5.4 Bus Transport Service

5.4.1 Management

(1) Public Transport Company

There are 93 companies authorized for public transport, of which 54% are authorized to operate with different types of vehicles and different levels of service. Companies which only operates taxi service are 23 %. Companies operating only Colectivos are 17% including zone services and, 3% only operates mix service. (Table 5.4-1)

Table 5.4-1 Bus Companies in Bogota

	No. of Companies
(1) Fleet (excl. Taxi)	
0 - 99	23
100 - 199	7
200 - 299	6
300 - 399	9
400 - 499	6
500 - 999	10
1000 - 1500	4
1500 -	1
Total	66
(2) By type of Vehicle	
Bus Corriente	46
Bus Ejectivo	32
Bus Super-Ejectivo	2
Buseta	34
Colectivo	37
Nixed	5
Taxi	45

(2) Procedure to Establish a Bus Company

Creation of a company (Transport law)

Article 983 Codigo de Comercio, STT grants authorization to create a bus company to those who have an interest to participate in the public transport business for passengers or mix, if they fulfill the following requirements:

a) Letter of intention to make the company
b) Camara de Comercio certificate
c) Feasibility study that indicates:
   zone/ service conditions/ service level/ type of vehicle/ need for the routes/ frequency and areas of operation/ Determination of the transport capacity required/ relation to the vehicles that would operate.
d) Announcements
e) Previous authorization
f) Operation license: Recognition from STT to a company that fill following requirements:
   - Labor contract with all the drivers
   - Certification from ISS with Social Security Number
   - Lease or administration of vehicles contracts
   - Documents that shows vehicles property
   - Minimum transportation capacity belonging to the company and/or

shareholders
- Accounting system and up to date accounts
- Internal functioning rules of the company
- Administrative and operative structure of the company
- Installations for the operation
- Terminals that are adequate to dispatch vehicles
- Terminals that are adequate to operate vehicles
- They must have a program and a system of preventative maintenance for the vehicles owned and affiliated of the company
- Security policies required by law
- Fund for reposition of vehicles
- Functioning license for 10 years under the name of the company

(3) Functions of Public Transport Company

By law, public transport companies should have functions of the following items:

a) To have an adequate maintenance service for vehicles, paid for them or facilitating the owners to do so.
b) To make contracts with drivers on salary.
c) To carry-on the name, distinctions and the number of order that allows vehicle identification
d) To control vehicles by using authorized stickers that indicates the level of service or fares and routes identification
e) To obtain and provide the vehicles operation card of the company and operate the routes, schedule and zones with the authorized fares and frequencies
f) To uphold the service policies
g) To provide the authorities with the data that are required for a study.
h) To have internal rules in the company

5.4.2 Operation

(1) Fleet

Table 5.4-2 shows the number of registered vehicles for public use as of September, 1995. There are about 20,000 units of buses and the bus-like. Most of them are superannuated: the average age is estimated to be 8.7 years for regular buses and 6.3 years for bus ejectivos. More than half of busetas and colectivos are aged over 5 years. In addition to this fleet, there are about 39,000 taxis registered.

These figures came from STT's official statistics. It is reported, however, a significant number of these vehicles is operated for private use, not for public use, because of the tax exemption system to public utility vehicles.

Table 5.4-2 Public Transport Fleet in Bogota

Vehicle Type	No. of Fleet
Bus Corriente (regular)	8989
Bus Ejectivo	1934
Bus Super-Ejectivo	57
Buseta	6589
Colectivo	4126
Total	21,695
Taxi	39014

Source: Transport Company Data, STT

(2) Fare System

Fare system of public transport in Bogota is shown in Table 5.4-3. The rates are quarterly reviewed and revised by STT. They are raised at the same rate as the change in price index, 15 - 20% per annum. On Sunday and Holidays, night time rates are applied.

The Alcaldia Mayor de Santa Fe de Bogota and the STT are in charge of implementing the fare policy to the mass transport system in the Capital District. The city has had a policy of differential fares since 1985, so that the users will have different alternatives and to promote investment in new vehicles and improvement of the quality of the service.

Flat rates by type of vehicle are adopted after a concentrated agreement process between the Administration and the companies which represented by different unions.

The present agreement increases fares in steps, with a maximum increment of 18% in one year, following to the Pacto Social. Microbus and vehicles for higher levels of service such as ejecutivo and super ejecutivo have a limited liberty of fare setting.

All vehicles have two kinds of service: Day and Night, in which fare is increase in 300 pesos, night service is between 8:00 p.m. and 5:00 a.m. Night fare is applied on Sundays and Holidays. Every vehicle must have a sticker with the prices in the upper high side of the window and close to the entrance door of the vehicle. The current fare system as of October 1995 is shown in Table 5.4-3.

Table 5.4-3 Fare System of Public Transport in Bogota, October 1995

Type of Vehicle	Daytime	Night time
Bus		
Corriente(Regular)		
Model 1964 or before	100	130
Model 1965 - 1968	140	170
Model 1969 - 1977	160	190
Model 1978 - 1980	180	210
Model 1981 - 1990	180	210
Model 1991 or after	300	330
Ejectivo	350	380
Super-Ejectivo	370	400
Busela		
Corriente(Regular)	120	150
Ejectiva	220	250
Super-Ejectiva	280	310
Clectivo	300	330

Source: Costs and tariffs Division, STT

STT is in charge of making and up-dating public transport costs analysis, in order to revise different levels of fares depending of the service at proper timing. The costs cover the following components:

1) Variable Costs

Fuel/ Lubricants /Tires, spares and protectors/ Maintenance and reparations/ Salaries and Social Securities/ Bus wash and grease

2) Fixed Costs

Garage/ Road taxes and services/ Administration/ Insurance

3) Capital Costs

Capital recuperation/Feasibility

Variable costs are estimated based on the following factors: (1) kilometers per month by the vehicles according to the service level, (2) number of days of work in average per month by vehicles according to the service level, (3) number of passengers per month per vehicle according to the service level, (4) fuel and lubricants consumption rate, and (5) frequency of change of different parts that must be replaced

5.4.3 Route and Service Frequency

(1) Classification of Routes

The STT is the entity that is in charge of authorizing the routes to the companies by resolving the alignment by direction of circulation for each route, schedules, and frequency, the type of vehicle and level of service. Routes are classified by the type of journey as:

1) Circulation Route

Open Route: It operates with only one terminal located in the origin of the service and operates the journey in a circular way using different roads.

Close Route: It operates with only one terminal located in the origin of the service and operates going in both directions, using the same roads or in the same influence zone.

2) Diametric Route

It operates with two terminals that are placed on both ends and whose alignment is operated under the same influence zone. Those routes cross the city from North to South with very long journeys.

3) Peripheral Route

It operates between or inside the peripheral city zones which are given by the topographical conditions and roads with difficult access to the zone.

4) Routes For Mixed Service

They go to the several wholesale market (centros de abastos) of the city.

5) Informal Transport

It is the non-authorized peripheral transportation that serves those zones in which public transport is defective or does not exist, because it operates in sub-normal or illegal zones. This service operates with vehicles of colectivos or old camperos type, whose owners are organized in small companies and operate under their own conditions and fares without any control by the authorities. This service is illegal, it generates big problems because there is no alternative for the residents in these zones. Schedules depend upon the zone, sometimes 24 hours, sometimes only early in the morning and night.

According to the STT data, there are 631 authorized routes, of which 500 routes are operating with authorization. 20 are authorized but operating different routes. The rest of the 111 routes are authorized but abandoned.

In addition to these authorized routes, there are 95 illegal routes operated, mostly with good frequency. Out of those, 55 routes are operated with authorization, but from a

different origin, to a different destination or not on the designated route.

(2) Authorization of Routes

The application to operate areas, routes, schedules, frequencies, transport systems or sub-systems, presented by companies or societies to the authority (STT), must have:

a) Indication of the company or companies that are in the society, have the level of service, type of vehicle, and zone authorized to operate the service requested.
b) Route or routes map that conform the system or sub-system, with indication of length, time of the journey, service time, roads type, bus stops, terminals, frequency, type of vehicles, and socioeconomic profile of the zone of influence.
c) To operation zones: Socioeconomic profile of the zone in which they plan to operate, bus stops, terminals and type of vehicle.
d) Quantification of the potential transport demand by origin and destination by studies made under normal conditions of demand.
e) Confrontation and influence of the route, operation area, system or sub-system requested with the authorized influence area.
f) Road and traffic analysis in the route, system or sub-system requested.
g) Demonstration that they have or will have the vehicles to operate the route, the operation area, system or sub-system requested, without affecting the already authorized service.
h) Guarantee of the proposal by an insurance policy for 1 year.
i) Document from STT, that proves all fines imposed to the company or society are paid.

After the evaluation, the authority will order the applicants to announce the new route in a newspaper of some well-known circulation, to check if some people complain. After the period for complaining, or rejection of the complaints the route will be authorized.

5.4.4 Facilities for Bus Service

(1) Bus Exclusive Lanes on Avenida Caracas

1) Traffic Volume in 1989

As the first bus priority project, Avenida Caracas was selected in order to develop public transport and for implementation of some other acts, such as the reinforcement of transports authorities; the restructuring of urban transports enterprises, no parking fares control, stopping and parking controls, etc.

The chosen roads were the Carrera 24, the Calle 80 and the parallel roads (par vial) of Calle 68-66 on the sense east- west, and the south-west corridor formed by Autopista al Sur and the Avenida 1° de Mayo.

At the most loaded section in the north- south direction, the Avenida Caracas handled 499 vehicles/hour (218 busetas and 281 buses) in the morning peak hour between Calles 60 and 57. Carrera 13 handles, in its most loaded part, 659 vehicles/hour (505 busetas and 54 buses). In the south-north direction, the point with the higher load is between Calles 53 and 57 with 737 vehicles/hour (427 Busetas).

In the morning, between Caracas and Carrera 13 they move up to 33,000 passengers/hour for north-/South; in the opposite way, it moves between Avenida Caracas and Avenida 10 at 28,000 passengers/hour. Between downtown and Teusaquillo and between Avenida Caracas and Avenida 7ª it moves at 34,000 passengers/hour. In the afternoon, for North-south, Avenida Caracas manages 27,000 passengers/hour and by Carrera 10ª, 30,000. North- south, it carries 10,000 passengers/hour on the Avenida 7ª

and the Avenida Caracas, 6,000.

The road was improved in 4 -Lane road in both directions, divided in 2 for buses with a width of 6.60 meters and for particular vehicles, with a width of 6.00 meters. The central sidewalks have an average width of 3.00 meters. Each station has 4 covered modules for a total length of 24 meters. Distance between bus stops driving the same route is maximum 600 meters. At the same time, at-grade pedestrian crossings are installed, traffic signal controlled, protected by barriers to regulate pedestrians (Figure 5.4-1). This project was implemented in 1989 to 1992 divided in two steps.

Referring to other roads, a general readjustment of the parallel and crossing corridors was proposed, with improvements in intersections, paving, carriages width, etc. The left turns are made trough the local streets and street parking is moved to other close streets, where the traffic is not disturbed. Colectivos were moved to Avenida 7ª, private cars to the Circunvalar and to 16, 17, 19, 20 and 22; and some other bus routes to Carrera 13. Referring to the buses, they are restricted to 450/hour, which is considered the maximum capacity. All moved routes must take the other corridors (Avenida. 7ª, Carrera. 9, 13, 15 and 16).

As a result of computer simulation, the following effects were expected by the implementation of the project:

a) Passengers staying time: from 56.517 to 36.393 pax-hours reduced by 35%.
b) Vehicles staying time: public transports vehicles passes from 1141 to 730 buses-hours
c) Kilometer by type of vehicle: 3% reduction is expected for buses and 3% increase for vehicles. For busetas the reduction is 12%.
d) System Speed: Proposed speed is 19 Km/h, 46% improvement above actual 13 Km/h speed. Public Transport increase is from 10 to 14 Km/h, meaning 40% improvement.
e) Saturation level is reduced under actual levels, thus increasing the trip speed.

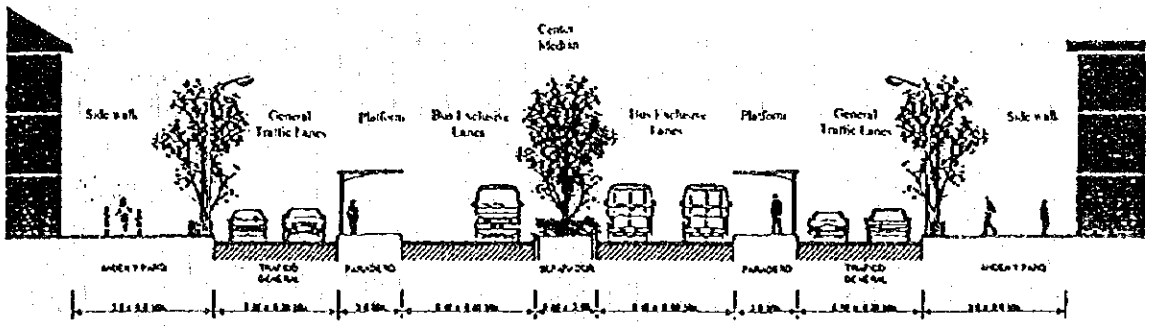

Figure 5.4-1 Cross- Section of Avenida Caracas Bus Exclusive Lane

2) Post Evaluation

The post-evaluation study was made between October 1993 and July 1994, by STT and Grupo Interinstitucional de Transporte(GIT), to compare the previous situation, the design figures, initial results and the situation two years after the implementation, in order to correct the mistakes and define parameters for new similar projects. The following effects became clear:

a) Public Transport Exclusive Lines:

North bound average speed: was increased 21% in the north section and 62% in the central section. South bound average speed: 69% increase in the north section and 55% in central section.

b)General Traffic Line

Traffic volume has increased as much as 234% (afternoon, south bound in the north section). North bound, in the north section, traffic volume has increased by 8% and more than 76% in the central section. South bound in the north section, daily traffic volume has increased by 85%, but in the central section, it has decreased by 32%. Design speed has not been achieved, because of the increase in vehicles after 1992 (Car taxes changed from 300% to 15%).

c) Carrera 13

Speed has decreased in 10% (previous afternoon restriction favored general traffic and the proposed bus stop system has not been implemented).

d) Carrera 16

Traffic volume reduction was 38% for calle 45-68 section and 8% for calle 68-72, because public transport has been introduced. Overall speed has decreased by 5%, because of street parking, pedestrian crossing and commercial activity increase.

e) Carrera 17

Carrera 17 changed from two way to one-way and speed has increased, although paving conditions were not good.

As the conclusion, the project has been a success, but the lack of control and maintenance reduced slightly the project's benefits.

(2) Bus Terminals

Bogota Bus Terminal company was established in 1980 with the authorized capital of 2,500 million pesos (of which paid up capital is 643 million pesos) by the governmental organizations (85%, Municipality, IDU, MOT, etc.) and the private sector (15%, bus operating companies). The Company developed the Central Bus Terminal at Salitre which opened in 1984. This terminal serves the inter-regional buses with route distance over 50 km from Bogota.

Each bus company collects from bus passengers 3% of the bus fare as the terminal charge and pays 45 to 70% of the amount to the terminal company, according to the number of terminals on the route.

Monthly revenue of the terminal company is about 250 million pesos, while the monthly expense is about 100 million pesos. Although the current account is positive, the company is facing serious financial difficulties because of heavy interest payment for new sub-terminal development projects.

1) Inter-regional Bus Terminal

Inter-regional bus terminal dispatch buses are nationwide. It has a boarding platform, mailing, toilets, storage, taxis and public transport area. It is divided into four areas painted in different colors for easy recognition:

a) Yellow : South and Southwest.

b) Blue : Northwest
c) Red : North, Northeast.
d) Green : Small vehicles.

There are 61 companies for inter-city passengers transport, operating buses, busetas, microbuses and taxis, with different levels of service:

a) Level 1 Current
b) Level 2 Luxury
c) Level 3 Air conditioned
d) Level 4 Taxi service.

Fares depend on distance, level of service and terminals used. From Bogota terminal there are 461 authorized routes. 61 companies operate from the terminal were they sell tickets, dispatch and end routes. In strategic points of the city they have satellite terminals, for ticket sale and bus boarding buses.

The transport terminal has urban circular routes served with buses and colectivos and two internal routes. Fares are set by STT. Regional transport for nearby cities does not use the terminal. They have their own terminals and use the city streets. Those terminals are located near the old Sabana train station. The terminals are too small for the demand, and generate illegal public space occupation and urban deterioration.

2) Urban Buses Terminal.

There is no specific terminal. Usually streets are used as such. They operate from a metallic constructions. They use the public space illegally, and generate high urban impact activities like parking, maintenance and delinquency. Usually these are residential neighborhoods. In these conditions, planning, operation and control by STT is very difficult.

Every company has a terminal from where they dispatch, according to the neighborhood they are serving. The dispatcher is the one who authorizes a bus to start, according to his judgment and arrival order. There are 615 so called neighborhood terminals, usually in the suburbs of the city.

In connection with Troncal Caracas Project, three neighborhood terminals were constructed in Aurora II, Molinos II and Diana Turbay, all of them are located in the south of the city: The main objectives of them were:

a) To Avoid congestion, illegal use of public space and chaos caused by buses parking on the roads.
b) To provide an adequate, organized and safe place to board the bus.
c) To provide a place to operate the service properly.
d) To provide the drivers, a parking place, with toilets and cafeteria.
e) To provide the companies and the authorities a place for control and operation.
f) This terminals would improve the Troncal Caracas operation, by a better service frequency.
g) To concentrate in only one place the different companies operating in the area.
h) To avoid the urban deterioration by improper development of the maintenance activities.
i) To provide the so called "City Gem", a place from where urban life is born and extended to the surrounding area.

Every terminal has a service module (Toilets, cafeteria, dispatch office and control office), platforms, parking area and shield bus stops. Roads connecting each terminal were paved. Today they are not operating properly because of the lack of control, and

somehow the pervious conditions remain. These terminals were given to local cooperatives, and they gave them again to the transport companies.

STT has carried out a transit projects in Suba and Bosa, where different problems and their causes were analyzed, proposing specific projects. This projects have been presented to the Local Authorities for their construction.

5.5 Taxi Service

5.5.1 Fleet and Companies

In the mid-1980s, there were about 15,300 taxis operating in Bogota. The taxi fleet has rapidly increased during the past ten years and now exceeds 40,000 units in 1995 according to STT registration data (Table 5.5-1). However, it is estimated that 25% to 30% of them are not operated as taxis, but used for private business purposes. This happens because taxis are levied taxes more favorably than others. For instance, the value added tax at the purchase of a car is 15% for taxis while more than 30% for others.

Table 5.5-1 Increase of Taxi Fleet in Bogota

Year	Taxi Fleet
1985 December	15,300
1990 December	25,061
1991 December	36,490
1992 December	38,705
1993 August	39,500
1994 December	40,282
1995 July	39,214

Note: * estimated
Source: Unidad de Transporte Publico, STT

There are 45 companies operating taxis, of which 21 companies are engaging also in bus businesses. The largest companies manages 22,000 taxis, more than half of the total. In the same way as a bus company, taxi companies generally do not have any taxi fleet of their own, but are a group of taxi owners. A person who wants to start a taxi business has to get a car and the right of quota (cupo) which costs about three million pesos and belong to some bus company. He can choose to be a society member, by buying the stock of the company or to be an affiliate without shares.

Table 5.5-2 Taxi Companies in Bogota (1995)

Taxi Fleet	No. of
1 - 9	4
10 - 99	12
100 - 499	14
500 - 999	7
1000 - 1999	2
2000 - 2999	5
3000 - more	1
Total	45

Source: Unidad de Transporte Publico, STT

A member or an affiliate is obliged to pay monthly dues (called "rodamiento") to the company. The amount of these dues is different by companies, and in the case of a Company A, 18 US$ for a radio taxi and 9 US$ for a taxi without radio. By law, the amount cannot exceed 10% of monthly proceeds. On the contrary, the company provides the member or the affiliate with such services as documentation to STT and security companies, business guidance, passenger information service by radio and financing for parts and repair, in some cases.

5.5.2 Operation

(1) Taxi Fare

Taxi fare is also controlled by the Division of Costs and Tariff of the Public Transport Unit, STT in the same way as Buses. All taxis are obliged to install a taxi meter. As of October 1995, the formal taxi fares are as follows:

1) Regular charge

a)	Basic fare	350 pesos
b)	Every 69m running	10 pesos
c)	Every 90 second stopping	10 pesos
d)	Minimum Charge	750 pesos

2) Additional Charge

a)	To/from Airport	700 pesos
b)	Door to door service	400 pesos
c)	Night time (8:00 p.m. to 5:00 a.m.) Sunday and holiday	110 pesos

(2) Daily Operating Distance and Proceeds

To get daily operation records, 50 taxis selected at random were surveyed on a weekday in October 1995 (hereinafter, referred to as "taxi survey"). Survey items are starting and arriving time and mileage, origin and destination, number of passengers, fare and usage of radio to get the passenger(s) for every trip.

According to the survey result, daily operating distance is in the range of 105 km to 267 km and the average is 172 km. The ratio of distance with passengers is 65.2%. There is no significant difference of this ratio between taxis with radio and without radio: 65.7% for the former and 63.4% for the latter.

Out of 50 sampled taxis, 76% have a radio but the rest. In case of a radio taxi, the ratio of getting passengers by radio is rather low at 45%.

Number of trips with passengers is widely varied by taxi, ranging 6 to 25 trips and the average is 15.8 trips a day as shown in Figure 5.5-1. Most of taxi drivers are the owner of the taxi.

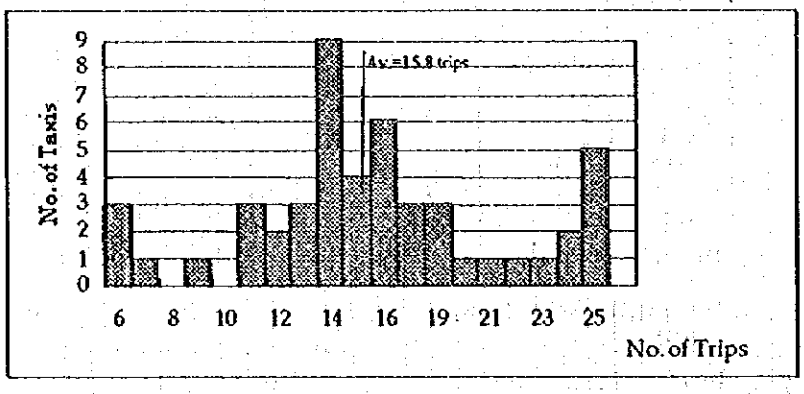

Figure 5.5-1 Distribution of Daily Taxi Trips

He will work as he likes. He can stop working based on sales (proceeds), not by hour. Perhaps, this is the reason of the wide distribution of the number of daily trips. Some drivers prefer to work only in the night time, for example, from 8:00 p.m. till 4:00 a.m.

because of traffic congestion in the daytime and negotiability of fare at night time.

The correlation between daily proceeds and working hours is illustrated in Figure 5.5-2. The lowest proceeds is 19,400 pesos, the highest is 50,300 pesos and the average is 32,700 pesos. The taxi that earned the lowest amount was operating 8.5 hours (from 5:30 a.m. to 14:00 p.m.) and the taxi that earned the highest was operating 16.5 hours (from 9:30 a.m. to 2:10 a.m.). The average work time is 10.9 hours.

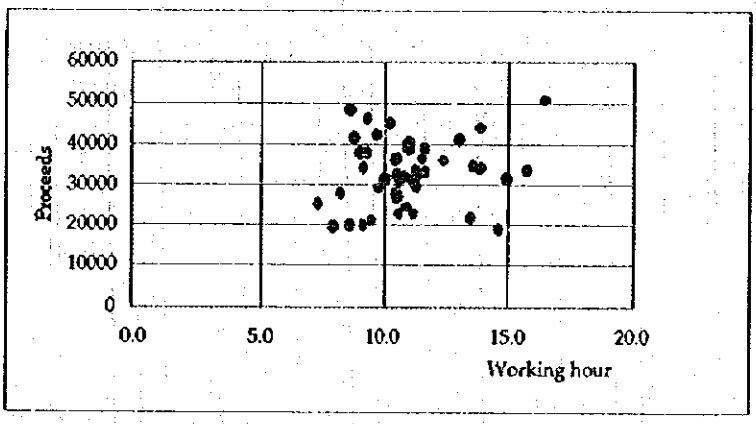

Figure 5.5-2 Daily Proceeds and Working Hours of Taxi

5.5.3 Demand Structure

61.6% of taxi trips with passengers are transporting one passenger and 29% are two passengers. The average number of passengers is 1.5 per trip (Table 5.5-3).

Table 5.5-3 Number of Taxi Passengers per Trip

Number of Passenger	Composition(%)
1	61.6
2	29.0
3	7.8
4	1.4
5 or more	0.2
1.5 passengers	Average

The total number of taxi passengers is estimated based on the following data and assumptions:

a) 25% of total fleet of approximately 40,000 units are not used as taxi.
b) Average operating rate of taxi is 90%.
c) Number of daily trips with passengers is 15.8 trips
d) Average occupancy is 1.5 passengers per trip

Thus, total number of daily taxi passengers is:

40,000 x (1-0.25) x 0.9 x 15.8 x 1.5 = 639,900 passengers / day

Average trip length is 7.0 km and 19.6 minutes, then, average travel speed is 21.4 km/hr. Distribution of trip length is shown in Table 5.5-4. Figures in the table are the number of sample trips.

5.5.4 Financial Condition

As stated before, average proceeds are 32,700 pesos. Assuming 25 working days per month, gross monthly revenue will be 817,500 pesos. According to taxi drivers, fuel cost is

about 5,000 pesos per day (125,000 pesos monthly) and maintenance cost is in the range of 150,000 to 200,000 per month. Deducting those costs and "rodamient" paid to the company, net monthly revenue would be about 500,000 pesos.

The estimated amount is seemingly not enough to cover capital cost (depreciation and interest payment). In fact, owner drivers have no idea about depreciation. Those figures will be compared later, with the vehicle operating cost estimated by STT.

Table 5.5-4 Trip Length of Taxi Trip in Distance and Time

	Trip Time (Minutes)														
Km	0-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60	60-	Total	%
1	10	24	11	2	0	1	1	0	0	0	0	0	0	49	6.3
2	13	33	26	8	1	0	0	1	1	0	0	0	1	84	10.9
3	1	36	32	12	1	0	0	2	0	0	0	0	0	84	10.9
4	0	17	35	14	7	2	1	0	0	0	0	0	0	76	9.8
5	0	7	23	17	7	5	5	0	0	0	0	0	0	64	8.3
6	1	3	18	19	6	6	2	2	0	0	0	0	0	57	7.4
7	0	1	9	17	18	8	4	1	0	0	0	0	1	59	7.6
8	1	2	7	12	14	7	3	4	1	1	1	0	1	54	7.0
9	0	0	6	4	14	7	6	3	1	0	1	1	0	43	5.6
10	0	0	2	6	7	6	11	3	4	0	0	1	0	40	5.2
11	0	0	4	4	4	4	5	2	1	3	1	0	0	28	3.6
12	1	0	1	3	4	7	6	1	2	1	0	0	1	27	3.5
13	0	0	1	2	3	2	8	4	3	0	2	0	0	25	3.2
14	0	1	1	1	1	2	4	4	4	5	2	0	0	25	3.2
15	0	0	0	1	2	5	2	1	3	1	1	0	1	17	2.2
16	0	0	0	1	1	1	1	1	2	2	2	0	0	11	1.4
17	0	0	0	0	1	3	0	0	1	1	0	0	0	6	0.8
18	0	0	0	0	1	1	2	1	1	1	1	0	0	8	1.0
19	0	0	0	0	1	0	1	0	0	1	0	0	1	4	0.5
20	0	0	0	0	0	2	0	0	0	0	2	0	0	4	0.5
20-	0	0	1	0	0	0	0	2	0	2	0	2	2	9	1.2
Total	27	124	177	123	93	69	62	32	24	18	13	4	8	774	100.0
%	3.5	16.0	22.9	15.9	12.0	8.9	8.0	4.1	3.1	2.3	1.7	0.5	1.0	100.0	-

5.6 Railway Service

5.6.1 National Railway System

(1) Outline

The total extension on the Colombian National Railway system was 3,154 km in 1994, out of which 1.239 km is not in use, thus 1,915 km is under operation. Figure 5.6-1 illustrates the railway network.

The railway transport is only for cargo. Passenger transport reached the peak in 1975, exceeding five million passengers a year, and since then, decreasing year by year due to the development of road, river and air transport. Finally in 1992, passenger service was discontinued.

On the other hand, annual railway cargoes recorded 2.5 million tons or 1,200 million ton-km in 1970's and fell in a decreasing trend in 1980's, showing 1.3 million tons (1.8% of the total cargo transport) or 730 million ton-km (2.6%) in 1984. As this decrease continued, it fell to 0.8 million tons (0.5%) or 330 million ton-km (0.6%) in 1994.

It was difficult, originally, to expect a huge capacity on the Colombian railway because it was constructed threading mountainous areas in bad alignment. In addition, poor maintenance because of financial difficulty accelerated its deterioration and decrease in capacity, which resulted in losing demand and then the financial conditions became worse. Thus, the railway system fell in a vicious circle. Each local line was forced to stop its service one by one and the operated lines was reduced to the said length.

Beside the National Railway, there are two private railways in Colombia: one is a 145 km line between Cerrejon and Pto. Bolivar (145 km), annually transporting 13.0 million tons of coal and the other is a 37 km line between Paz de Rio and Belencito, transporting 1.0 million tons of iron ore.

Due to the demand decrease and accumulated financial deficit, the National Railway of Colombia (FNC) was dissolved and privatized by the Law No.21 of 1988. The FNC was transformed to a new public entity in smaller size named " Empresa Colombiana de Vias Ferreos (FERROVIAS)" which manages infrastructure and facilities of the railway. Figure 5.6-2 shows its organization.

By introducing private capital, two companies were newly established for the railway operation: "Sociedad Colombiana de Transporte Ferroviario (STF)" and "Sociedad Colombiana de Transporte Ferroviario de Occidente (STFO)". They have contracts annually with FERROVIAS to operate the assigned railway. The national and private capital share of STF is 49:51 and of STFO is 30:70. Then, both of them are regarded as private companies.

Another new entity, "Fondo Pasivo Social de Ferrocarriles (FPSF)" was founded to succeed to and manage the assets of FNC. This agency is also dealing with pensions and insurance of retired employees of FNC.

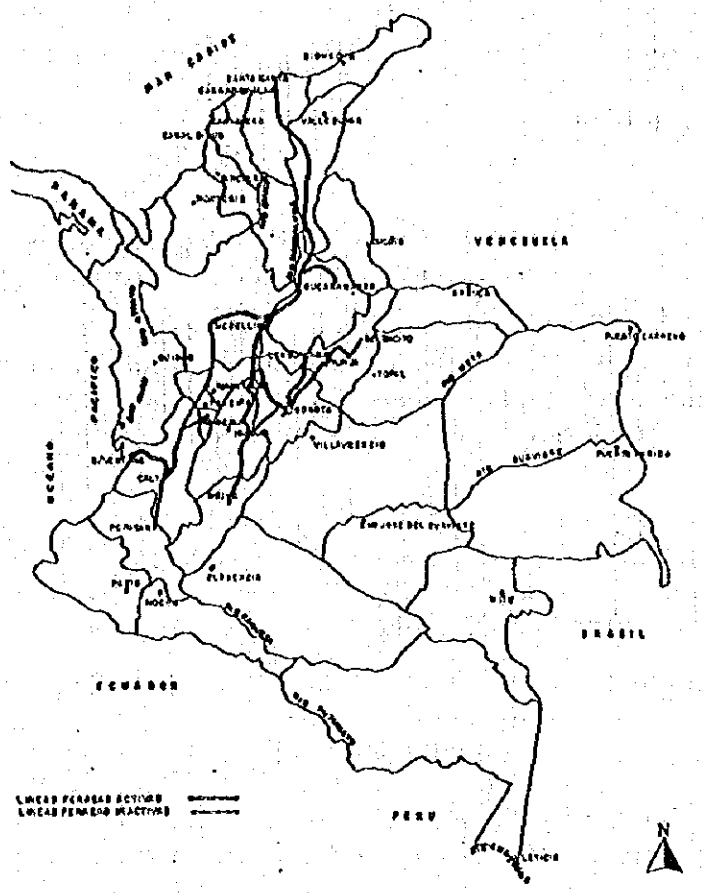

Figure 5.6-1 Network of the National Railway of Colombia

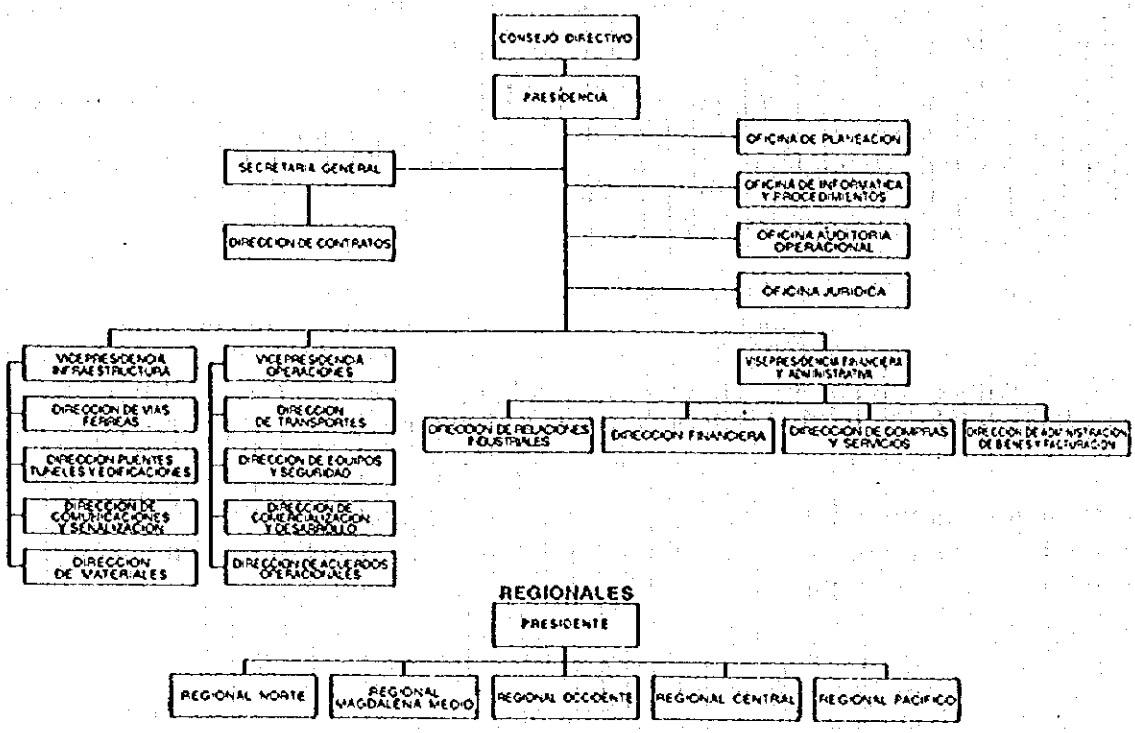

Figure 5.6-2 Organization of FERROVIAS

(2) Railway Transport

The 1,915 km railway lines under operation are divided into three groups: Red Atrantico (1,171 km), Red de Nordeste(340 km), and Red de Occidente (236 km) of Buenaventura - Buga line. The former two are operated by STF and the last by STFO.

Red Atrantico consists of two lines in Bogota - Pto. Salgar - La Loma - Santa Marta line (973 km) which is the longest, and Grecia - Medellin line (198 km) and other access lines (168 km) with few trains operated. Red de Nordeste is also composed of two lines: Bogota - Belencito line (262 km) and La Caro - Lenguazaque line (78 km).

Recent major cargoes of STF are coal, cement, fertilizer, steel and grain in the descending order and of STFO, sugar, rubber and salt.

Since 1988, railway cargoes were decreased below one million tons, sometimes, down to 300,000 tons. In 1994, annual demand was recovered to 810,000 tons (620,000 tons by STF and 190,000 tons by STFO), still below the target volume of one million tons. This is partly because of delayed rehabilitation and maintenance were not implemented as scheduled.

(3) Investment

Operating speed has fallen to 25 km/hour, a half of the design speed and trains derailed frequently, mainly due to the lack of proper maintenance and rehabilitation of the aged facilities. Thus, the railway system has deteriorated and is loosing its capacity.

Actual investment in the railway in 1991 to 1994 was US$ 84 million, while the planned amount was US$ 338 million for 1991 to 1995 according to the rehabilitation plan made by Consejo Nacional de Pólitica Economica y Social (CONPES) in 1991. Financial difficulties caused this gap.

An effective rehabilitation plan and its steady implementation are absolutely needed for the railway to play its role, making full use of scale merit and competing with other transport modes.

(4) Issues and Policy

As stated above, the Colombian railway has been suffering from deterioration of facilities and poor transport capacity and consequently, accumulated financial deficit. To make a breakthrough, CONPES and related agencies are developing a restructuring plan for the railway, aiming at an effective re-organization and rationalization of management. The main policies are:

a) To establish sound management by abolishing critical lines in the network.
b) To increase the investment for maintenance and rehabilitation.
c) To cooperate with other modes by developing inter-modal facilities.
d) To realize more effective transportation by clarifying the responsibility and relationship of the National Government, Administration Company and Operation Companies.
e) To establish a system to invite private capital to the railway sector.

When the national railway system was privatized in 1988 into FPSF, FERROVIAS, STF, etc., functions and responsibilities were demarcated clearly by law. In practice, however, the scope of right and duty on administration and management of assets were ambiguous for each agency.

Above all, lack of investment is the main reason for the recession of the railway. During 1978 to 1985, railway investment was less than 1% of the total investment in the transport sector. Presently, MOT is carrying out the national transport study to develop a

comprehensive and long-term plan. In this opportunity, it is strongly recommended to make an intensive study on "raison d'etre" of the railway system, that is, "to be or not to be?", from economic, social and political points of view. And if the result is affirmative, the railway should be rehabilitated and improved, mainly by the public investment and demand should be guided to railway transport by policy measures.

On the other hand, rail trucks in the urban area of Bogota can offer the most precious space for future introduction of urban rail transit. Many plans were repeatedly proposed, using railway tracks. The Railway Authorities should play important roles more actively to utilize the precious space effectively.

5.6.2 Facilities and Operation in Metropolitan Area

(1) Outline

Railway system in the Bogota urban area is managed by the Central Regional Office, one of the five Regional Offices of FERROVIAS and operated by STF. Location of the railway lines are presented in Figure 5.6-3.

There are three railway lines: the west line starts from the central station called "Estacion de la Sabana" and runs westward while the north and the south lines branch from the west line. The west and the north lines are operated for cargo, but the south lines are unused.

All the railway trucks in Colombia are narrow gauged at 914 mm. 37 kg/m rails are used in the west line and 30 kg/m rails are in the other two lines. At four crossings with trunk road, the lines are separated in grade and other sections are all at grade where road traffic is stopped at a crossing by closing the gate manually, when a train passes. From, the control center, the passing of a train is radioed to each flagman.

As officially reported, the right of way is 50 m wide for the whole line. However, in most urban sections, both sides of railway truck have been invaded by squatters, the spaces were narrowed to 3 to 5 m in width and over 10 m in the suburban area. This makes the train operation dangerous. Although maintenance of rail trucks is contracted to private companies, they are maintained in very bad conditions due to the shortage of budget. Due to this poor maintenance, a train is forced to run at the speed of less than 15 Km/hour.

(2) Present Conditions of Railway Lines in Bogota

1) West Line

The west line, presently, operates one train a day in each direction between Bogota and Santa Marta, transporting coal, salt, grain and steel to Bogota, but few cargoes from Bogota. Immediately after starting the Sabana station, the west line turn to the west and run straight to Fontibon, crossing Carrera 30, Autopista de las Americas, Carreras 42, 50, 68 and Avenida Boyaca. At the 40 km point, it reaches Facatativa and there it turns to the north toward Santa Marta, branching a line to Neiva in the south which has been discontinued.

Within 5 km from the Sabana station, the right of way is 7 to 13 m wide due to squatters and garbage. At the 5 km point between Carreras 50 and 68, there is a wide marshaling yard and a control center. In the neighboring area, there used to be an industrial zone but recently housing estates have been developed for middle class people.

This west line runs in parallel with and between two arteries; Autopista el Drado and

Autopista de las Americas where recent urban development is remarkable. This fact suggests the possibility of the transformation of this line into an urban railway.

2) North Line

The north line operates one train in each direction everyday between Bogota and Belencito, transporting cement, iron ore, beverages, etc. In the weekend, a tourist train is operated from the Sabana station to Nemocon (60 km), with a steam locomotive by Turistren Company.

Down to the 5 km point, the north line uses the tracks of the west line in common and then takes the route to northeast. Through the Salitre new town now under construction, the line passes the Simon Bolivar Park and El Salitre park. In this section, the right of way is 6 to 10 m wide, partly invaded. At the 9 km point, the north line merges into Avenida Ciudad de Quito, taking its center median with 8m-wide green belts on both sides.

Soon the line crosses Avenida13, one of the busiest street in the city. The crossing is now under grade separation work. Then, the line crosses the Calle 100 and reaches Usaquen station. There are commercial and residential areas for middle class residents along this section and no squatters are found.

After crossing Calle 116, the line takes the route to north, crossing Calles 127, 134 and 153, all at grade, and arriving at La Caro station at the 35 km point. Here, the line branches; one goes to Belencito, and the other to Lenguazaque.

Down to Calle 153, new roads have been recently constructed on both sides. Traffic is rapidly increasing, mainly due to commuters living in this area. If the north line is converted to urban railway, the service should be extended at least to Calle 153 or La Caro station.

3) South Line

Branching from the west line at the 2 km point, the south line takes the routes west-southwest in a straight line, crossing Calle 18A, Calle 13 and Calle 6. Passing by the rotary of Avenida 3 and Transversal 47, and the intersection of Avenida 1 de Mayo and Avenida 68, the line crosses Avenida Boyaca at the 8 km point and meets Autopista Sur at the 10 km point. Then, it runs along the Autopista Sur, passing by Bosa (13 km) and finally reaching Soacha at the 22 km point.

This line has already been discontinued, partly due to the reduction policy since 1980, and partly due to squatting. The right of way width is 3 to 5 m in the urban area and 8 to 12m beyond Avenida Boyaca. Because the line was left disused for a long time, there are many spots occupied by squatters and garbage.

Recently, a rapid population growth occurred along the corridor of Autopista Sur and also in Bosa and Soacha. This trend will continue at least in 10 for the next 20 years. In this respect, the south line could become very precious space for urban transportation in the future.

(3) Utilization for Urban Transport

To cope with the urban transport problems, a lot of plans and ideas have been proposed to introduce a mass-transit system into Bogota. Some of them aimed at utilization of railway land for Metro line, LRT line, exclusive bus way or urban expressway. In some studies, feasibility of such ideas was analyzed.

On the other hand, related agencies have started practical discussions on a substitution line and exchange of land. One alternative plan is shown in Figure 5.6-4, where the west line is terminated at Funza and a new detour line connecting with the north line is constructed along the future "Avenida Regional Longitudinal Occidente", and a cargo terminal is developed in Funza as an intermodal point between railway and truck transportation.

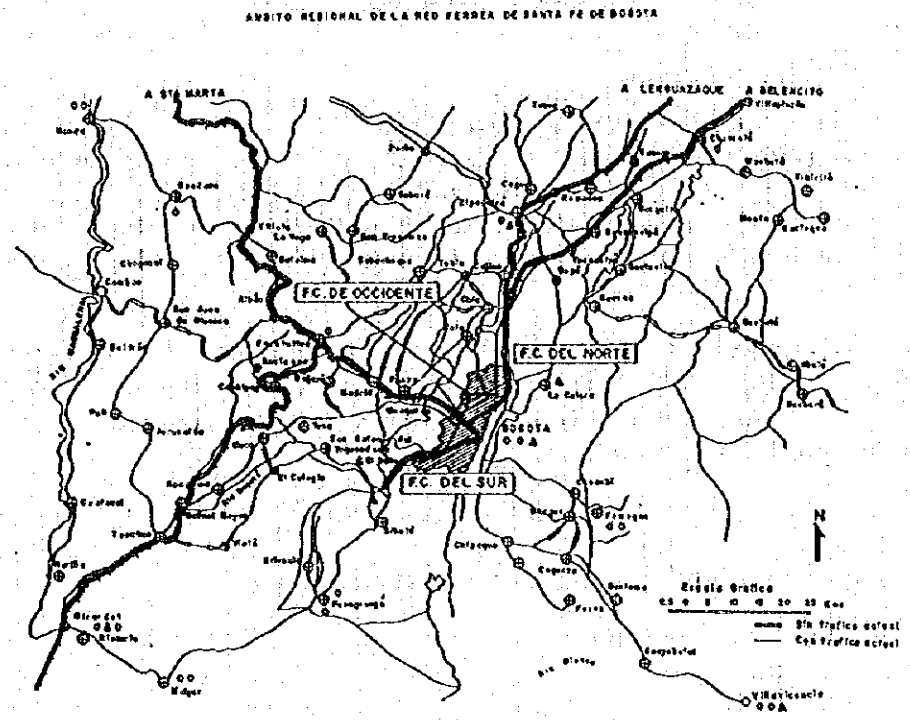

Figure 5.6-3 Railway Lines in Bogota Metropolitan Area

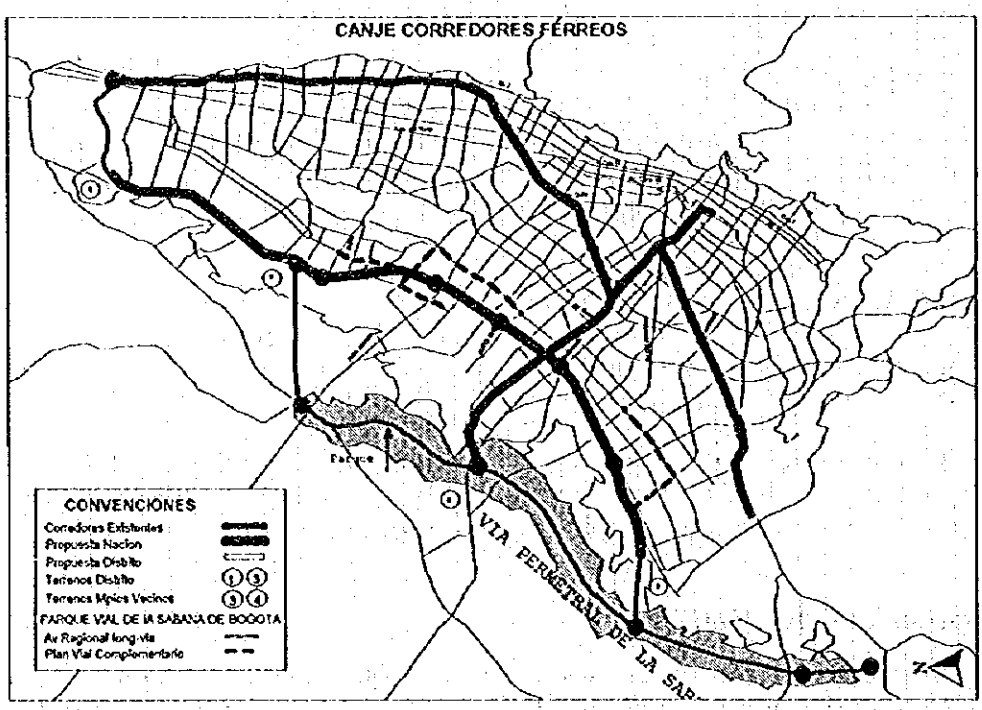

Figure 5.6-4 Development Concept of Urban Railway Corridors and Detour Connection Line

5.7 Review of the Past Mass-Transport Plans

5.7.1 Historical Background

Since street-car service was abolished in the 1960's, the necessity of new mass-transport has been widely recognized in Bogota, and various types of mass-transport and a variety of network plans have been repeatedly proposed to the Central and Local Government. Figure 5.7-1 illustrates the major studies or plans and their relationships, including on-going and future studies.

The first influential study briefly called " Phase II Study", was conducted in 1971 to 1972 to establish an urban development strategy. The transportation sector was an important and strategic part of this study and a feasibility study on mass-transport was recommended. The first comprehensive feasibility study on a mass transport system was done by the INECO-SOFRETU consortium in 1981, and a rail transit network was proposed under the long-term perspectives. This plan was hardly started because of the huge amount of investment required. Ten years later in 1991, the plan was updated by INECO, taking into account the changes in preconditions for the former study.

In the meantime, MPOT invited 21 countries to a bid for rehabilitation and effective utilization of existing railway corridors and four proposals came to the bid. After the evaluation by INGETEC and BECHTEL, a proposal called "Intermetro SPA" from an Italian group was selected, mainly because of its investment requirement was less than others. In the succeeding study, the network was extended to serve the Centro area directly. Finally, the plan had come to a deadlock, mainly due to difficulty of agreement on financing between the national and the local government. In connection with this plan, a project called "Linear Social" which proposed using the south railway line for urban transport, connecting the line with Avenida Caracas, was implemented. However, this plan was also suspended since Avenida Caracas could not solely absorb the demand transported by the train.

In 1990 to 1991, STT planned to introduce exclusive lanes for buses on Avenida Caracas with the technical support of Crichiba in Brazil, and the project was implemented in 1991. The success of this project was followed by other several bus-exclusive-lane projects applying to Carrera 10 & Avenida Jimenez and Calle 80 & 68. The study of the latter is financed by IBRD.

In 1993, the Municipal Government intended to introduce an investment of private sector by granting the concession of mass-transport project. Nine proposals came to the bid and were evaluated by Halcrow & Fox and G. Silvas ASC. The conclusion was that none of the proposals merited the startup immediate negotiation except the one called "Metrobus". Metrobus, however, was only for short- and medium-term measures. The assessment group itself proposed a mass-transport network and a development strategy.

In accordance with the recommendation of the assessment group, the National Government together with the Municipal Government intends to carry out a study called the "Mass-Transport Conceptual Plan" in 1996, in order to formulate a network plan, identify the top priority route, and study the plains feasibility and institutional requirements. Now, DNP is ready to make the international bidding for this study project.

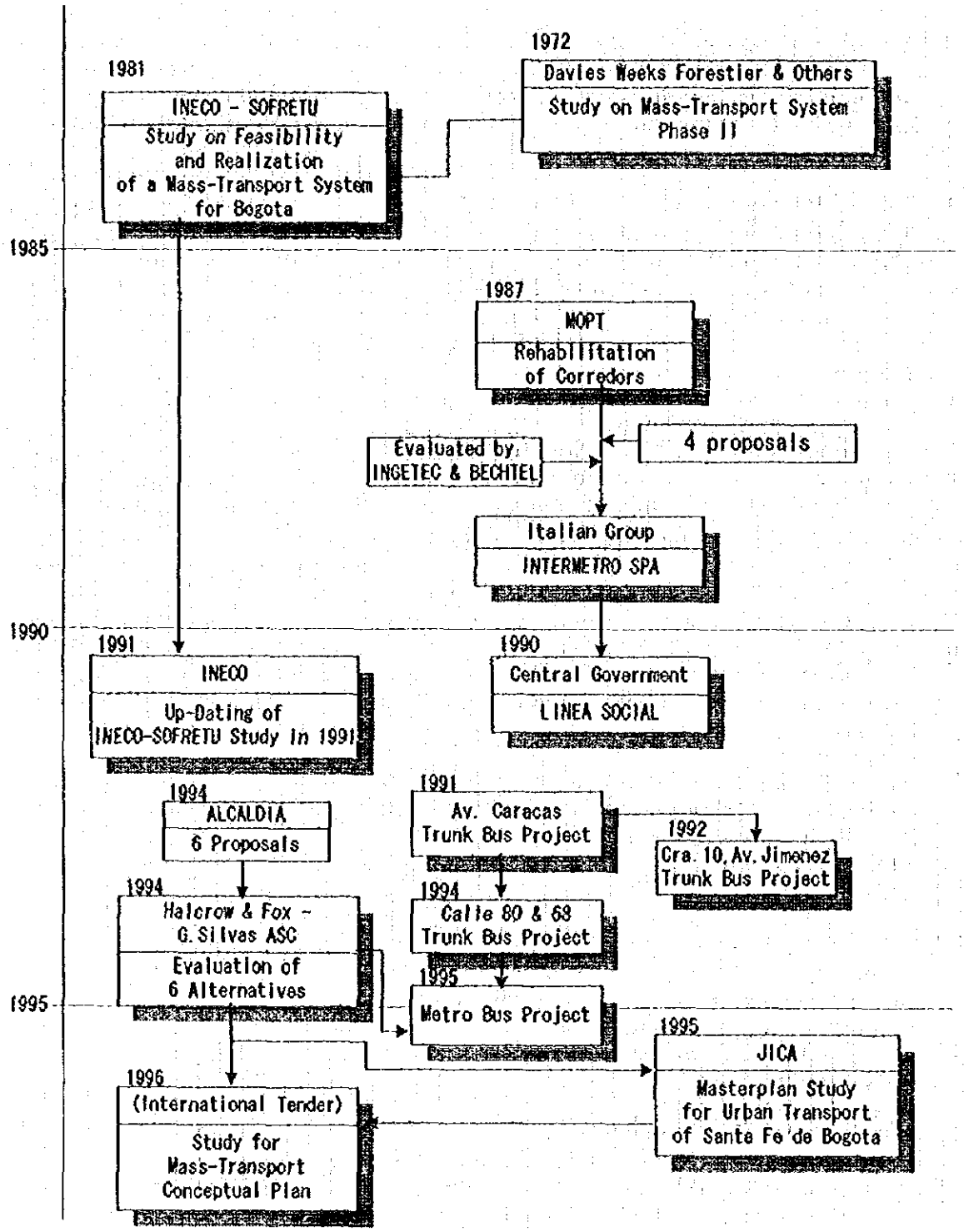

Figure 5.7-1 History of Mass-Transport Study in Bogota

5.7.2 The Future of Bogota, Phase II

The Study was realized in 14 months by the order of Colombian Government, with the support of United Nations Special Fund and the supervision of IBRD. The Study was intended to generate urban development guidelines for the years in the seventies and eighties. Nevertheless, because of the slowdown in population growth, most recommendations have not been implemented. The importance of this study lays on the integrity of urban development and transportation issues, recognizing transportation as the main tool for urban development policies implementation.

At the time of the study, the car ownership rate was still low, partially because of the tax system, but also because the public transportation covered most of the city and offered low fares. However, the public transportation system was also flawed by low quality, efficiency and safety standards. This study presented maybe one of the most accurate forecasts and one with significant influence on the construction of the Bogota Metropolitan Area.

(1) Recommendations of the Study

1) Short-Term Measures

Recommended measures to improve public transportation conditions are:

a) Unify bus routes and reduce the number of those crossing the central area.
b) Replace microbus (colectivos) by busetas.
c) Introduce express routes.
d) Introduce bus stops and bus bays.
e) Improve public information of bus routes.
f) Improve bus design and maintenance.
g) Improve driver's wages and working conditions.
h) Rationalize subsidies to transport companies.

2) Medium-Term Measures

Construction of New Artery System: consists of a double-carriageway road network, located approximately one kilometer distance in between, with access points every three hundred meters. Avenues located in undeveloped areas should leave enough space for widening in case of any change on demand structure. Some areas of the network should exclude through-traffic and be modified into pedestrian and bicycle roads. A new belt road system should be developed as an express transportation system to promote decentralization.

3) Construction of Critical Sections and Improvement

a) Redesign sixteen critical intersections
b) Introduction of pedestrian, bicycle and traffic free paths into the central and historical area.
c) Progressive parking restriction in Centro and its outskirts.

4) Traffic Management Program

a) To update traffic signal control.
b) To set and enforce toxic gas regulations
c) To update, publish and enforce traffic regulations and obligatory use of safety belt to all areas.
d) To implement more strict vehicle inspection.

5) Mass-Transport System

A feasibility study should be undertaken to implement a mass-transportation system, linking the actual center with the proposed new centers, especially Centro - Fontibon, Suba, Modelia, and Soacha lines.

6) Car Ownership Policy

A study should determine the effect of measures such as car import quotas, national production restriction, taxation and improvement of public transport system.

7) Car Use Policy

Update taxation system to car ownership, fuel consumption and parking.

8) Transport Executive Committee

Create an executive committee composed of the municipal and national Government as well as representatives of private bus companies. The aims of this committee are to give assistance in planning, execution, maintenance and regulation of recommendations of the study. Also, establishing priorities for investment and new bus route control.

5.7.3 Feasibility and Realization of Mass-Transport System (INECO-SOFRETU)

This was the first mass-transit study done in a comprehensive approach and with a long-term perspectives to the time horizon of year 2000 on the urban growth of Bogota city. "Metro de Gran Galibo" was proposed with considerations on needed capacity, level of service, technical issues, compatibility with a feeder network, urban development and environment.

The proposed "Metro" consists of five lines, 88 stations and 92.8 km in total length. Out of five lines, three are Centro lines and two are peripheral lines. The network alignment was designed based on the urban development of LA VICTORIA, the area surrounded by the municipalities of Soacha, Funza, Mosquera, Madrid.

5.7.4 Updating Mass-Transport Study (INECO)

Physical and socioeconomic variables are redefined, according to the changes between 1981 and 1991. The 1981 study was based on the assumption of the expansion of the city high above the actual limits. Two years after the study, President Betancourt started the development of Ciudad Bolivar for estimated population at one million people on the skirts of the southern mountains. On the contrary, the growth rate was slightly reduced. These two factors made the development of "La Victoria" unnecessary, on the southwest side of the city and on the other side of the Bogota River.

The alternatives proposed in 1981 are re-evaluated. The result of the study was to add another branch to the Third Line, providing access to the southern side of the city. Line One and Two became a single line, linking the southwest and the northwest, passing through the central area of the city. The remaining branches will be isolated lines linking Centro with Kennedy and Fontibon.

Consequently, the southwest and northwest development path is confirmed, taking a similar pattern to those in the original study. However, the urbanization of the surrounding towns were more rapid than expected and trip generating area became further from Centro.

The trip destination areas remain as the original study. Technical, economic and financial issues are redefined. Methodologically, analysis was made on the urban dynamics and trend between 1981 and 1991. The different alternatives for the network

are checked with UTPS and EMME2, projecting the figures to the time horizon of the year 2010. Six alternatives are evaluated to obtain the final proposal.

5.7.5 Intermetro SPA

(1) Process

During the years from 1982 to 1986, President Betancourt focused his priority on the Medellin Metro, causing a vacuum in the process for Bogota's metro project. As a part of the President Barco's Program, the railroad lines were highlighted to improve a metropolitan transport system. This idea was promoted by the Ministry of Public Works and Transport (MOPT).

26 countries are invited for the bid of the concession project for urban railway, including design, funding and construction. Four offers have been received and evaluated by INGETEC and BECHTEL. The Italian proposal is selected in two consecutive evaluation processes.

When the negotiation begins, the Italian Government proposed the repayment of the loan by coal. However, the participation between the Nation and the Municipality became unclear. Finally, the process was broken.

(2) Project

The proposed project was to use the existing railroad line for the urban metro. This line was originally set to replace the first line (actually, Avenida Caracas). It passed around the existing city and therefore around the main activity area between Calle 68 and Avenida de las Americas, divider of Calle 30.

When the Government found that little demand was to be served by the planned lines, the alignment was changed to include a detour line through the city center. This change slightly increased the cost, because it had not been originally negotiated and because it was designed as an elevated viaduct. Moreover, even by this detour, only the old city center was served, but not the Chapinero area.

The first phase, social line, with 22.8 Km linking Soacha in the southwest with Centro was extended to the northwest to the Campin Stadium on Calle 63. Fifteen stations were proposed. All of those, except for the central area by-pass were at grade. Crossing roads should be elevated by 7 fly-over structures, and less important crossings should be at grade. The southern railroad was already not in use.

The second phase extended from Calle 63 northbound up to 140 street in 9.6 Km, all at grade, with 9 additional fly-over and 5 stations. The third phase was a radial line from Fontibon in the west to the city center. It was at grade, except for the last kilometer from the Sabana Station to Carrera 10. It had 2.7 km plus 1.3 Km as a service line. Eight stations were proposed.

(3) Evaluation

The Mayor Caicedo Ferrer's Administration re-examine the project, consulting with transportation experts. The expert team recommended against the project because of technical, economical and financial difficulties. The main issues were:

a) Demand studies were not solid.
b) The proposed demand was not compatible with the cost of the project
c) The cost-benefit analysis had not been undertaken, to support the feasibility of the project.

d) Railroad corridors are not coincident with the demand and origin-destination lines.

5.7.6 Linear Social

After the failure of the railroad proposal, the Mayor Pastrana's Administration looked for a new alternative that would not compromise the scarce resources from the social investment or demand new taxes. It was a way to justify the Troncal Caracas Project and its compatibility with metro type system. The Empresa Metro de Bogota developed the study.

(1) Methodology

a) Analysis of socioeconomic variables analysis.
b) Transport sector character existing demand and supply.
c) Transport solution study
d) First phase definition
e) First phase cost
f) Financial plan
g) Fare system

(2) Project

The proposed project extended from Kennedy in the southwest to Centro, using Avenida Primero de Mayo, the existing south railway and Avenida Jimenez, where the system was linked with Avenida Caracas, to distribute passengers around the city. The line had 13 stations.

(3) Conclusion and Recommendations

a) Troncal Avenida Caracas Project should be completed.
b) The southwest area should be linked with Centro and the industrial area by a mass-transport system.
c) The system should be connected to Avenida Caracas.
d) The transport authority should be created.
e) The Nation should finance 50% of the project cost.
f) Cars from the neighboring cities using road network in Bogota should pay for maintenance.
g) Car taxes should be used to pay the project.
h) Valorizacion taxes (surplus value tax) should be included in the project.
i) Fuel taxes, not higher than 10% should be included in the project.
j) The private sector should participate in the development of the surrounding area.
k) Fares should be similar to those of buses.

The proposed project had the problem to release 300,000 pax/hour into Avenida Caracas with the capacity of 30,000 pax/hour. In addition, the project was an isolated piece of a system based on a very uncertain financial structure. Finally, support of the Nation was not obtained due to political reasons.

5.7.7 International Bid for Mass-Transport System by District Office

The District Administration (Municipal Office) decided to invite the private sector to make proposals for a mass-transit system on a basis of concession. The proposed system was required to achieve the following:

a) A wide coverage of the transport demand in the city
b) Integration with the existing transport system
c) Environmental benefits and improvements in the use of public space
d) To support for the planned structure of the city

e) To provide a better level of service than the present system
f) To make it possible to offer a partial solution

Following the Decreto 1421 of July 1993, the National Government implemented "Estatuto Organico de Santafe de Bogota", giving the legal basis by Article 72 for the invitation of the private sector to propose mass-transit system.

The bidding process started on 25th of November and closed on 8th of June 1994. Out of nine proposals, six are accepted for evaluation. Technical evaluation was made by the EPCE-Halcrow Fox-PNUD Group in August 1994.

5.7.8 Trunk Bus Corridor with Bus Exclusive Lane

To cope with the serious crisis of public transportation, the Inter-institutional Transport Group (GIT) was composed in 1988 and started a project called " BIRF 1, Bogota" with the corporation of IBRD and Brazil. The project aimed at development of a general plan for special roads (corridors) providing a priority to public transport, which may complement and join the future Metro.

Additional objectives of the project were the implementation of measures, such as the reinforcement of transport authorities, the restructuring of urban transport enterprises, liberalization of parking fares, abolishment of parking control, etc.

The criteria for selecting the road corridors were to have a bus traffic larger than 250 buses (or busetas)/hour in the rush time and passenger volume larger than 10.000 pax/hour, or an average speed lower than 18 km/hour.

(1) Bus Troncal on Avenida Caracas

The Avenida Caracas is firstly chosen as the main axis for the system for its fundamental condition of crossing the whole city from the extreme north up to the very south, and also due to the characteristic of concentrating inside the 31% of the routes and the 67% inside its area of influence.

This project was implemented in 1991 and has been operated successfully. The post-evaluation project was made in 1993 by STT and GIT. Details of this project are stated in Chapter 5.4.4. The case of Avenida Caracas became a pilot model of the following projects.

(2) Bus Troncal on Carrera 10

After the experience obtained in the Troncal Caracas Project, the GIT team decided their efforts to design a similar response for Carrera 10 between Calle 1 and Calle 26. The traffic survey showed critical figures as an average distance between stops of 20 meters, which caused a very slow traffic flow.

The so-called "Boulevard" project consisted of eight lines and two types of boarding platforms. In opposition to Avenida Caracas, sidewalks were to be used also for public transport service and middle platforms were to be disposed alternately. In this way, 16 different stops were provided every 400 meters. Small buses would use Carrera 9 and 11.

The main conflict of this project was the condemnation against any type of mass-transport project by transporters and inhabitants along the street. In 1986, Mayor Sanchez's administration had recovered the Avenue, reducing the width from four to three lanes in each direction. This project would completely modify the street profile and the investment made in sidewalks would be lost.

(3) Bus Troncal on Avenida Jimenez

Avenida Jimenez is the most representative street in Centro and always saturated with traffic. Currently, the avenue has ten lanes in four carriageway from Aranda Bridge (Carrera 50) to Carrera 13 and four lanes in both directions, crossing the heart of the city, from Carrera 13 to the Circunvalar in the skirt of hills. This is the most congested section.

The project is consisted in the adequacy of the dividers for boarding platform, following a system similar to that in Avenida Caracas, but is more generous in space. From Carrera 13, the avenue becomes one-way eastbound, using two lanes for buses and another two for cars. When it reaches Carrera 4, buses turns to the north into Calle 17 westbound to return by Carrera 13, generating a loop. Calle 17 has to be widened in two specific points, and parking shall be completely prohibited. Cost-benefit indices are similar to those in Avenida Caracas. Political and economic reasons frustrate these projects.

(4) Bus Troncal on Calle 80 and Calle 68

This project is the necessary result of Avenida Caracas Project. It has been supported by IBRD and most of studies performed. The alignment is obvious and consistent with the policy of providing transportation to the less dense areas by lower cost schemes.

The design is the same as Avenida Caracas. Between Autopista and Carrera 30, it has already four carriages. After Carrera 30, dividers must be built, but there is enough space on both sides. Calle 68 will be facilitated with bus stops on sidewalks as a complement of Calle 80.

Economic figures should be similar or higher than those of Avenida Caracas. This project is scheduled to be complete in 1996, with a total investment of 48,307 million pesos. The bid for final design will be opened soon.

(5) Bus Troncal on Calle 13

Bus-exclusive lanes are planned also to Calle 13 as one component of IBRD finance project. In one direction, 2 lanes will be used for buses and three lanes for areas. The target implementation year is 1996. Total cost is estimated at 5,176 million pesos.

5.7.9 Metrobus System (SMB)

The Metrobus Plan is one of the proposals in the bid of 1994 stated in Chapter 5.7.7, offered by the Group of Corporacion Financiera de Transporte, Stagecoach International and Volvo Bus Corporation. The District Administration showed keen interest in this plan, mainly because of its low investment requirement. The stage 1 plan is scheduled to implement within two years. According to plans, however, one of the most important routes in stage 1 will use the space of the south railway line, some section of which has been heavily squatted. Due to this difficulty, the implementation of the project seems to be delayed.

(1) Route

In stage 1, eight lines are planned, three of them will operate on exclusive busways, while other five will operate in mixed traffic. Stage two will add newly four lines and extend three lines built in stage 1

(2) Bus Fleet

SMB will be operated by three types of new Volvo Buses:

a) Double-Articulated Bus: 25m long with 5 doors, mounted with EURO 1 diesel engine. Capacity is 254 passengers.
b) Articulated Bus: 18m long with 4 doors and EURO 1 engine. Capacity is 178 passengers
c) Large Bus: with 2 doors carrying 103 passengers, mainly used for ring routes.

(3) Facilities

SMB proposes a flat fare system where passengers can transfer freely. This system is supported by unique bus stops and transfer stations.

a) Bus Stop: arranged in approximately 400m intervals. The bus stop shelter looks a transparent tube, made of steel frame and hard glass in modern design, facilitated with a ramp for the handicapped. The shelter has five exits with doors for getting on/off a bus. The floor is designed at the same level as the floor of a bus. By this, passengers can get on and off the bus in 0.1 second in average. Passengers can buy tickets with a pre-paid card or cash by a ticket machine. A ticket agent and a guard will be arranged.
b) Transfer Station: Transfer stations are planned at the junctions of two trunk lines or a trunk line and a ring line, to secure the passengers' safety and confronts. This station functions also as a bus stop.
c) Depot: SMB depot will be located in the suburbs, accessible from each line. Workshop for check, maintenance and cleaning should be wide enough to park about 100 units and to expand in the future.
d) Road Rehabilitation: Road surface of the SMB routes should be rehabilitated so that buses can keep the design speed (25 km/hr). Also at a bus stop, road surface should be adjusted to the same height as the shelter floor.
e) Traffic Sign: Caution signs should be properly disposed to secure the safe operation.

(4) Demand and Operation Plan

As a base of demand forecast, tariff is assumed at 320 pesos (US$ 0.4) per ticket, which is in the same level as bus ejectivo.

When the stage 1 service starts in 1997, total demand for SMB is forecasted to be one million passengers per day, based on the estimates of population, employment and commercial activities in the influence area. To this demand, SMB trunk lines will be served by 60 units with the capacity of 254 pax/unit hourly in one direction, transporting a maximum of 15,000 passengers per line, and 75,000 passengers in total.

In 1999, when the stage 2 starts, demand will grow to 2.5 million passengers per day, and 120 units will carry 30,000 passengers per hour in one direction, that is, 190,000 passengers in total 12 lines. After the year 2000, a 2.2% growth rate of demand is assumed, as shown in Table 5.7-1.

Table 5.7-1 Demand for Metrobus System

Year	Population (1,000)	Passenger (1,000)	No. of Buses in operation	Total No.of Buses	Max. Capacity (pax/hr/direct.)
1997	2,250	1,000	348	465	75,000
1999	4,650	2,515	852	1,423	190,000
2004	5,185	2,804	920	1,537	212,000
2009	5,780	3,126	1,005	1,679	236,000
2014	6,445	3,486	1,095	1,829	263,000
2019	7,186	3,886	1,195	1,996	294,000
2024	8,012	4,333	1,290	2,155	328,000

(5) Investment

Investment cost of SMB is estimated as shown in Table 5.7-2. CFT will procure the capital. SMB company will be financially self-sustainable and no subsidies will be needed. Stagecoach International will manage the company and Volvo will produce the buses. Local capital is expected by 50% of share.

Table 5.7-2 Investment Plan of Metrobus (million US$)

Cost Item	Stage 1	Stage 2	Total
1. Infrastructure			
Civil work	22	9	31
Bus stop	16	13	29
Road rehab.	12	9	21
Workshop	17	17	34
Others	9	10	19
Sub-total	76	58	134
2. Bus Fleet	134	303	437
Total	210	361	571

5.8 Current Issues of Public Transport

As already pointed out in many studies in the past, public transport system in Bogota City implies dozens of problems in the various sides of Administration (STT), transporters (Companies, Cooperatives), operators (bus owners, drivers) and users (passengers, local communities). Let's mention hearsay complaints at random.

1) Administration
   a) Prevailing illegal operation such as route change and route cut.
   b) No respect of law and regulation.
   c) Loading and unloading at non bus-stop.
   d) Frequent overtaking to catch more passengers.
2) Companies
   a) Frequent change of policy and regulation without consistency.
   b) Permission and refusal of new route, ignoring reality.
   c) Authorization of unqualified company without minimum fleet.
   d) No legal basis to manage and control bus owners and drivers.
   e) Malversation by officials in charge.
   f) Abuse of route plate by driver.
   g) Bus owner's and driver's short-sighted interest only in their own profit.
   h) Bus owner's unfair salary payment to keep good drivers.
3) Bus Owner
   a) Excessive competition and less sales.
   b) Insufficient service by company.
   c) Low fare rate not sufficient to cover the cost.
   d) Drivers will pocket sales.
4) Passengers
   a) Very hard to catch a bus.
   b) Buses are old and dirty.
   c) Rough driving, frequent breakdown and accidents.
   d) Discontinue of operation on a route without notice.
   e) Thievery and robbery in buses
   f) Bad manner of drivers and dispatchers.
5) Local Communities
   a) Prolongation of a route without our approval.
   b) No terminal facilities
   c) Bad environment at a terminal.

We, the JICA Study Team, believe that most of these phenomena derive from the following three issues: (1) Excessively long routes, (2) Too many routes and fleets, and (3) Excessively inexpensive fares. These factors have brought about today's excessive competition and unprofitability in the transport business, and they are either the direct or indirect origins of the above-mentioned phenomena.

(1) Excessively long routes

As the urban area expanded outward, bus routes became longer and longer. Now, the longest one exceeds 40 km in length. Generally speaking, the longer a route becomes, inevitably the less profitable it will be, because of the lower occupancy in average. Under the flat rate condition as in Bogota, this tendency will be strengthened. It is reported in

Tokyo that a bus line longer than 15 km will be unprofitable.

(2) Too many routes and fleets

Over 600 routes are operated by about 70 companies. New inhabitants in the suburbs insist on bus service, and bus companies rush to get the concession of new lines. STT do not have enough data to judge the necessity of the route. Thus, the number of bus routes increase without control.

Most of routes run from the outskirts of the city to the city center. There is no clear demarcation of trunk lines and feeder lines. According to the bus passenger interview survey, only a few percent of passengers transfer to another bus on the way to their final destinations. However, it may be too extravagant to permit a passenger to move from any point to another any point by one ride, in a large city with a population of six million.

Further study on demand-supply balance will be needed to judge if the present 22,000 units of bus and bus-like vehicles are adequate or excessive. However, transporters insist that over-supply makes their business difficult and the STT stopped new license issuance.

(3) Excessively inexpensive fare

Bus and taxi fares have been controlled by political decision. However, it is apparent that daily sales cannot cover the capital cost. Bus owners have no concept of depreciation, and as it were, they are eating their buses little by little, every day. Under these conditions, excellent service can hardly be expected.

It is a very unique fare system in the world to apply different rates based on the age of the fleet. This complicated fare system suggests implicitly the Administrator's dilemmatic confusion between policy and reality.

Moreover, a flat rate not depending on trip distance is still applied to long routes of 30 to 40 km. A zone fare system should be considered not only for the transporters' benefit, but also for the passengers' benefit.

Looking for further origins of these three factors, they may be attributed to: (a) Weak control power of Administration, (b) Old-fashioned business structure, and (c) Egoistic local communities. In the planning stage, further analysis will be made on each factor and the inter-relations between them. Based on the results, some solutions will be sought.

CHAPTER 6
Road Traffic Control and Management

6. ROAD TRAFFIC CONTROL AND MANAGEMENT

6.1 Traffic Control and Management Conditions

6.1.1 Traffic Signal Control System

(1) Signal Light Facilities

1) Signalized Intersections

As of October in 1995, there are over 700 signalized intersections in Bogota as shown in Figure 6.1-1. The intersections are divided into three zones for control purposes; north, central and south, as shown in Table 6.1-1.

Table 6.1-1 Number of Signalized Intersections in Bogota

Zone	North Zone	Central Zone	South Zone	Total
Control Center	Chico	Paloquemao	Muzu	
Signal Controller	273	180	159	612
Signalized Intersection	322	216	183	721

2) Traffic Control Facilities

The traffic signals maintained are mostly of the vertical type, and they are installed at major intersections, overhanging the center line of each approach. Signals for pedestrians are rarely facilitated.

At some intersections, traffic signals are not visible because of the shortage of signals in number, and also of low poles which frequently make it difficult for drivers behind large buses to see them. Pedestrians' safety is sometimes threatened by the insufficient signals for pedestrians. If the lights do exist, they tend to be too small.

Aiming at more effective signal control, introduction of vehicle detectors have recently been installed at major intersections, adopting loop-type detectors. The standard layout plan is illustrated in Figure 6.1-2.

Traffic data at the intersections are directly transmitted to the control centers via underground cables binding 10 to 600 wires with diameters of 0.04 to 0.06 millimeter.

The control room in the main control center is equipped with traffic signal controllers, console tables, graphic panels, and back-up batteries, and it has already basic functions for traffic signal control such as interface between detectors and controllers, processing and stockpiling of traffic data, and display of current control situation. However, the present display system cannot cope with real-time traffic control in feeding back the results of demand analysis to the control system.

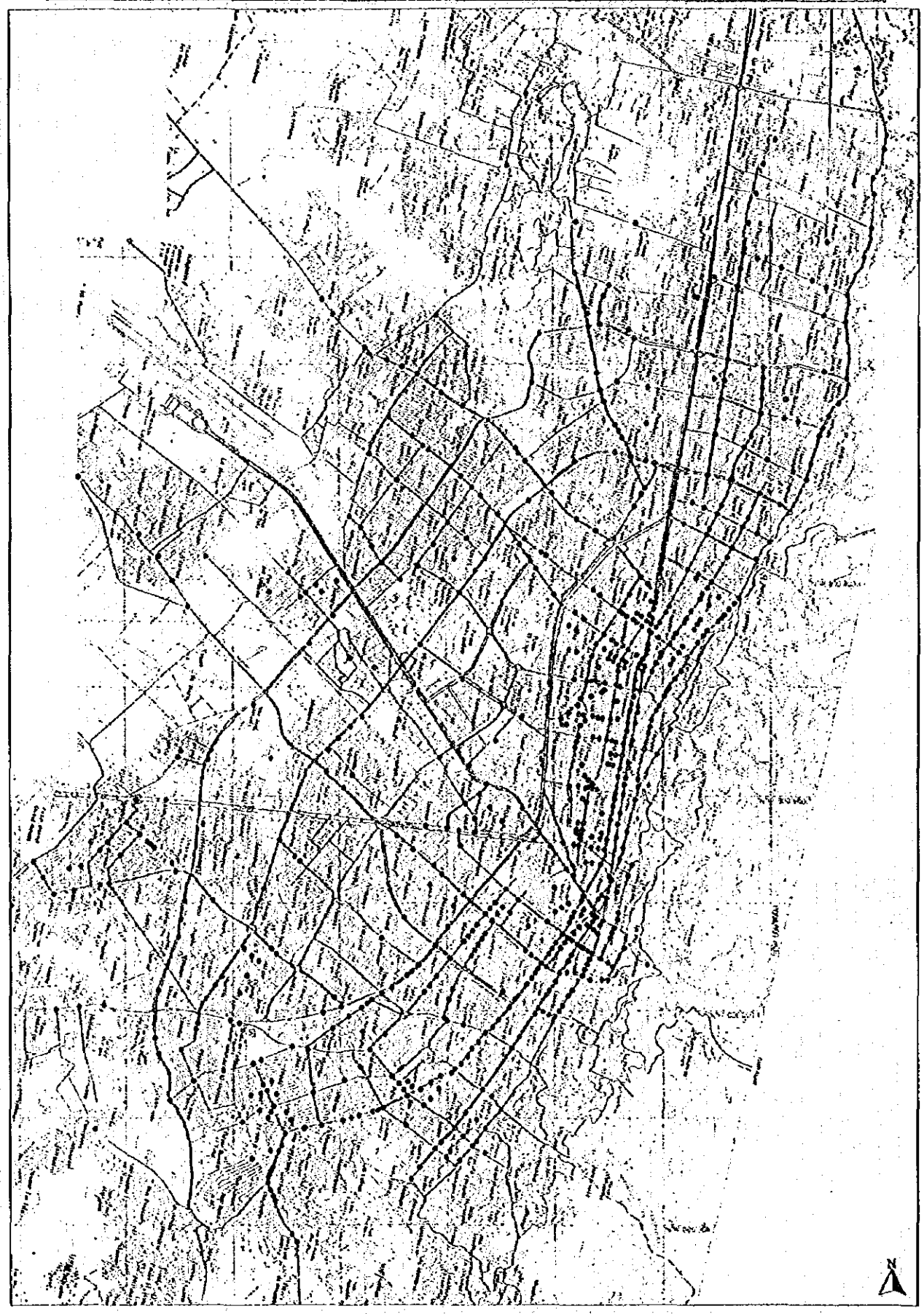

Figure 6.1-1 Location of Signalized Intersections

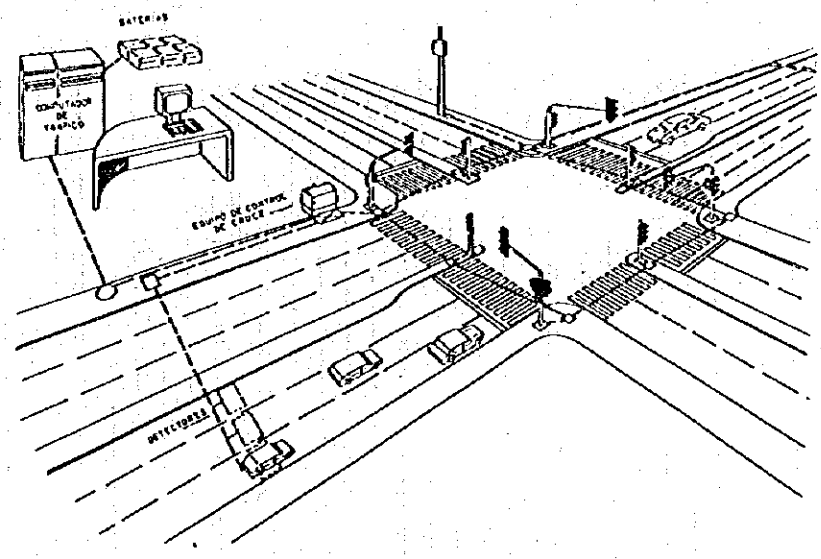

Figure 6.1-2 Standard Layout of Traffic Detectors

(2) Management of Control Center

1) Control Center

Currently, traffic signals in Bogota are managed and controlled by the Telecommunication Company of Santafe de Bogota (ETB) jointly with the Traffic Sign, Marking and Signal Division of the Transit Unit in STT. During the period from 1971 to 1991, ETB was solely responsible for the signal control. Afterwards, it came under the jurisdiction also of STT by the municipal ordinance No. 256 in 1991.

2) Signal Control System

Traffic signals are controlled according to the control parameter table developed individually for major arterials, based on the traffic characteristics such as daily or hourly variations (Table 6.1-2). The current control system introduces the pattern of the selection coordinated control system which can change the green split by time in a day.

This system works effectively when the traffic shows a stable fluctuation pattern. However, it can neither cope with a drastic change in fluctuation nor pay consideration to the traffic on the road crossing the arterial. For such purposes, the traffic-response system may be needed.

Table 6.1-2 Pattern Table for Signal Control

Grope	1001			1002			2001			2002			3002			3004		
Time	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
0:00		3	3		8	8		8	8		8	8		8	8		8	8
5:05	2	3	3	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
5:30	8			3	3	2	3			3			3			3		
6:00		2	2	2	2	2	2	3		2	2		2			2		
6:30	10	6		10			6	2	3	6	2	2	6					
7:00	9				6	9	6				6	9		3	3	6	3	3
7:30																		
8:00																		
8:30	8														2			2
9:00	6			6					2					2			2	
9:30					5													
10:00	5			5			5			5								
10:30								5			7		5	5		5	5	
11:00																		
11:30																		
12:00										9								
12:30																		
13:00			8			2				5	2							
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16:00							7						7					
16:30																7		
17:00	9			9						9								
17:30										7								
18:00																		
18:30																		
19:00									3									
19:30			2						3									
20:00	7			7								3	2		3	2	2	3
20:30																		
21:00								2	8		2			2			2	
21:30	8	8	3	2	2	8							3			3		
22:00							2	3		2				3	8		3	8
22:30												8	8			8		
23:00		2			2		3	8		3	3							
23:30	3			8			8			8				8			8	
24:00																		

A ~ C : Weekly Pattern 1~ 10 : Hourly Pattern

(3) Planned Improvement of Traffic Control System

A new signal control system was studied from 1991 to 1994. The new system is financed in 1995 and currently under implementation with a completion date set for 1996. The outline of the system is as follows:

a) The entire Bogota is divided into three traffic zones in the same way as present. Each traffic zone has a sub-center where the traffic data are sent from the detectors installed at intersections on a real-time basis.
b) After the primary processing, the signals are controlled in each sub-center and the data are transmitted to the upper-tier computer (central processing unit: cpu) in one of the sub-centers to compile for emergency back-up.
c) The upper-tier computer have sufficient CPU to manage 150 intersections for the first step in 1996, and finally a maximum of 400 intersections. The computer system have dual system for fail safe operation.
d) The system in the control center is operated and maintained by five to six traffic engineers and electric engineers. Back-up batteries will be installed for fail safe operation.

e) The system is expected to improve the present overall average speed of 18Km/hr up to 25Km/hr.

(4) Current Issues and Subjects of Traffic Signal Control

Presently, STT and ETB are developing and introducing a new centralized traffic-activated control system. The purpose of signal control is to keep a smooth traffic flow by properly controlling traffic and pedestrians, as well as to keep their safety. From this point of view, the introduction of the new system is highly evaluated because it will enable ETB to control traffic in a more effective and sophisticated way. In relation to this aspect, the following should be noted:

1) Equipment for Signal Control

a) Most of the traffic signals are installed on low poles and have small lenses, resulting in poor visibility.
b) Signalization is insufficient in secondary roads; for example, along Avenida Caracas and 19 where crossing traffic volume exceeds a certain level. Traffic signals should be installed for safety purpose.

2) Control

Control parameters should be adjusted properly to the change of traffic conditions on a real-time basis. In addition to the information from traffic detectors, a surveillance system using CCTV camera should be introduced.

3) Management

Trend traffic data analysis and its accumulation is important to operate the control system effectively. Personnel capable of dealing with this complicated task are to be arranged.

6.1.2 Traffic Control Regulations

The major traffic control regulations in Bogota are as follows:

a) One-way traffic regulation
b) Reversible-lane regulation
c) Bus-exclusive lane regulation
d) Larger vehicle prohibition regulation

(1) One-way Traffic Regulation

The locations of one-way roads are shown in Figure 6.1-3. There are numerous one-way roads, mainly major roads running the north and south sides of city central, surrounded by Avenida 7a, Avenida 100, Avenida Quito and Avenida 1 de Mayo. At present , the reversible lanes are introduced in combination with the one-way system on section between Calle 18 and Avenida 92 of Avenida 7a. The one-way system on narrow streets in the city has basically been maintained.

(2) Reversible-Lane Regulation

Figure 6.1-3 shows reversible-lane-regulated roads. The reversible-lane roads are located on the traffic congested roads of the north and the east commercial/business area. The main reversible-lane roads are Avenida 7a (4 lanes and 2 lanes including section of one-way, during morning peak hour 6:30-9:00 in section of Calle 147-Calle 72, during evening peak hour 17:00-20:00 in section of Calle 116-Avenida 92; however in midday hour 12:00-13:30, only one-way in section of Calle72-Calle 28), Avenida 19 (3 lanes and 1 lane during morning peak hour 6:30-9:00 in section of Avenida 127-Avenida

100) and Avenida 92 (one-way from two way of 4 lanes during evening peak hour 17:00-20:00 in section of Avenida 7a-Carrera 18). The currently preserved number of reversible-lane roads shows the effectiveness of perplexing changes in traffic demand. However, traffic facilities such as overhead lane direction signals and signs attached to gantry or pedestrian bridge, and variations in lane line color should be installed for notifying to drivers.

(3) Bus-Exclusive Lane Regulation

Roads regulated with the bus-exclusive lane are shown in Figure 6.1-3. The bus-exclusive lane is only located in the section between Avenida 78 and Calle 51 Sur on Avenida Caracas. Four lanes for bus-exclusive lane in the central part of the carriageway are prepared. In the peak hour, the exclusive lane can cope with the rapid traffic and prove sufficiently effective.

(4) Curb Parking Regulation

Curb parking is prohibited on most of the major roads in built-up areas of Bogota, with the exception of the "Zona de Azule" part, which is prepared for toll parking on roadsides. Recently, strict and thorough control for vehicles violating the regulations by traffic police is inadequate.

(5) Heavy Vehicle Regulation

By the regulation of Bogota for heavy vehicles, heavy vehicles over 5 tons are not allowed to enter the area inside the ring road of Avenida Boyaca during rush hour. Figure 6.1-4 shows the heavy-vehicles-restricted roads. The main points of the regulation are as follows:

a) Heavy vehicles over 5 tons are prohibited during 6:30-9:00 and 18:00-20:00 in the area surrounded by Calle 170, Autopista Del Norte, Avenida Boyaca, Avenida 1 de Mayo and Avenida 7a.
b) Heavy vehicles over 12 tons are prohibited during 6:30-9:30 on Avenida 7a (section Calle 170-Calle 146), Autopista del Norte (section Avenida Boyaca-Avenida 81), Avenida 68 (section Autopista del Norte-Avenida 1 de Mayo), Avenida Suba (section Avenida Boyaca-Avenida 127), Avenida 81 (section Avenida Quito -Avenida Boyaca), Transveasal 47 (section Avenida Suba-Avenida 81), Autopista el Dorado (section Avenida Boyaca-Avenida 68), Avenida Centenario (section Avenida Boyaca-Avenida de las Americas), Avenida del Americas (section Avenida Boyaca-Avenida Quito) and Transversal 42-47-49 (section Avenida 1 de Mayo-Avenida del Americas).
c) Heavy vehicles over 12 tons are prohibited during 18:00-20:00 on the above-mentioned roads with exception of Avenida 7a and Autopista del Norte.

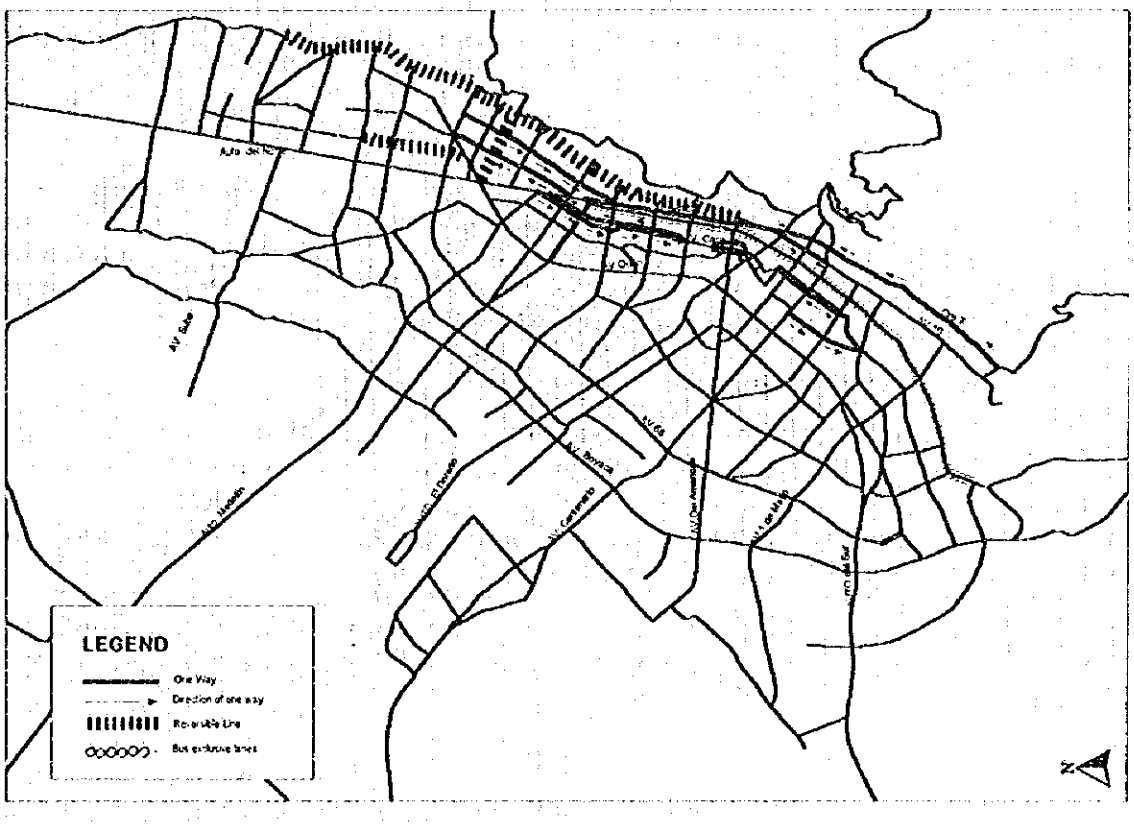


Figure 6.1-3 One-Way Roads, Reversible Lane and Bus Exclusive Lane

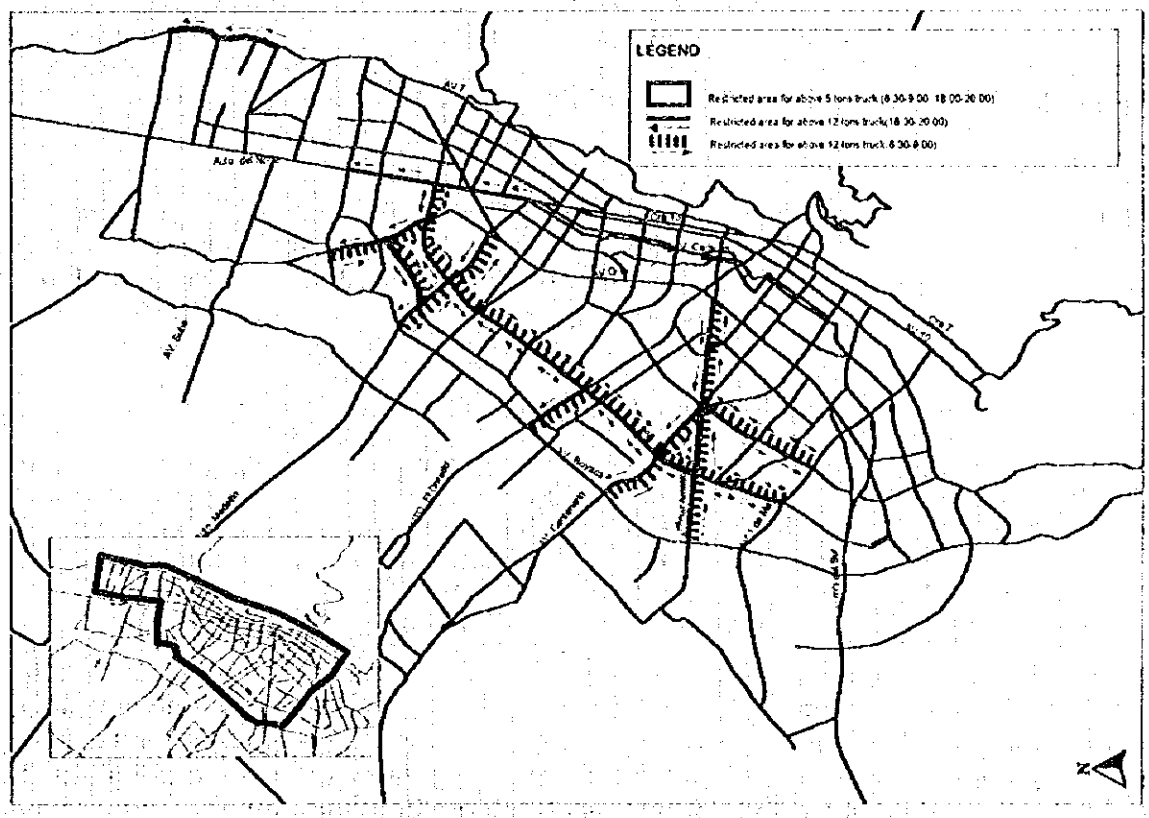


Figure 6.1-4 Road Network designated for Heavy Truck

6.1.3 Traffic Safety Facilities

Present conditions of the traffic facilities in the urbanized area of Bogota are summarized as follows:

(1) Pedestrian Bridges

Pedestrian bridges are generally required to be installed on wide streets with many urban facilities attracting many people, i.e., schools, hospitals, large bus stops, etc. In Bogota, pedestrian bridges are already installed at several points along Avenida Quito and its outer ring, as well as radial arteries such as Autopista Norte, Autopista el Drado, Avenida las Americas, Avenida 37 and Avenida 63.

(2) Guard Fence and Guard Rope

No street in Bogota has a guard fence, rope or rail except for Avenida Caracas at its bus stops. Guard facilities dividing sidewalks and carriageways are needed along arterials, especially at the front and rear of their intersections and pedestrian bridges, in order to protect pedestrians, to keep vehicles in the carriageway, and in addition, to prevent disordered jay-walking.

People in Bogota tend to cross road, at any place where they want, threading their way through traffic. This should be prevented by fence or rope, not only for smooth traffic, but for safety.

(3) Traffic Signs

Traffic signs for guidance, regulation and caution are comparatively well arranged in Bogota. Especially in the central area, every street name are shown in a proper position. As for the regulatory signs, stop signs and no-parking signs are properly installed. However, some one-way signs and no-left-turn signs are badly disposed for visibility, although they are not insufficient in number. Some one-way signs are attached directly on building walls and are not easy to recognize in the nighttime or when following a large vehicle. They should be replaced with a pole-type sign.

(4) Traffic / Road Marking

On a road surface in the urban area, stop lines, lane marks, pedestrian crossings and parking lots are painted. Maintenance of them is not good, especially on secondary road with heavy traffic, where most crossing marks are faded out. On the other hand, makings on arteries and parking lots in Zones Azales are comparatively well maintained.

6.1.4 Traffic Education and Campaign System

It is necessary that drivers obey traffic signals and regulations if the benefits of traffic control systems are to accrue. Therefore, the status of traffic education and campaign systems in Bogota is unveiled by the current situation in which the effectiveness of traffic control systems are undermined by unlawful drivers and pedestrians.

(1) Driver and Pedestrian Behavior

Driving habits which ignore traffic laws are frequently seen on the roads in Bogota. For instance, drivers ignore red lights of traffic signals, do not follow lane markings, make sudden and frequent lane changes without notice, ignore speed limits, jump queues, and block intersections. Bus drivers are among the worst, since they habitually load and unload passengers everywhere inside intersections and between center lanes. They overtake or change lanes near intersections in order to pick up extra passengers,

and they wait for passengers even when at green lights. Such bus driving behavior leads to a lower traffic flow rate unless under a traffic-coordinated control system coordinated by the results of travel time survey and investigation of the occurrence of traffic accidents. Therefore, effective traffic education programs and campaigns should be promoted to improve drivers in compliance with traffic laws and regulations.

The pedestrian behavior in Bogota is seen as lawless in some cases and well behaved in others. For instance, they cross the streets ignoring signal lights in road sections between intersections, and also wander into vehicle lanes to shortcut their journeys. Especially in bus waiting areas, pedestrians and passengers overflow onto vehicle lanes. Such pedestrian behavior is generally regarded as a cause of traffic congestion in Bogota. Therefore, appropriate pedestrian education programs are needed in order to discipline pedestrians to obey the traffic laws.

(2) Driver Licensing System

The licensing drivers of both public and private motor vehicles in Bogota are administered by the STT under the Ministry of Transport. License processing in Bogota has been undertaken at the Traffic Security and Educational Department of STT-a department equipped to test the skills and knowledge of applicants. Licenses issued now have a validity of four years. To obtain a driver's license, he or she must be 16 years old or above, physically and mentally fit to drive a motor vehicle, free from any contagious diseases, and literate.

Issuing procedures are as follows:

a) A person who intends to obtain a driver's license must first apply for a practical driving instruction (60 hours) and a classroom instruction (14 - 18 hours) at an STT driving school or private driving school.
b) The applicant is then scheduled to take a written examination and a practical driving test under the supervision of an STT examiner at any school.
c) Applicants who pass the above examinations proceed to taken a psycho-physical examination which tests their vision, reactions, and reflexes.
d) Within 8 days, the applicant receives the driver's license.

There are about 80 private motor vehicle driving schools and one STT motor vehicle driving school in Bogota. The STT driving school has three courses, a prospective driver course (60 hours of classroom instruction, 14-18 hours of practical driving instruction), a full-fledged driver course (10 hours), and a recategorization course for upgrading a license. Official drivers can take the practical driving test at the STT driving school free of charge.

The quality of instruction given to student-drivers is generally inadequate. The balance between driving practice and classroom instruction seems unduly skewed toward driving practice, and insufficient classroom instruction is provided. As a consequence, proper attitudes toward driving and law enforcement which stress the need for self-discipline and social responsibility are not adequately stressed.

(3) Driver Education Programs and Champaign

STT has a department of traffic security and education. Its main function is to carry out an educational campaign for pedestrians, drivers and road users such as the training of professionals and teachers in the driver educational programs, and coordinating the driving schools for driver's licenses. The drivers and pedestrians of education programs and campaigns are as follows;

a) Education program for elementary school and kindergarten children
b) Didactic recreational park program in transit for children
c) Education program of school patrols
d) Social program for traffic education campaign by high school teachers
e) Education programs (campaign) in the private sector
f) Education programs by mass media

6.2 Status of Parking

6.2.1 Car Parking

Presently in Bogota, parking is in principle prohibited on every trunk road. The car user has to park his car at a parking lot designated on a street or an off-street parking facility.

(1) On-street Parking

1) Zonas Azules

As the number of private cars increases, illegal parking prevails on streets or public spaces in some areas with high parking demand. To cope with this situation, STT introduced an on-street parking system called "Zonas Azules" in the early 1990s, to promote effective utilization of urban spaces. In the early stage, the Zonas Azules were managed by the offices of Alcaldia Menores on a rather small scale, and since December 1994, it came under the control of STT. STT consigns the daily operation and management of the Zonas Azules to four private contractors.

The Zonas Azules cover the area between Avenida 7a and Carrera13, which is divided into four sub-zones by Calle 72, 34 and 26. Management of each sub-zone is consigned to a contractor. Revenue of parking fare is shared by the contractor (60%) and STT (40%). The contractor is responsible for marking, ticketing, publishing, preparing uniforms, cramping, pulling and parking of violating vehicles.

In the Zonas Azules, parking lots are marked on the road side in the same way as a common on-street parking lot. Parking at those lots is charged from 7:00 in the morning until 7:00 in the night. The parking fare is pre-paid directly to the collector who is patrolling around the Zona Azul. STT introduced automatic parking ticket vending machines made in Germany in September 1995, but users are not yet well-informed and well-accustomed with the new system.

As of October 1995, there are 4,600 lots in whole Zonas Azules(Table 6.2-1). Parking fares are different by zones in the range of 350 pesos to 550 pesos for each two hours. The fare system is proposed by the consignee companies and implemented after the approval by the Vigilance and Security Fund (Fondo de Vigilancia y Segridad: FVS).

Table 6.2-1 Parking Lots and Fares in Zonas Azules

Area	No. of Lots(1991)	No. of Lots(1995)	Parking Fare(2 hrs)
Centro	689	1,100	$ 350
Tequendama		250	$ 400
Chapinero	1,743	1,900	$ 550
Norte		1,350	$ 550
Total	2,432	4,600	$ 350 - $ 550

Source: Chamber of Commerce of Bogota for 1991 and STT for the others.

A vehicle parking beyond the pre-paid hours by 15 minutes or longer will be fettered with a wheel cramp called a "Cepo", and if the fine is left unpaid for a long time, it will be removed to a designated place by a wrecker. Penalties for parking violation is $20,000, which is equivalent to five times of the minimum daily wage (currently defined at 4,000 pesos by law). In addition, violators are charged the full amount of parking fare, the cramp charge (2,750 pesos) and the wrecker charge (20,000 pesos) in every case. If the penalties are left unpaid longer than five days, the fine will be doubled.

2) Demand for Zonas Azules

According to the STT data, current daily demand for the Zonas Azules is about 20,700 vehicles, which means the rotation per lot is 4.5 times a day.

In this Master Plan Study, an interview survey to the Zona Azul users was conducted with the purposes of collecting data on parking time duration by trip purpose and opinions concerning the current fare system of Zonas Azules. This survey was carried out on weekdays in November 1995. A total of 769 samples were collected from 14 sites scattered in Norte, Chapirero, Tequendama and Centro. The main results of the survey are as follows (see Figure 6.2-1):

a) Parking Duration
b) Average parking duration is 1.3 hours for all the survey data. Survey sites are selected taking account of land use of the surrounding area such as office/bank, commercial and school. Among them, the area of Carrera 8 with Calle 99, which is one of the office/bank areas, shows an exceptionally long parking duration of 2.7 hours. Some samples show 6 to 8 hours. The average parking duration of other office areas falls in the range of 1.0 to 1.8 hours. The parking duration at commercial areas is in the range of 0.7 to 1.2 hours. Most of the Zona Azul users park less than two hours; only 3% park longer than 6 hours (see Table 6.2-2 and Figure 6.2-2).
c) Parking Duration by Trip Purpose
d) Parking duration of "to work" trips is the longest exceeding two hours, while other trips park about one hour on average, without remarkable difference among other trip purposes (Figure 6.2-3).
e) Parking Charge
f) About a half of the users consider the current fare level adequate while the other half feel it is too high. On the contrary, 6% of the total think the current fare is too low. Thus, the majority of the users agree with the current fare. Generally speaking, long-time users tend to consider the current fare reasonable, while short-time users consider it too high (see Figure 6.2-4 and Figure 6.2-5).

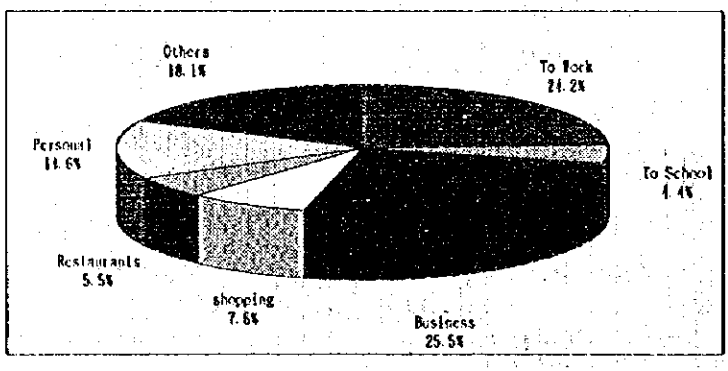


Figure 6.2-1 Parking Purposes

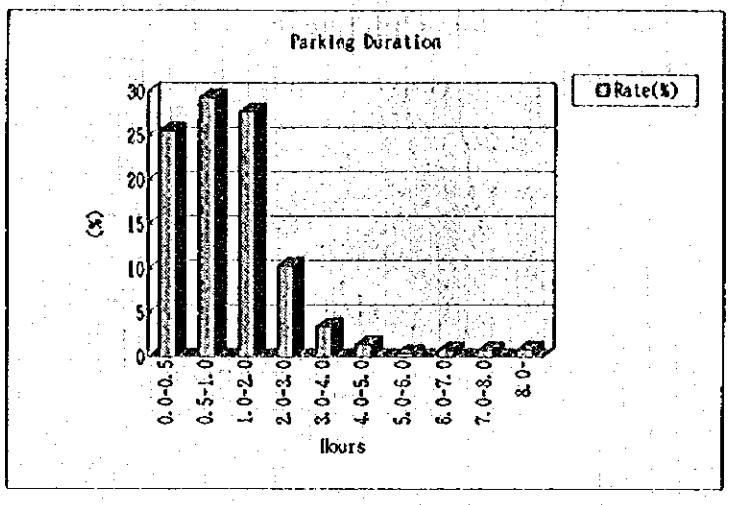


Figure 6.2-2 Parking Duration

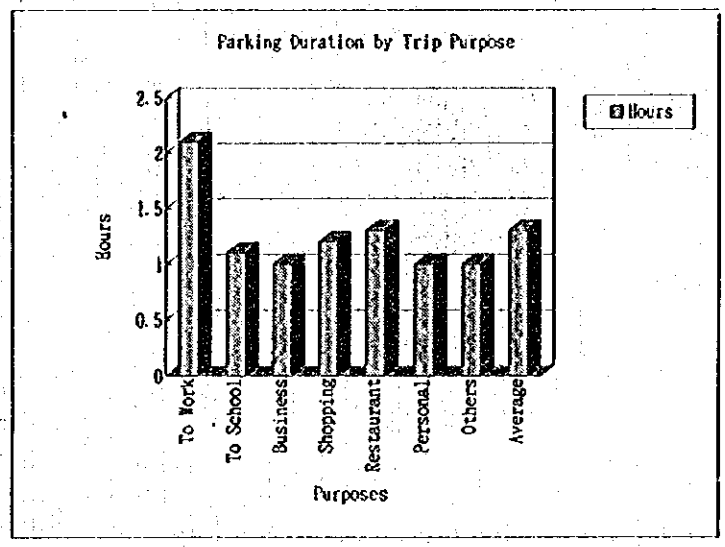
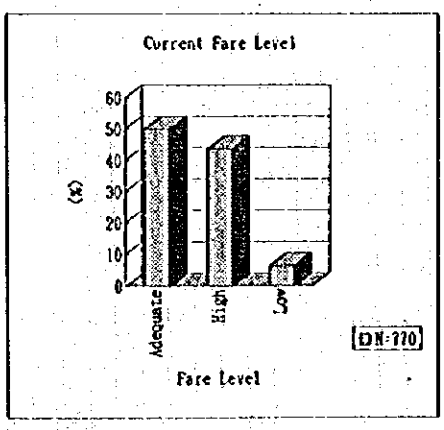


Figure 6.2-3 Parking Duration by Trip Purposes



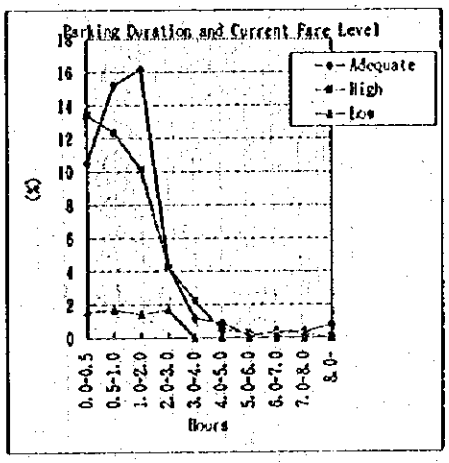


Figure 6.2-4 Parking Fare Level **Figure 6.2-5 Parking Duration and Current Fare**

Table 6.2-2 Parking Duration in Zonas Azules

<On street Parking>

Parking Facolities *	Lots	Type of use					Openning Hours (hours)	Total Capacity (lots)	Park Duration (hours)
		Office	Comercial	Bank	Institute	Univercity			
N-1		O					12.0		2.67
N-2			O			O	12.0		1.81
N-3		O					12.0		0.94
N-4			O	O			12.0		1.02
total	1,350						48.0	16,200	1.55
C-1		O				O	12.0		1.02
C-2		O	O				12.0		1.10
C-3						O	12.0		1.33
C-4		O				O	12.0		0.72
total	1,900						48.0	22,800	1.04
T-1		O		O			12.0		1.20
T-2		O					12.0		1.37
total	250						24.0	3,000	1.27
E-1		O			O		12.0		1.07
E-2		O			O		12.0		1.20
E-3		O		O			12.0		1.40
E-4		O	O	O			12.0		1.78
total	1,100						48.0	13,200	1.33
TOTAL	4,600						168.0	55,200	1.30

* N: norte, C: Chapinero, T: Tequendama, E: Centro.

3) Current Issues on Zonas Azales

The present Zones Azales system seems to be functioning effectively thanks to the efforts of well-trained inspectors and collectors. Sometimes, cramped vehicles are observed.

However, the present Zonas Azaleas are limited only to the physically allowable areas and seem to have no capacity to increase sufficiently to meet the demand; especially in Centro area. Some one-way streets allow parking on both sides, and this hinders the smooth flow of traffic on them.

Figure 6.2-6 illustrates the location of the Zonas Azules in Chapinero area. The Zonas spread widely all over the area, which suggests the difficulty of further significant expansion and the needs of development of off-street parking facilities.

4) Expansion Plan of Zonas Azules

The Zonas Azules will be expanded as shown in Table 6.2-3. Expansion is targeted together with the installation of ticket vending machines in December 1995. By implementing this plan, total parking capacities of the Zonas Azules will be about 30,000 vehicles a day, 1.5 times the present level.

Table 6.2-3 Expansion Plan of Zonas Azules

(As of October, 1995)

	Centro	Norte	Chapinero	Tequendama	Total
Present Lots	1,100	1,350	1,900	250	4,600
Planned Lots	1,700	2,250	2,280	250	6,150
Ticket Machine	0	5	14	5	24

Source: STT

(2) Off-street Parking

Privately owned off-street parking is administrated by DAPD and offices of Alcaldia Menor. IDU is planning to develop off-street parking facilities using public land.

1) Parking Facilities using Public Land

There are no off-street parking facilities operated by the public sector at present. There existed one at Plazoreta de Rosario, but it was sold to a private firm.

Development of off-street parking facilities is one of the main components of the current four-year plan (1995-1998) of IDU. IDU classified the urbanized area of Bogota into four categories A to D according to the intensity of parking demand, and looked for public space suitable for parking facility development. There are 25 sites found as the candidates (9 sites in area A and 16 sites in area B). IDU plans to develop 3- to 4-storied underground parking facilities with 300 to 500 lots under those public spaces, keeping the functions of the spaces as they are.

a) Out of the 25 sites, four highly prioritized sites were selected for earlier implementation in 1996. Those are the World Trade Center, Unilago, Parque de Lourdes and Plaza de Toros. The Municipal Government will grant the concession of the project to the private sector for 20 years. IDU is ready to bid for the projects and bidders shall propose their plan of design, construction, finance, management and operation, including the fare system. No subsidiary measures to this project are being considered at this moment.

2) Parking Facilities Operated by the Private Sector

Until 1992, FVS was administrating the off-street parking facilities owned and operated by the private sector, checking applications and granting operating licenses. Since 1993, however, the DAPD has been responsible to for checking applications to determine if they are appropriate in conjunctions with the urban development plan and in compliance to the Building Law. An operating license is granted by the Alcaldia Menor offices.

As for the fare system, only the maximum level of parking charge is regulated by the municipal ordinance, and operators can charge any fare within the limit. There are no subsidies by the national or local Government to the parking business in the private sector. There were about 280 parking facilities for public use operated by the private sector as of 1991, as shown in Table 6.2-4.

Table 6.2-4 Off-Street Parking Operated by Private Sector

	Parking Operated by Private Sector
Centro	186
Chapinero	62
Sur	26
Norte	6
Total	280

Source : Chamber of Commerce of Bogota :
"Hacia una nueva Police de Parquet"

As of 1992, the number of parking facilities by zone and parking capacity operated by private sector are shown in Table 6.2-5. About 9 % increase is observed when compared with city-center area in this survey.

Table 6.2-5 Parking Capacity (1992)

Zone	Lots
3 (Usaquen)	4
4 (Chapinero)	5
5 (Santa Fe)	77
6 (Santa Fe)	126
7 (San Cristobal)	34
25 (Candeleria)	59
Total	305

Source: Fondo De Vigilancia y Segridad de Santafe de Bogota.

3) Demand for Parking Facilities operated by Private Sector (Public Parking Facilities)

The survey and interview of parking time duration by trip purpose and opinions concerning the current fare were made on the parking time duration, parking charge, etc. at representative off-street parking facilities. This survey was carried out on weekdays in November 1995 collecting 1063 samples from 11 sites scattering in Norte, Chapinero, Tequendama, Centro, etc. The main result of the survey is shown in Table 6.2-6 and Figure 6.2-9 to Figure 6.2-11.

a) Parking Duration & Turn Over
b) Average parking duration is 1.6 hour for all the survey data. The area of Chapinero where is one of the office / commercial area shows exceptionally long parking duration of 3.2 hours.(see Table 6.2-6) The average parking duration of other office area falls in the range of 1.0 to 2 hours. The parking duration at commercial area is range of 1.1 to 3.2 hours. Most of the public parking facility users park less than 2 hours (see Figure 6.2-10). The turn-over rates range between 2.0 and 3.5. The parking duration and turn-over rates don't have good correlation. The parking demand may not be so high comparing to parking capacity.
c) Parking Duration by Trip Purpose
d) The trip purpose of "to work", "to school" show exceptionally long park duration 1.7 to 2.3 hours. The during time of other trip purposes , Business, Shopping , Restaurant are about one hour in average (see Figure 6.2-11).
e) Occupied ratio & Parking Charge
f) Table 6.2-7 summarizes the service condition of parking facilities surveyed and occupied ratio interviewed. According to the survey results, most of the parking facilities in CBD show the occupied ratios between 70% to 90% depending on their locations (see Table 6.2-7).

About 55% of the users consider the current fare level is adequate and the other 40% of users feel it too high. Then the majority of the users agree to the current fare. Generally speaking, it seems the current fare level of the Public Parking Facilities is suitable for the users. (see Figure 6.2-10, Figure 6.2-11)

Table 6.2-6 Parking Duration in Public Parking Facilities

<Off street Parking>

Parking Places *	Lots (N)	Type of Use: Office	Commercial	Bank	Insutitute	Univercity	Hospital	Openning Hours (hours)	Total Capacity	Parking Duration (hours)	Turn-over	Peak-time Occupancy (%)
n1	100		O					13.0	1,500	1.36	2.8	100
c1	80		O					16.5	1,320	2.32	3.5	60
c2	160	O	O					14.0	2,240	3.17	2.0	70
c3	100	O	O					13.0	1,300	1.49	1.5	80
c4	150	O	O					16.5	2,475	1.37	2.7	60
t1	800	O		O				24.0	19,200	1.96	2.9	85
t2	120	O						13.0	1,560	0.94	2.4	60
e1	124	O		O				11.0	1,364	0.96	2.4	-
w1	200		O					15.0	3,000	1.07	1.9	70
total	1,834							136	33,759	1.59	2.4	-
o1	160		O					15.0	2,400	1.08	2.4	70
o2	160						O	24.0	3,840	1.25	2.2	80
o3	220					O		14.0	3,080	2.79	3.2	80
total	540							53	9,320	1.51	2.5	-
TOTAL	2,374							189	43,079	1.57	2.4	-

* n: Norte, c: Chapinero, t: Tequendama, e: Centro, w: western area, o: Typical places.

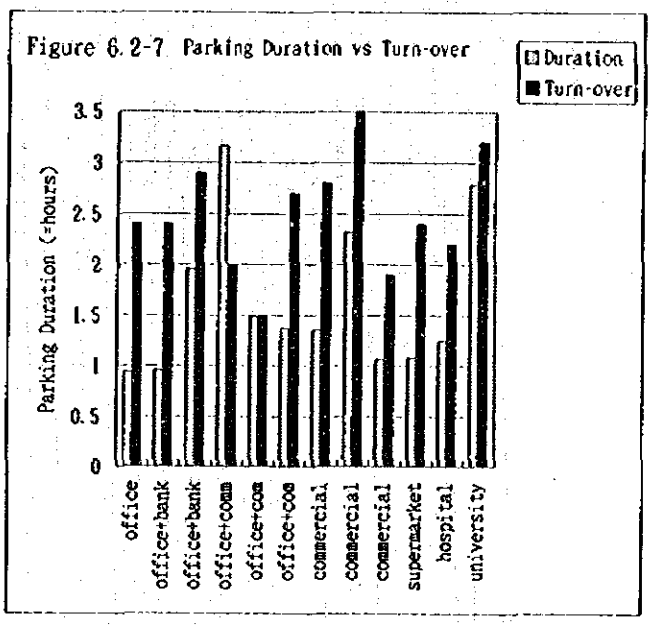


Figure 6.2-6 Parking Duration vs Turn-Over

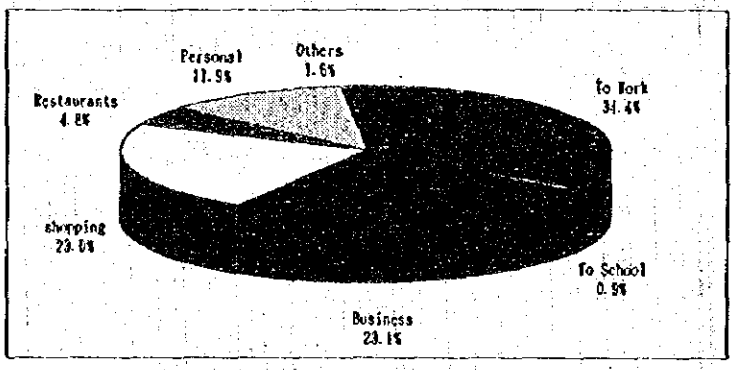


Figure 6.2-7 Parking Purposes

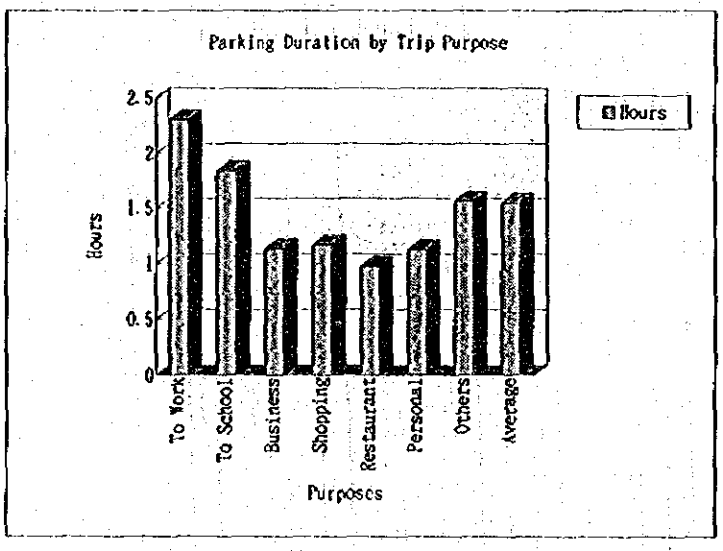


Figure 6.2-8 Parking Duration

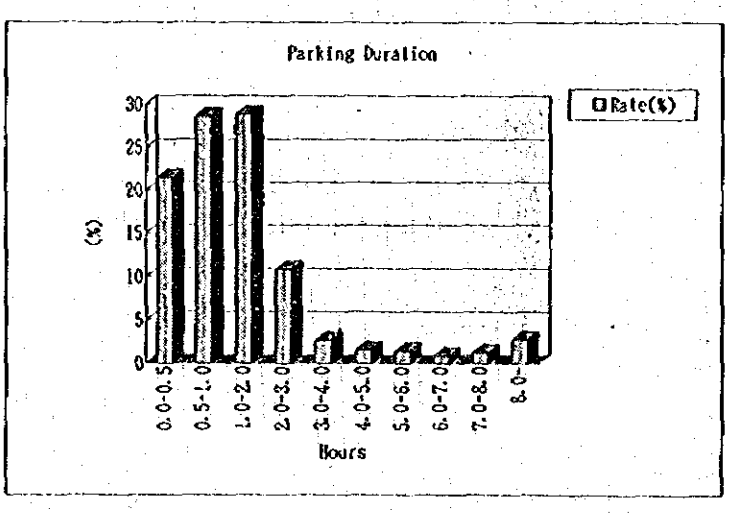


Figure 6.2-9 Parking Duration by Trip Purposes

Table 6.2-7 Occupation Ratio and Parking Charge

	Installation Type			Use Type				Service Condition						
		Public						Capac	Opening	Fare		Peak Day	Peak Hour	Occ.
	Lot	Build	Subte	Office	Trade	Univ	Others	Lotes	Hours	1	2			%
a1			X		X			100	7:00a.m 20.00	700	700	All days	14:00 19.00	100
c1			X		X			80	7:00a.m 23:30	1000	200	All days	All days	60
c2		X			X			160	7:00a.m 21:00	500	500	Saturday	8:00 20:00	70
c3	X			X	X			100	7:00a.m 20:00	500	500	Monday-Tuesday	7:00 12:00	80
c4	X			X	X			150	7:00a.m 23:30	700	700	Tuesday	7:00 13.00	60
i1			X	X				800	7:00a.m 21:00	820	820	Tuesday-Friday	7:00 17:00	85
i2	X			X				120	7:00a.m 20.00	700	700	Tuesday-Friday	9:00 17:00	60
e1		X		X				124	7:00a.m 18.00	500	500	No exact	No exact	-
o1		X			X			200	7:00a.m 22:00	700	700	Saturday	13:00 19:00	70
o1		X			X			160	7:00a.m 22:00	700	700	Saturday	13:00 19:00	70
o2	X						X	180	6:00a.m 06:00	1000	1000	Monday	16:30 18:00	80
o3	X					X		220	7:00a.m 21:00	0	0	Monday	07:00 15:00	80
s1-1	X				X			100	7:00a.m 00:00	400	400	Fraiday-Sunday	23.00 23.00	-
s2-1		X		X	X			200	6:00a.m 21:00	1500	1500	Monday-Tuesday	14:00 16:00	20
s2-2			X	X	X			800	6:00a.m 12:30	800	800	Tuesday-Friday	14:00 00:00	90
s2-3		X			X			120	6:00a.m 06:00	1180	800	Monday-Friday	All days	70
s3-1		X		X	X			1020	6:00a.m 06:00	500	500	Tuesday	All days	80
s3-2		X		X	X			60	7:00a.m 21:00	500	500	Saturday	All Afternoon	70
s3-3		X		X				140	7:00a.m 00.00	1000	750	Monday-Friday	16:30 17:00	100
s4-1	X			X	X			500	6:00a.m 20:00	300	300	Saturday-Sunday	All days	-
s4-2	X			X	X			120	5:00a.m 22:00	300	300	Saturday-Sunday	18.00 18.00	20
s11	X			X	X			80	6:00a.m 06:00	300	300	Friday-Saturday	6:00a.m 06.00	30
s13-1	X			X	X			100	6:00a.m 06:00	300	300	All days	22.00 00:00	-
s13-2	X			X	X			60	6:00a.m 06:00	500	500	Tuesday-Thursday	18:00 22.00	10
s13-1	X			X	X			200	6:00a.m 21:00	500	500	Monday-Friday	08:00 12.00	20
s13-2	X			X	X			400	6:00a.m 18.00	700	700	No exact	12.00 13.00	70
s16-1		X		X	X			160	5:30a.m 20.00	1000	1000	Saturday	14:00 00:00	50
s17-1	X			X	X			80	6:00a.m 06:00	500	500	Monday-Thursday	10.00 12.00	70
s17-2		X		X	X			333	7:30a.m 20:30	800	800	All days	07:30 20:30	70
s17-3		X		X	X			400	6:30a.m 19:00	1000	1000	All days	12:00 00.00	20
s17-3	X			X	X			60	6:00a.m 06:00	500	500	Monday-Friday	12:00 00:00	100

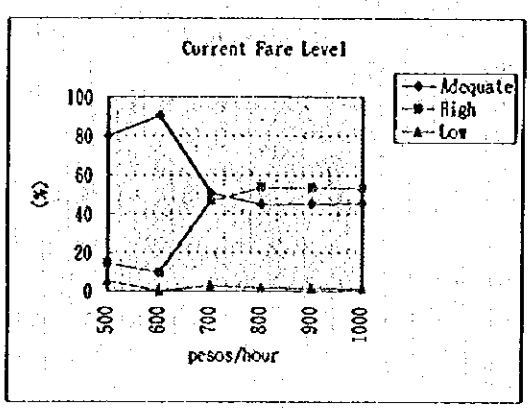


Figure 6.2-10 Parking Fare Level

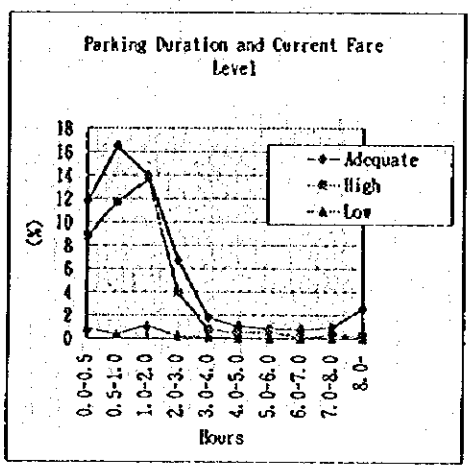


Figure 6.2-11 Parking Duration and Current Fare

4) Current Issue of Public Parking

There are a lot of private parking in the Centro and Chapinero area where parking demand is high. The survey showed that the parking was not filled up almost at any time. The occupancy rates were almost 80-100% at the peak hour according to the interview and parking demand is concentrated in a certain area such as in the Centro, Tequendama, etc. The fact that the parking has some room is also because there are plenty "Zonas Azules" which are used generally. Illegal parking on the local streets is observed in Norte area north of Calle 100 and the CBD east of Avenida Caracas because of relatively few parking area. These areas are expanding with urban development and preparation of parking will be required in accordance with the increase of the parking demand. In general, public parking should be developed and Zonas Azules be decreased gradually instead, from the view point of traffic capacity

and landscaping.

6.3 Current Traffic Management Problems and Issues

(1) Problems and Issues from Traffic Management

The following problems and issues concerning traffic flow were identified.

1) Within the area that constitutes the city's business and commercial center, a substantial volume of traffic is concentrated in the area bordered by Avenida 7a, Autopista del Norte, Avenida Quito and Autopista Del Sur, causing chronic congestion within the area.

2) Congestion in the above mentioned area is severe during peak hour, when major signalized intersections become saturated, as indicated by hourly traffic volume per lane. Moreover, travel speeds during the morning and evening peak hours fall to less than 10km/h, and nearly all stoppages are caused by intersection waiting time, spill back and other conflicts. In morning peak hour, the area surrounded by Avenida 7a-Avenida 147-Autopista del Norte-Avenida Boyaca-Avenida Quito-Autopista del Sur covering approximately 100km^2 is heavily congested. However, in the midday peak hour, the congested area is reduced to a 60 km^2 area of the city center. In the evening peak hour, the area expands further northward and westward than in the morning, and the traffic is higher density. The covering area shows 110 km^2.

3) The main causes for congested segments with travel speed of 10 km/h or less during peak hour are slow-moving buses/busetas conflicts near bus stops, and over-saturated congestion with traffic spill-back due to bottlenecks. The countermeasures for accomplishment of a smooth traffic flow and mitigation of traffic congestion at bottlenecks shall be required.

4) Several bottlenecks of major signalized intersection have a saturation degree of more than 1.0, indicating that these intersections are oversaturated.

5) There is a tendency toward high accident frequency in the area surrounded by Avenida 7a-Avenida 100-Avenida 68-Avenida Centenario, where congestion is severe. The countermeasures for reduction of traffic accidents will be essential for safety.

6) Driving habits which ignore traffic laws are observed on the roads in Bogota. For instance, drivers ignore red lights of traffic signal, do not follow lane markings, make sudden and frequent lane changes without notice, ignore speed limits, jump queues, and block intersections. Bus drivers are among the worst since they habitually load and unload passengers in intersections and the middle lanes. They overtake or change lanes near intersections in order to pick up extra passengers , and wait for passengers even when at green lights. Such driving behavior leads to a lower flow rate unless under a traffic-coordinated control system which reflects the results of travel time surveys and investigation of the occurrence of traffic accidents.

7) Therefore, effective traffic education programs and campaigns should be promoted to improve drivers compliance with traffic laws and regulations.

8) Regarding the driver license system in Bogota, the quality of instruction given to student-drivers shall be generally inadequate. The balance between driving practice

and classroom instruction seems unduly skewed toward driving practice with insufficient classroom instruction provided. As a consequence, proper attitudes toward driving and law enforcement which include the need for self-discipline and social responsibility are not adequately stressed.

(2) Problems and Issues from Traffic Management Facility.

The following problems and issues concerning traffic control/management facilities were identified.

1) The existing traffic signal control system has several problems related to its operation and facilities. Most of the traffic signals are installed on low poles and have small lenses, resulting in poor visibility. The signal lights for pedestrians are insufficiently installed. The signal control system works effectively when the traffic shows a stable fluctuation pattern. However, it can neither cope with a drastic change in fluctuation nor pay consideration to the traffic on the roads crossing the arterial. For such purposes, the traffic response system will be needed. And in case of over-saturated intersection, the countermeasure to mitigate traffic congestion should be considered.

2) Present Zones Azules System for parking will function effectively with the efforts of well-trained inspectors and collectors. Sometimes, cramped vehicles are observed. However, the Zones Azules are limited only to the physically allowable areas, and seem to have no capacity to expand to meet the demand. This is especially the case in the Centero area. Some one-way streets allow parking on both sides, and this hinders the smooth flow of traffic on them.

3) Regarding the present traffic control regulation, the currently prepared number of reversible-lane roads show the effectiveness of the perplexing changes in traffic demand. However, the traffic facilities such as overhead lane direction signals, signs attached to gantry or pedestrian bridge, and variations in lane line color should be installed for notifying to drivers.

4) Traffic safety facilities such as safety guard devices are not sufficient in number, quality and maintenance condition.

CHAPTER 7
Guidelines on Environmental Impact Assessment in Bogota

7. GUIDELINES ON ENVIRONMENTAL IMPACT ASSESSMENT IN BOGOTA

7.1 Introduction

7.1.1 Background and Procedure of Environmental Impact Study

The environment is of special importance to the life of humans and other living creatures, as well as to the economic, cultural and social development of the country, the nation and mankind as a whole.

In general, many developing countries formerly felt that environmental protection and development were incompatible and that to escape from poverty, their most pressing problem, priority had to be given to development, even at the cost of environmental destruction. Today, they address environmental problems such as pollution in major cities, etc., very seriously; the need to take account of environmental considerations in development projects is understood; and determined efforts are being made to tighten environmental laws and strengthen agencies charged with protecting the environment.

The items of Initial Environmental Examination(IEE), which resulted from the prior investigation, are shown below.

1) Socioeconomic environment
   a) Resettlement
   b) Cultural property
   c) Waste
2) Natural environment
   a) Groundwater
   b) Hydrological situation
   c) Flora and fauna
   d) Landscape
3) Environmental pollution
   a) Soil contamination
   b) Noise and vibration
   c) Ground subsidence

Under the above-mentioned items, this study includes collections of basic references on EIA concerned about environmental problems and preparation of an estimation of the impact of the urban transport projects on the environment.

7.1.2 General Condition of the Study Area

The population of Bogotá is over 6 million. The urban condition such as transport, housing and the environment have deteriorated seriously. As for transport, the flow of traffic is frequently interrupted owing to the lack of mass-transit systems, defect in traffic control, poor maintenance of vehicles and lack of traffic manners, leading to chronic traffic jams and environmental pollution caused by emissions from vehicles.

7.2 Legislation

Taking the opportunity presented by the "Rio Declaration on Environment and Development" (United Nations Conference on Environment and Development UNCED) 1992, the system of environmental protection in Colombia required the reexamination of the existing system of laws in order to build a society which ensures sustainable development with minimal negative effects on the environment.

To cope with environmental problems, Colombia enacted in December 1993 a Presidential sanction Law 99 which lays down 14 basic principles and a policy direction, and provides the basis upon which to implement a comprehensive environmental policy. The Environmental Law enacts the establishment of the Ministry of the Environment and the operation of a National Environmental System (SINA).

The objects of establishment of the Ministry of the Environment are as follows; guaranteeing the participation of the community in the national environment and renewable natural resources policy; insuring the right of every individual to enjoy healthy environment; protecting the natural heritage and the sovereignty of the Nation. In addition, it is the duty of the Ministry of the Environment to coordinate the National Environment System (SINA) created pursuant to this law, in order to ensure the implementation and performance of the corresponding policies, plans, programs and projects, guaranteeing the performance of the duties and rights of the Government and of private parties as to the environment and the natural heritage of the Nation. Colombia has extensive regulations for environmental protection, and these are summarized in Figure 7.2-1.

The Law 99 of 1993 that creates the Ministry of the Environment, establishes a better organization of the National Environment System (SINA) as follows:

The Ministry has the following scientific organizations :

a) IDEAM--Institute of Hydrology, Meteorology and Environmental Studies
b) INVEMAR--Institute of Marine and Coastal Investigations "Jose Benito Vives de Andreis"
c) Amazon Institute for Scientific Research, "Sinchi"
d) Institute of Environmental Research of the Pacific, "John Von Neumann"

The Regional Autonomy Corporations(CAR) are official corporate bodies attached to Departments and Municipalities. The Corporations for Sustainable Development are managed like the Regional Corporations, with some variations; especially in the composition of their local government councils.

These corporations cover all Colombian territory and they take the responsibility of the environmental management of the region, particularly granting environmental licenses for works or activities that could have an effect on the environment. Municipalities with more than one million inhabitants such as Bogota, Cali, Medellin and Baranquilla perform the function of the corporations in their relative areas. The organizational structure of the national environmental system is as follow.

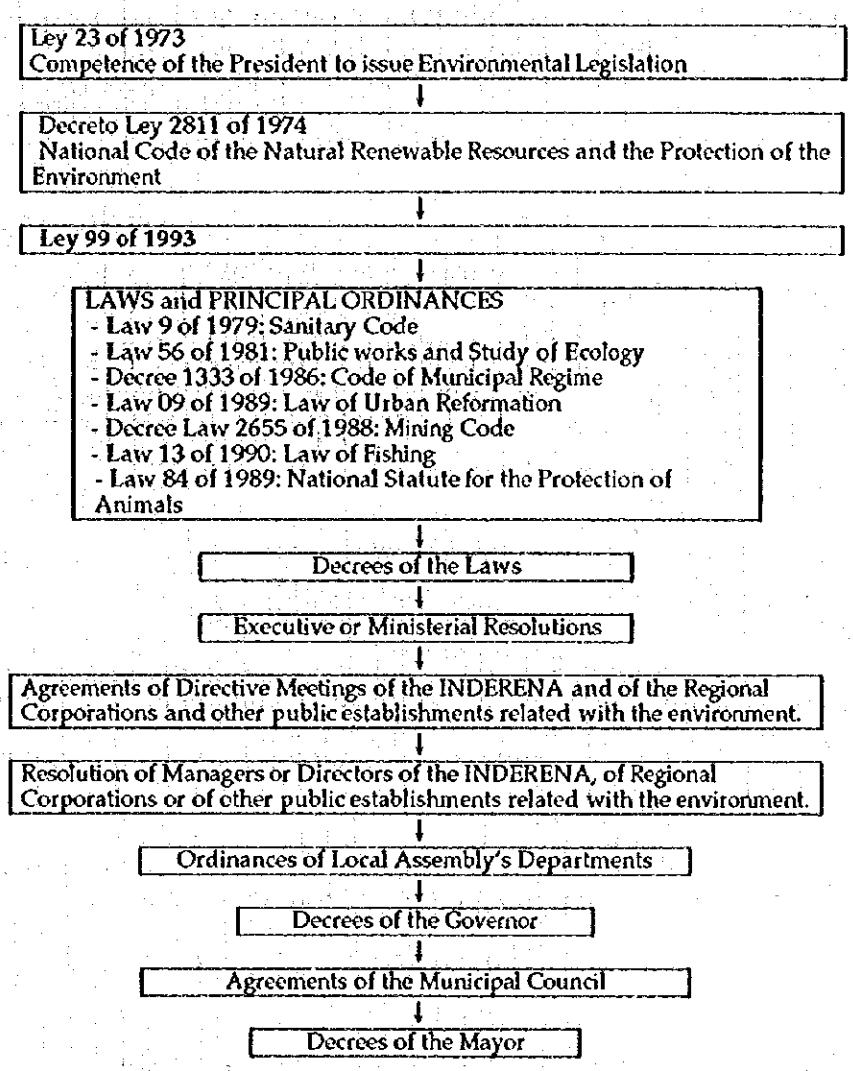


Figure 7.2-1 The Basic Structure Of The Environmental Legislation In Colombia

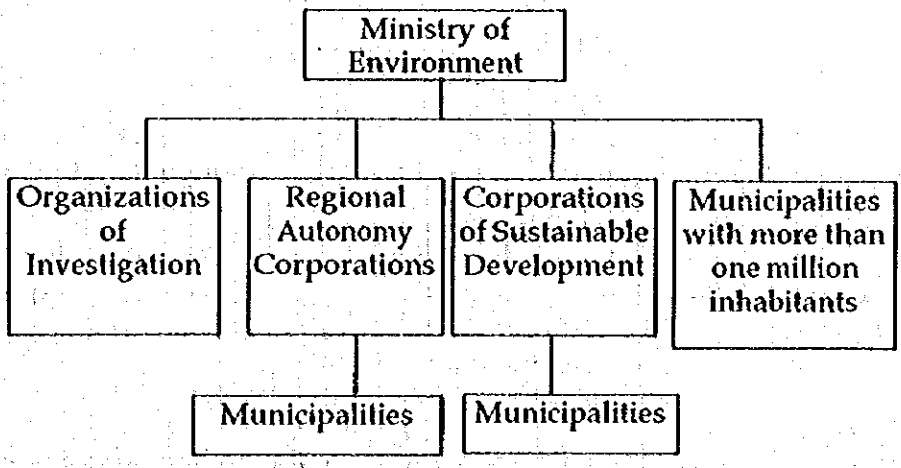


Figure 7.2-2 State Institutions and Environmental Management in Colombia

7.2.1 Law/guidelines on Environmental Impact Assessment

Ley 99/93 VII and Decreto No.1753/94 III provide the guidelines for the environmental impact assessment.

(1) Jurisdiction

Pursuant to this law, the environmental licenses will be granted by the Ministry of the Environment, the Corporaciones Autonomas Regionales(CAR) and some large cities with a population of over 1,000,000.

According to the scale and other characteristics of projects, jurisdiction is divided between the Ministry of the Environment and CAR. In addition, the municipal offices of large cities such as Bogota, Cari, Barranquilla and Medellin have the same jurisdiction as CAR .

The Department of Technical Administration of Environment (DAMA) has jurisdiction over projects in Bogota. Environmental Licenses have frequently been granted by the Ministry of the Environment, but not as of yet been granted by the DAMA.

(2) Projects Subject to an Environmental License

Large-scale Projects for urban transport development need a License from the following organizations prior to their implementation.

1) Ministry of the Environment

For the execution of national public works for roads, rivers and railway networks, including improvement and upgrading projects, and also projects that will affect the ecosystem of national parks, etc.

2) The CAR and DAMA

For the execution of public works for road networks other than the above and disposal of industrial waste and construction of mass-transport systems, etc. Because there are no national roads in Bogota, the DAMA is the authority for urban transport development projects.

(3) Procedure for the Granting of Environmental Licenses

The environmental authority will determine whether or not a project needs an environmental license based on the project information.

The environmental authority will determine the scope and conditions for the studies on environmental impact, and can request any additional information from the interested party. Following thus, the environmental authority will request technical opinions or relevant information from other entities or authorities.

The environmental authority will estimate and assess the environmental impact caused by the project, and will grant or deny the corresponding environmental license within a period not exceeding 60 working days.

(4) Public Hearings

Ordinarily, the environmental authority will hold a public explanatory meeting, which consisting of the representatives of the environmental authority, the interested party and the affected inhabitants. Though there is no obligation regarding the attendance of