.8 times greater than the import volume of 2,455,000 tons. This increase was mainly due to the increase of soybean exports.

Figure 8 Changes in Export/import Volume



Source: BCP

3) Movement of passengers

The current movement of passengers (1997) between departments was estimated as follows, based on the passenger movement patterns in 1990.

- Current generated and attracted traffic volume was obtained by multiplying those volume in 1990 for each zone by the population growth rate for each zone.
- Present pattern method was applied, by using the pattern of 1990 to prepare the present OD matrix.
- Present generated and attracted volume was calculated by multiplying those in 1990 by the growth rate of private cars in each zone, and pattern of 1990 was used to estimate the present private car OD matrix.
- OD matrix of passengers using public transportation was obtained by deducting the private car OD matrix from the total passengers OD matrix.

Table 4 shows the movement of passengers between departments in 1990 and 1997. Among the passengers using public transportation in 1997, railway passengers were neglected because there was only one service per week (on Sundays), between Asunción and Ypacarai.

It is estimated that the volume of passengers moving between departments increased in the period from 1990 to 1997 by 20%, from 61,500 passengers/day to 73,869 passengers/day. However, the volume of passengers using public transportation showed almost no change, from 51,917 passengers/day to 54,858 passengers/day, and the share ratio of public transportation decreased from 84% to 74%. As for vehicle types, buses showed no change from 2,000 vehicles/day while private cars doubled from 3,900 to 7,800 vehicles.

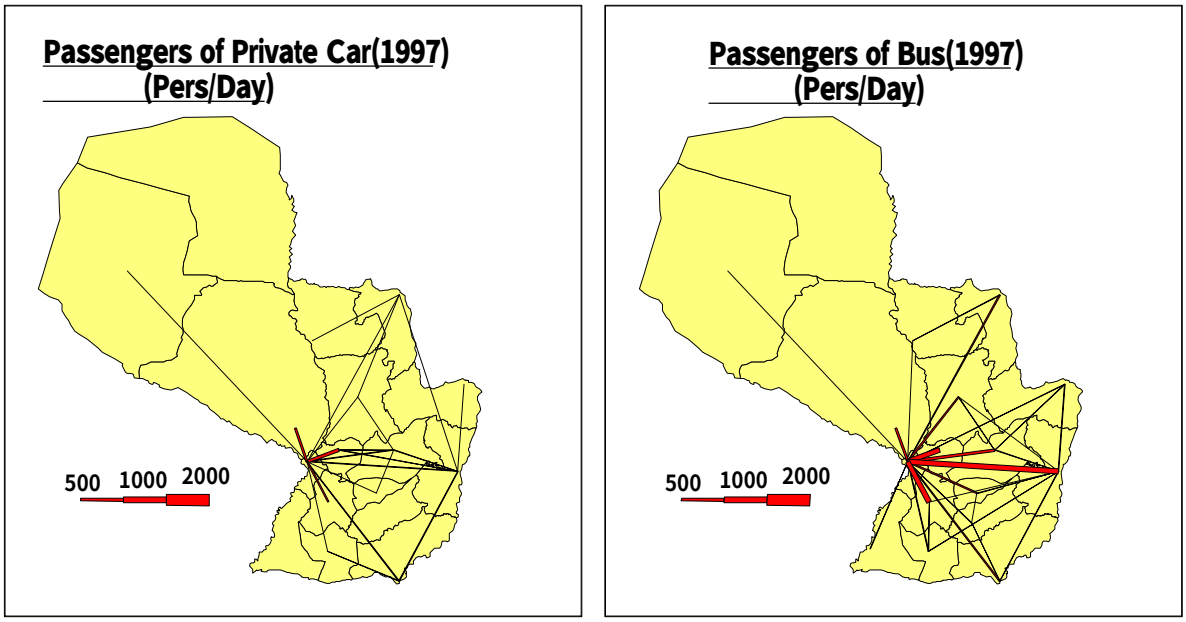
With regard to the movement of passengers in 1997, public transportation showed significant movement between the departments Central and Alto Paraná.

Table 4 Passenger Movement between Departments

			1990	1997	1997/1990
Population		Person	4,218,732	5,095,666	1.21
Number of private cars		Vehicles	116,467	241,787	2.08
Total passenger movement		Passengers/day	61,500	73,869	1.20
	Cars	Passengers/day	9,583	19,011	1.98
		Vehicles/day	3,911	7,760	
	Bus	Passengers/day	51,478	54,858	1.07
		Vehicles/day	1,907	2,032	
	Railway	Passengers/day	411	0	-

Average number of passengers Cars：2.45 Passengers/vehicle、Bus：27.0 Passengers/vehicle

Figure 9 Passenger Movement by Car and Bus (1997)



4) Road traffic volume

MOPC imposes a toll charge on National Roads. Figure 10 shows the traffic volume per day, based on the data of toll collected. Places where a toll is collected are located on paved National Roads, near the department boundaries. Tacuara (National Road No.3) started toll collection when paving was finished in 1996. Ypacarai, on National Road No. 2, has the largest volume of traffic, exceeding 7,000 vehicles per day. The traffic volume in other places ranges between 700 and 3,000 vehicles per day.

Regarding the increase in traffic volume since 1994, National Roads No. 2 and No. 7, connecting the departments Central and Alto Paraná, marked a high rate of 40%. Almost no change was observed in Ybyraro (National Road No. 1) and Remanso (National Road No. 9).

As for the transition of average daily traffic by vehicle type at tollgates, passenger cars increased by 28% (1998/1994) while buses and trucks increased by 64% (1998/1994), indicating the increase of

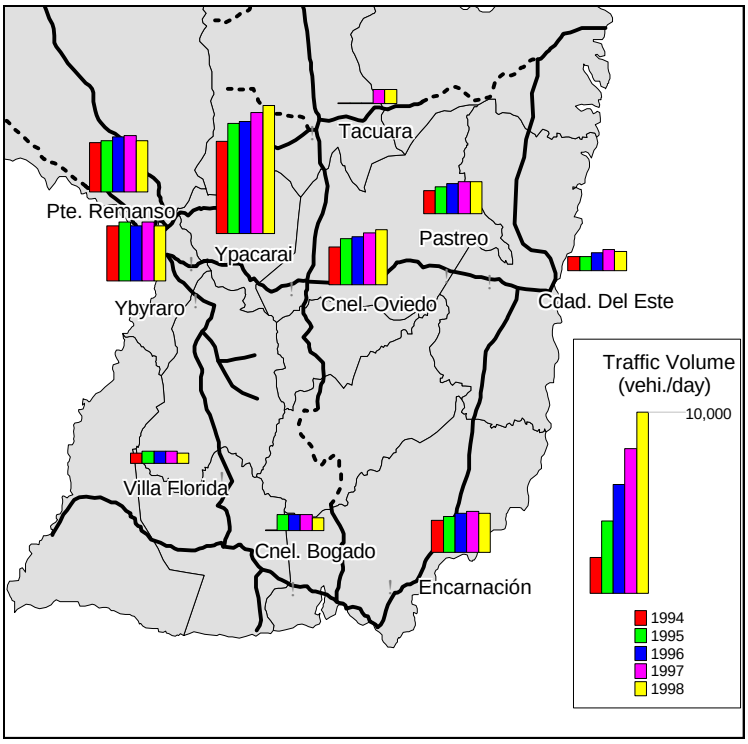
freight transport. Buses and trucks correspond to 33% of the total traffic volume (1998).

Table 5 Variations in Traffic Volume by Vehicle Type (Source: MOPC)

	CATEGORY I		CATEGORY II-V		
	Volume	Rate	Volume	Rate	
1994	12,979	1.00	4,579	1.00	Category I Passenger Car
1995	13,988	1.08	6,476	1.41	Category II Truck and Bus with 2 axes
1996	14,757	1.14	6,791	1.48	Category III Passenger Car with load space
1997	15,872	1.22	7,692	1.68	Category IV Truck with 3 axes
1998	15,588	1.20	7,528	1.64	Category V Truck with more 3 axes

Source: MOPC

Figure 10 Variations in Average Daily Traffic Volume



Source: MOPC

(2) Number of vehicles

Regarding the number of vehicles registered in 1996, there were 213,000 private cars and 146,000 of other types of vehicle, making a total of 359,000 vehicles. This was about twice the number of 1989. A significant increase was observed in the four years from 1991 to 1994, and the increase rate fell in 1996.

The ownership rate of vehicles was 72.5 vehicles/1,000 people in 1996, and the rate for private cars only was 42.9 vehicles/1,000 people.

With regards to the number of vehicles registered by department, two-thirds (244,000 vehicles) is

concentrated in the Central department. The departments next to the Central are Alto Paraná (37,000 vehicles) and Itapua (20,000 vehicles).

Figure 11 Number of Vehicles Registered and Ownership Rate

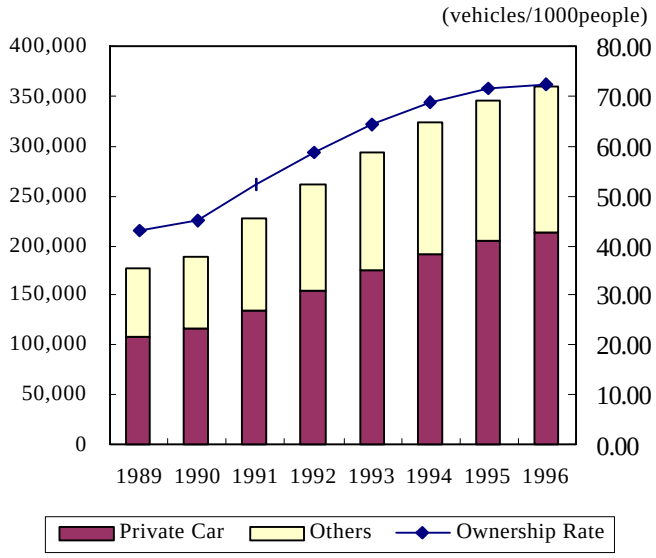
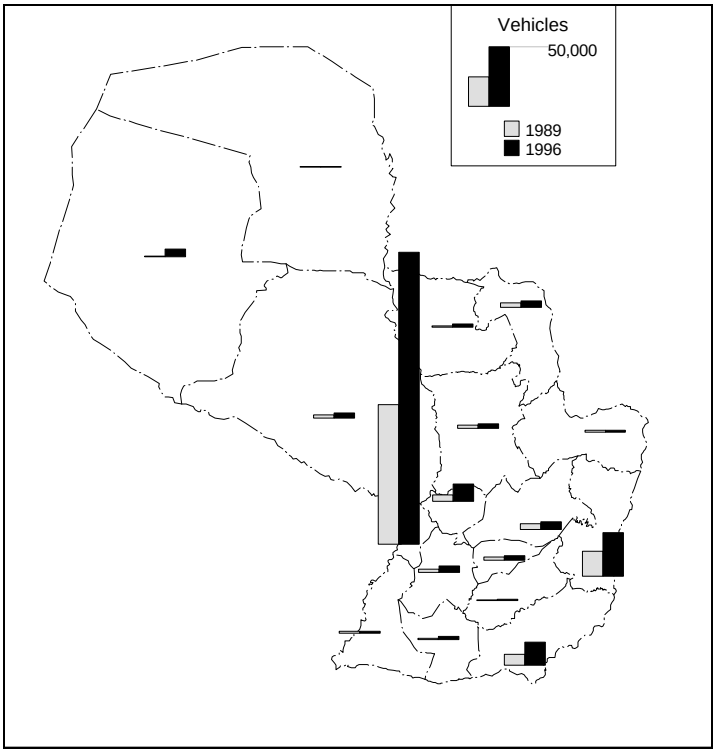


Figure 12 Number of Registered Cars by Department



(3) Airports and Air Transport

Paraguay has two international airports: Silvio Pettirossi Airport in Asuncion and Guarani Airport in Ciudad del Este. Improvements of the former have been recently done in the loading and unloading

areas. The latter, built with financial assistance from the Japanese government, is not utilized at full capacity. Apart from these two international airports, there are some domestic airports. But those are not little utilized.

The number of arrivals and departures of commercial and military flights at Silvio Pettirossi International Airport has declined from 1995 to 1998 at the average annual rate of minus 9.77%. In addition, the same at Guaraní Airport has also declined at the average annual rate of minus 20.59% from 1996 to1998.

Table 6 Number of Arrivals and Departures of Commercial and Military Flights at Silvio Pettirossi International Airport

FLIGHTS	1994	1995	1996	1997	1998	Average Annual Growth Rate
International	N/A	10,428	9,998	10,193	9,920	-1.65%
National	N/A	31,756	25,369	20,060	22,938	-10.28%
Military	N/A	6,284	6,905	5,134	2,749	-24.09%
Total	N/A	48,468	42,272	35,387	35,607	-9.77%

Source: DINAC

Table 7 Number of Arrivals and Departures of Commercial Flights at Guaraní International Airport

FLIGHTS	1994	1995	1996	1997	1998	Average Annual Growth Rate
International	N/A	N/A	2,387	3,031	730	-44.70%
National	N/A	N/A	4,454	4,646	3,584	-10.30%
Total	N/A	N/A	6,841	7,677	4,314	-20.59%

Source: DINAC

The number of commercial airline passengers arriving and departing at the Silvio Pettirossi International Airport remained unchanged in these 5 years. On the other hand, the same at Guarani International Airport has declined at the average annual rate of minus 10.65% from 1996 to 1998.

Table 8 Number of Commercial Airline Passengers Arriving and Departing at Silvio Pettirossi International Airport

FLIGHTS	1994	1995	1996	1997	1998	Average Annual Growth Rate
International	433,745	476,952	475,738	442,481	430,061	-2.53%
National	45,824	80,231	82,233	78,095	69,006	7.65%
Total	479,569	557,183	557,971	520,576	499,067	-1.36%

Source: DINAC

Table 9 Number of Commercial Airline Passengers Arriving and Departing at Guarani International Airport

FLIGHTS	1994	1995	1996	1997	1998	Average Annual Growth Rate
International	N/A	N/A	15,171	12,640	12,723	-8.42%
National	N/A	N/A	43,870	36,482	34,408	-11.44%
Total	N/A	N/A	59,041	49,122	47,132	-10.65%

Source: DINAC

The volume of imports and exports at Silvio Pettirossi International Airport has been reduced at the

average annual rate of minus 19.07% from 1994 to 1998. The volume of imports at Guarani International Airport has grown at the average annual rate of 34.03% from 1996 to 1998

Table 10 Volume of Imports and Exports at Silvio Pettirossi International Airport (Tons)

Type of Cargo	1994	1995	1996	1997	1998	Average Annual Growth Rate
Imports	16,278	21,909	15,008	8,704	6,727	-19.82%
Exports	1,972	1,418	1,590	1,390	1,101	-13.56%
Total	18,250	23,327	16,598	9,094	7,828	-19.07%

Source: DINAC

Table 11 Volume of Imports at Guarani International Airport (Tons)

Type of Cargo	1994	1995	1996	1997	1998	Average Annual Growth Rate
Imports	N/A	N/A	5,686	8,956	10,214	34.03%
Exports	N/A	N/A	N/A	N/A	N/A	N/A
Total	N/A	N/A	N/A	N/A	N/A	N/A

Source: DINAC

As seen above, air transportation volume is smaller than that of other means of transportation. In addition, air transportation volume has been decreasing these years. It is considered that this decrease reflects the stagnation of Paraguay economy in recent years. Therefore, if the economy takes a favorable turn, air transportation volume will increase.

(4) Structure of transport

Regarding traffic movement, it is necessary to grasp details of the flow from material to final consumption concerning freight, which shows complicated movement. OCIT data, containing input from customs documents data, will be used in the detailed analysis of freight movement. Regarding export/import volume, there exists data from Central Bank that was used in 1), but a slight difference appears when it is summed up. Table 12 shows a comparison between OCIT data and Central Bank data. Central Bank's data is less than OCIT's, suggesting that Central Bank data has some omissions. Therefore, OCIT data will be used from now on as export/import data.

Table 12 Export/import Volume, Based on BCP and OCIT Data

(Unit: 1000tons)

	Export		Import	
	BCP	OCIT	BCP	OCIT
1995	2,768	2,727	2,541	2,605
1996	3,272	3,467	2,417	2,783
1997	4,002	4,418	2,588	2,724

1) Export/import items

Table 13 shows the weight volume of exports and imports by item, for the period of 1994-1997. The highly ranked items show no big change, although import of fertilizer is increasing recently. Another point is that the export volume of items related to cotton, which was the main export item in 1990, fell from the top 15 items.

The item ranked top in export volume is oil-stuff seeds such as soybeans, corresponding to 30% of the total export in 1997. The top item in import volume is petroleum-related products, corresponding to 16% of the total import volume in 1997. In the same year, the sum of the weight of the top 15 items in export and import volume corresponds to 86.5% of the total export/import volume, and the top 10 items correspond to 80%.

Table 13 Changes in the Top 15 Export/import Items by Category (ton basis)

			Ranking of Export + Import							
Code	Category	Main items	1994	1995	1996	1997	Import volume	Export volume	Export + Import	% of total export + import
12	Oil stuff seeds	Soybean, peanut	2	2	1	1	24.2	2131.7	2155.9	30.2%
27	Petroleum-related products	crude oil, gasoline	1	1	2	2	1125.9	10.9	1136.8	15.9%
10	Grain	Wheat, maize	6	6	5	3	6.7	512.7	519.4	7.3%
44	Wood	Logs, lumber	3	4	4	4	2.5	486.1	488.6	6.8%
23	Food	Soybean cake	4	3	3	5	12.1	460.5	472.6	6.6%
25	Mineral	Gravel, cement	5	5	6	6	83.4	347.7	431.1	6.0%
31	Fertilizer		61	9	7	7	172.2	0.1	172.3	2.4%
22	Beverage	Beer, drinking water, wine	12	8	9	8	109.2	28.1	137.3	1.9%
15	Vegetable oil	Soybean oil	7	11	8	9	6.1	122.7	128.9	1.8%
72	Iron	ore scrap, ballast	10	13	11	10	72.0	50.3	122.3	1.7%
84	Machine part		16	14	14	11	120.7	1.1	121.9	1.7%
87	Car-related items	Cars, car component	15	16	16	12	115.1	0.1	115.2	1.6%
85	Electronic-related items		21	12	12	13	95.1	0.5	95.6	1.3%
39	Plastic products		37	18	15	14	60.9	3.2	64.1	0.9%
11	Milling	Flour	31	25	25	15	0.6	13.4	14.0	0.2%

Source: OCIT

2) Export/import method

Regarding the transport mode used in export, the proportion by waterways is increasing recently, and in 1998 (January – October) the ratios of land and water transport marked almost the same value, 50% each. Railroad and airfreight were almost zero. The increase in water transport is due to the fact that the transport of soybean is shifting to waterways recently. As for the export of items other than soybean, land transport corresponds to 80% and water transport to 20%. Regarding imports, land and water transport are 50% each, a ratio that shows almost no change through the years.