

Figure 7.3-5 Location of Major Arterial Road Segments in Table 4.3.2

#### 7.4. BUS PASSENGER CHARACTERISTICS

The following description of bus passenger characteristics are derived from the findings of the Bus Passenger Survey over 165 routes undertaken by PDTU2001 and those of the additional bus passenger survey, conducted as part of the present Feasibility Study, over three bus routes earmarked for the operation of the proposed Trunk Bus System.

### 7.4.1. BOARDING AND ALIGHTING CHARACTERISTICS

#### (1) Passengers on Icoaraci-Centro Route

The most common route from Icoaraci to Centro originates in the built-up area of Icoaraci and passes Rodovia Augusto Montenegro and Av. Almirante Barroso to reach Sao Braz Bus Terminal and Centro, with route length of some 27km. Figure 7.4-1 shows passenger boarding and alighting behaviors on this route during the peak hour. Passengers on board in the vicinity of an Icoaraci terminal is around 20 but jump to 80 – 90 by the time the bus reaches the outer periphery of the built-up area of Icoaraci. At around 7km from the originating terminal, passengers reach the full capacity of about 100 (both seated and standing-up). The full capacity continues through Sao Braz Bus Terminal, where the bulk of passengers get off, leaving 20 or so on board. The bus rarely picks up passengers within Centro.

#### (2) Passengers on Cidade Nova-Centro Route

The most common route from Cidade Nova to Centro originates in the built-up area of Cidade Nova and passes Rod Mario Covas, Rodovia BR-316 and Av. Almirante Barroso to reach Sao Braz Bus Terminal and Centro, with route length of some 18km. Figure 7.4-2 shows passenger boarding and alighting behaviors on this route during the peak hour. Passengers on board in the vicinity of a Cidade Nova terminal range from 30 to 40 but steadily increase up to the intersection to Rodovia BR-316. Passengers continue to increase albeit slowly along Rodovia BR and Av. Almirante Barroso. They drop from some 10 to 20 or so at Sao Braz Bus Terminal. The bus seldom picks up passengers within Centro.

#### (3) Passengers on Marituba-Centro Route

The most common route from Marituba to Centro originates in the residential area of Marituba and passes Rodovia BR-316 and Av. Almirante Barroso to reach Sao Braz Bus Terminal and Centro, with route length of some 25km. Figure 7.4-3 shows passenger boarding and alighting behaviors on this route during the peak hour. Nearly full-capacity passengers board the bus in the residential area. Passengers continue to increase albeit slowly along Rodovia BR, often surpassing the bus capacity. Many passengers alight at Sao Braz Bus Terminal and the bus hardly picks up passengers within Centro.

Location of bus stop number presented in Figure 7.4-1 to Figure 7.4-3 is shown in Figure 7.4-5.

### 7.4.2. PASSENGER VOLUME ON ARTERIAL ROADS

Table 7.4-1 shows the estimates of the passenger volume during the peak hour and the average daily passengers. These estimates are derived from the findings of the PDTU2001 passenger survey and the additional passenger survey conducted as part of the present Feasibility Study. Figure 7.4-4 shows the estimated peak-hour passenger volume on three bus routes proposed for the Trunk Bus System.

Table 7.4-1 Estimated Passenger Volume on Arterial Roads Proposed for the Trunk Bus System

Name of Road & Segment	No. of Passenger (Passenger / Peak-hour) Inbound	No of Passenger (Passenger / Day) Inbound
① Rodovia BR-316	9,686	69,782
② Rodovia BR-316	20,942	111,445
③ Rod. Mario Covas	5,202	31,185
⑤ Rod. Augusto Montenegro	12,288	57,776
⑥ Rod. Augusto Montenegro	20,336	93,000
⑦ Av. Almirante Barroso	42,640	202,844
⑧ Av. Almirante Barroso	31,135	170,593
⑨ Av. P.A. Cabral	9,170	41,687
⑪ Av. Senador Lemos	1,701	15,145
⑮ Av. Marechal Hermes	10,488	95,152
⑯ Av. Gov. Jose Malcher	13,167	110,946
⑰ Av. Nazare	3,640	68,134

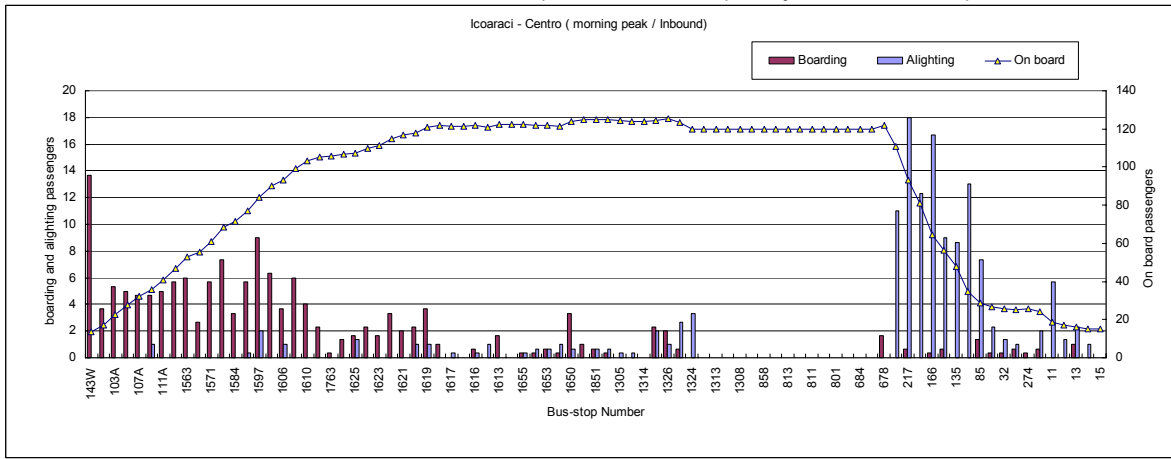
### 7.4.3. BUS TRAFFIC VOLUME ON ARTERIAL ROADS

Based on the results of Screen Line Survey conducted by JICA Study Team in June 2002 and analysis of data collected, the bus traffic volume on the arterial roads are calculated. The bus traffic volume on the existing August Montenegro, Rodovia BR-316, and Avenida Almirante is calculated as 1,200 to 6,200 bus / day / both directions, 4,500 to 8,000 bus / day / both directions, and 11,200 to 12,800 bus / day / both directions respectively as shown in

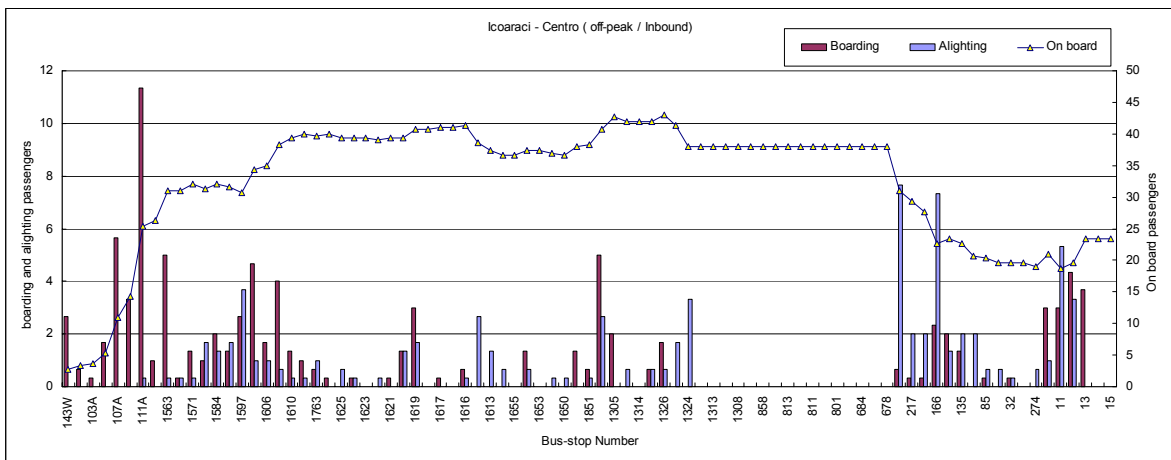
Figure 7.4-6.

On the other hand, the highest peak hour bus traffic volume of the Rodovia August Montenegro, Rodovia BR-316, and Avenida Almirante is calculated as 248 bus / hour / inbound, 327 bus / hour / inbound, and 562 bus / hour / inbound respectively as shown in Figure 7.4-7.

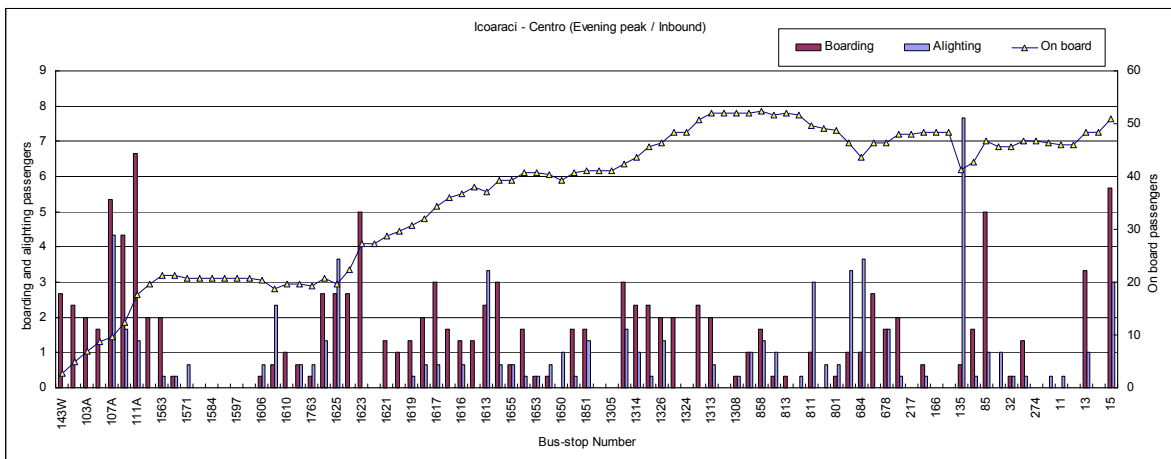
The Improvement of Transport System in the Metropolitan Area of Belem



Morning peak hour

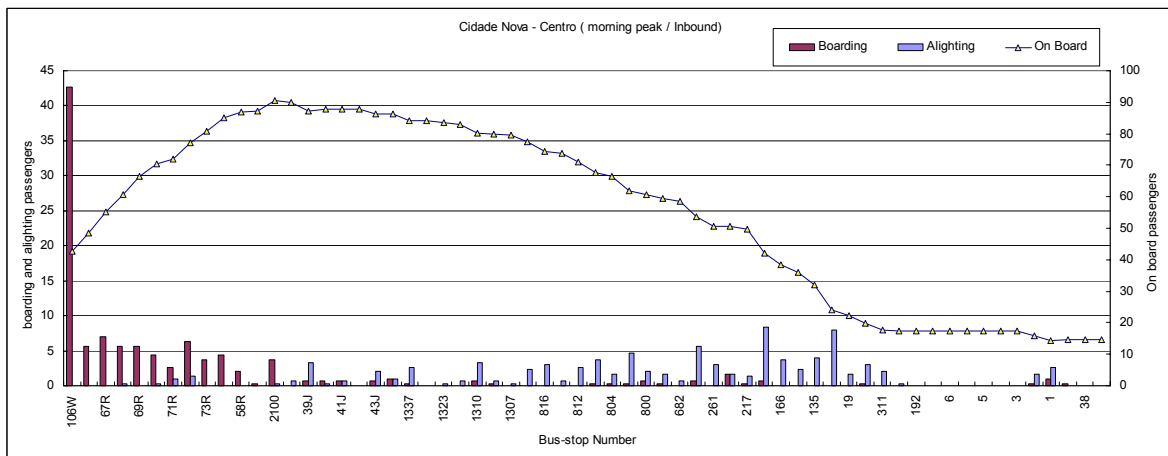


Off-peak hour

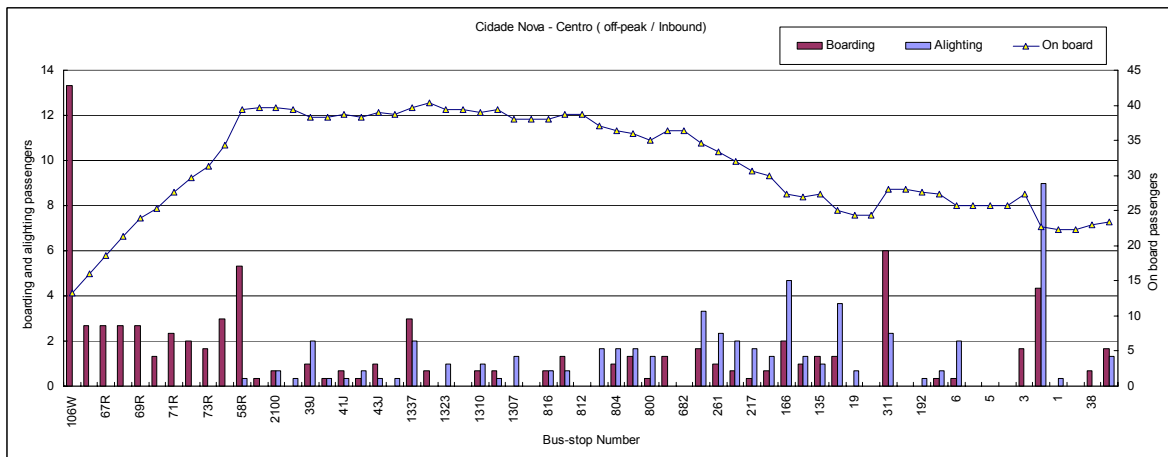


Evening peak hour

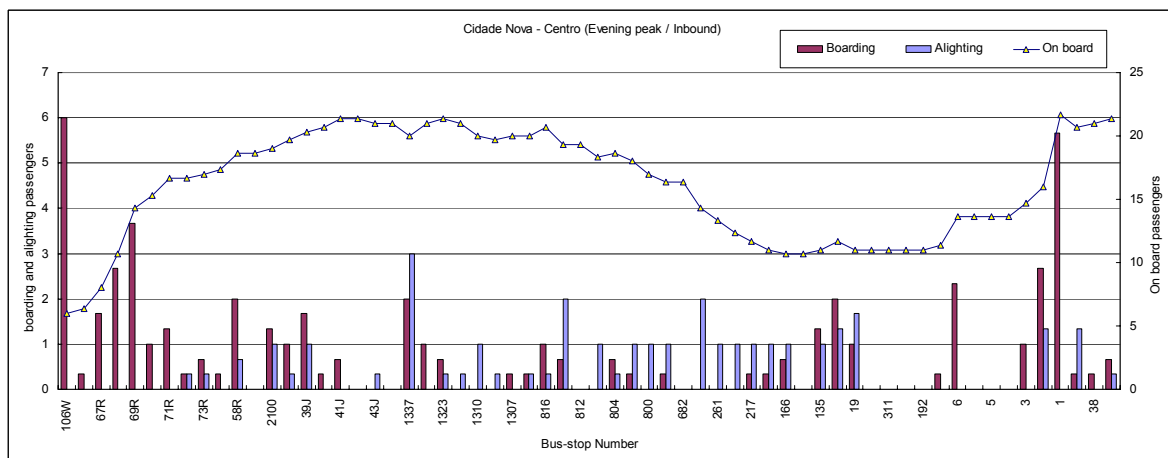
Figure 7.4-1 Boarding and Alighting Characteristics on Icoaraci-Centro Route



Morning peak hour



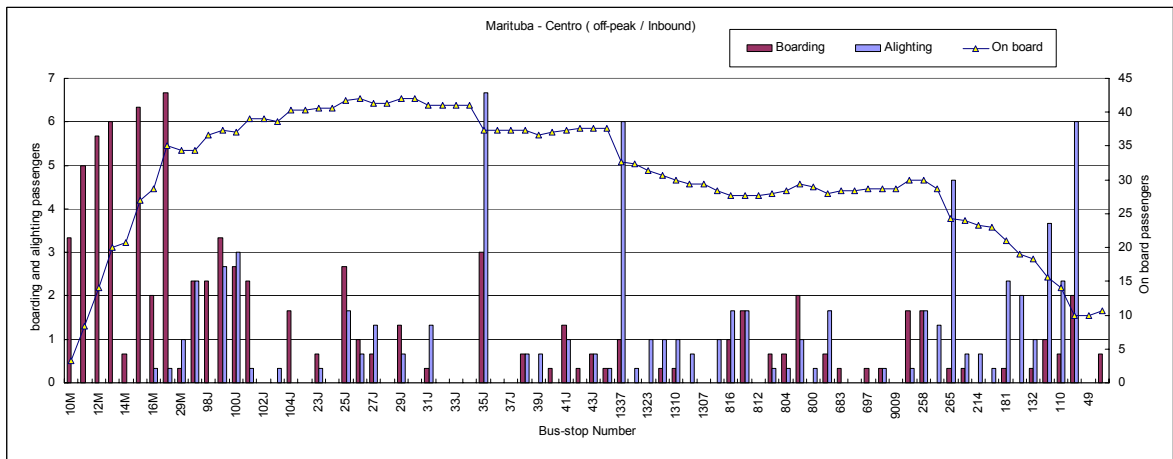
Off-peak hour



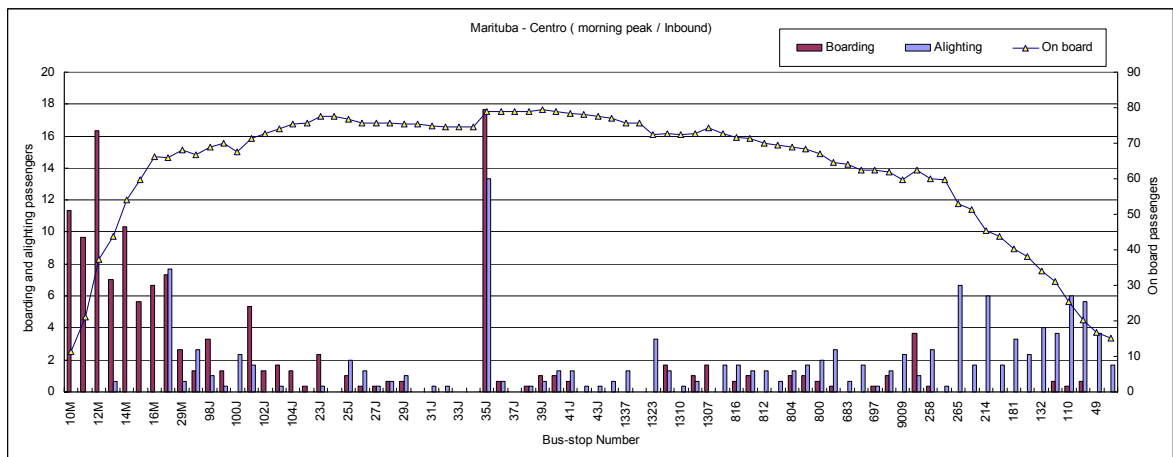
Evening peak hour

Figure 7.4-2 Boarding and Alighting Characteristics on Cidade Nova-Centro Route

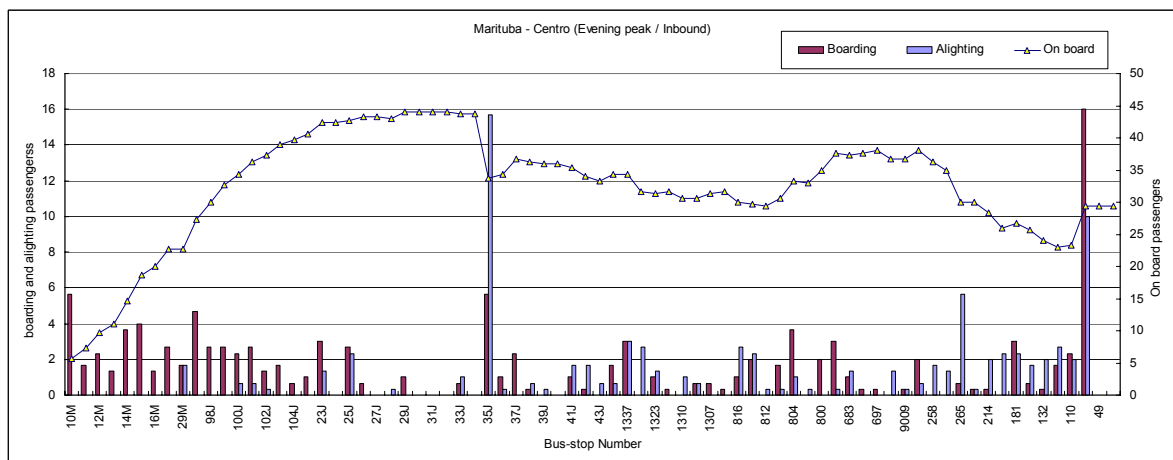
The Improvement of Transport System in the Metropolitan Area of Belem



Morning peak hour



Off-peak hour



Evening peak hour

Figure 7.4-3 Boarding and Alighting Characteristics on Marituba-Centro Route



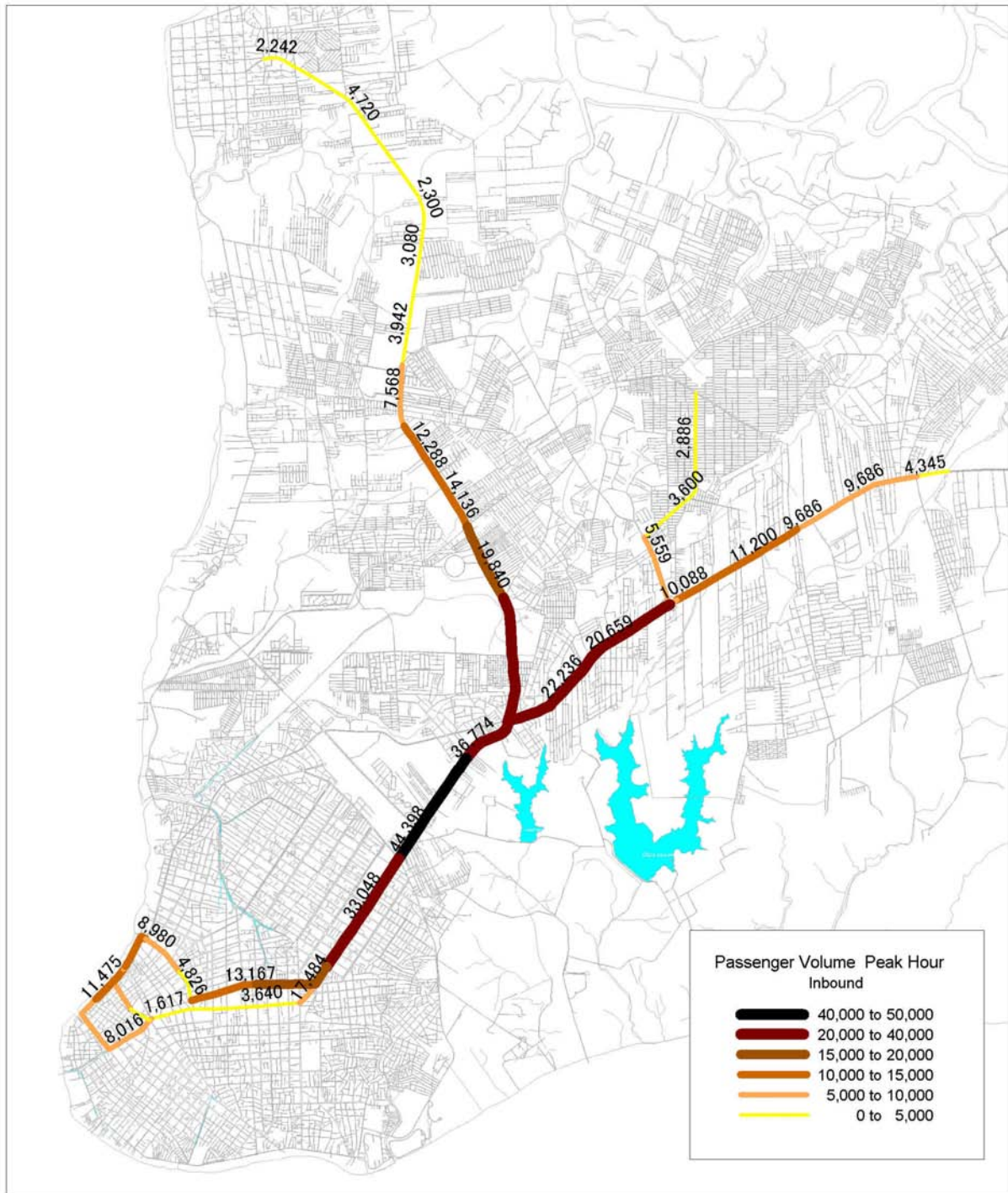


Figure 7.4-4 Peak-hour Passenger Volume on Proposed Routes for Trunk Bus System





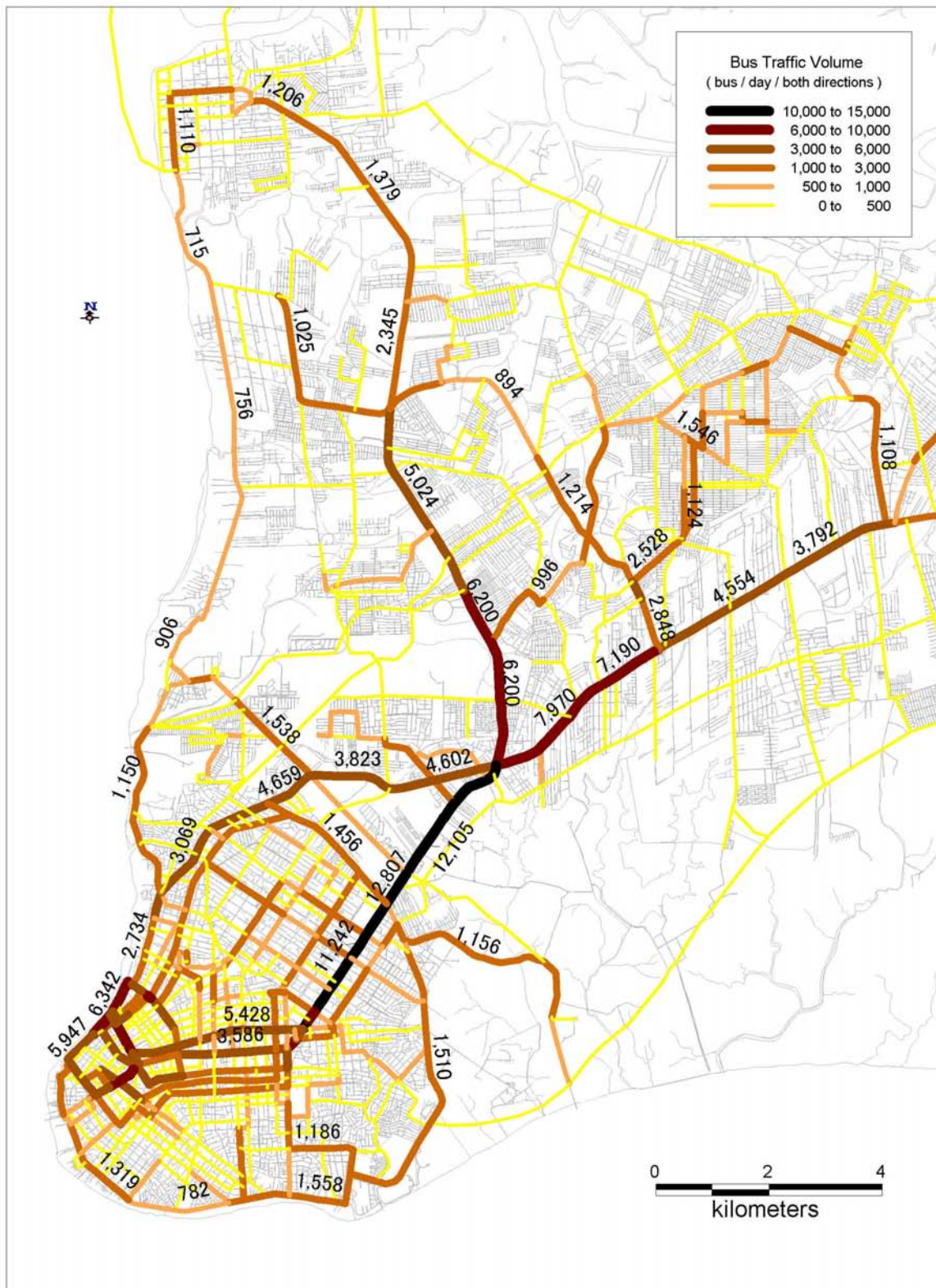


Figure 7.4-6 Bus Traffic Volume on Arterial Roads (Bus/Day/both directions)

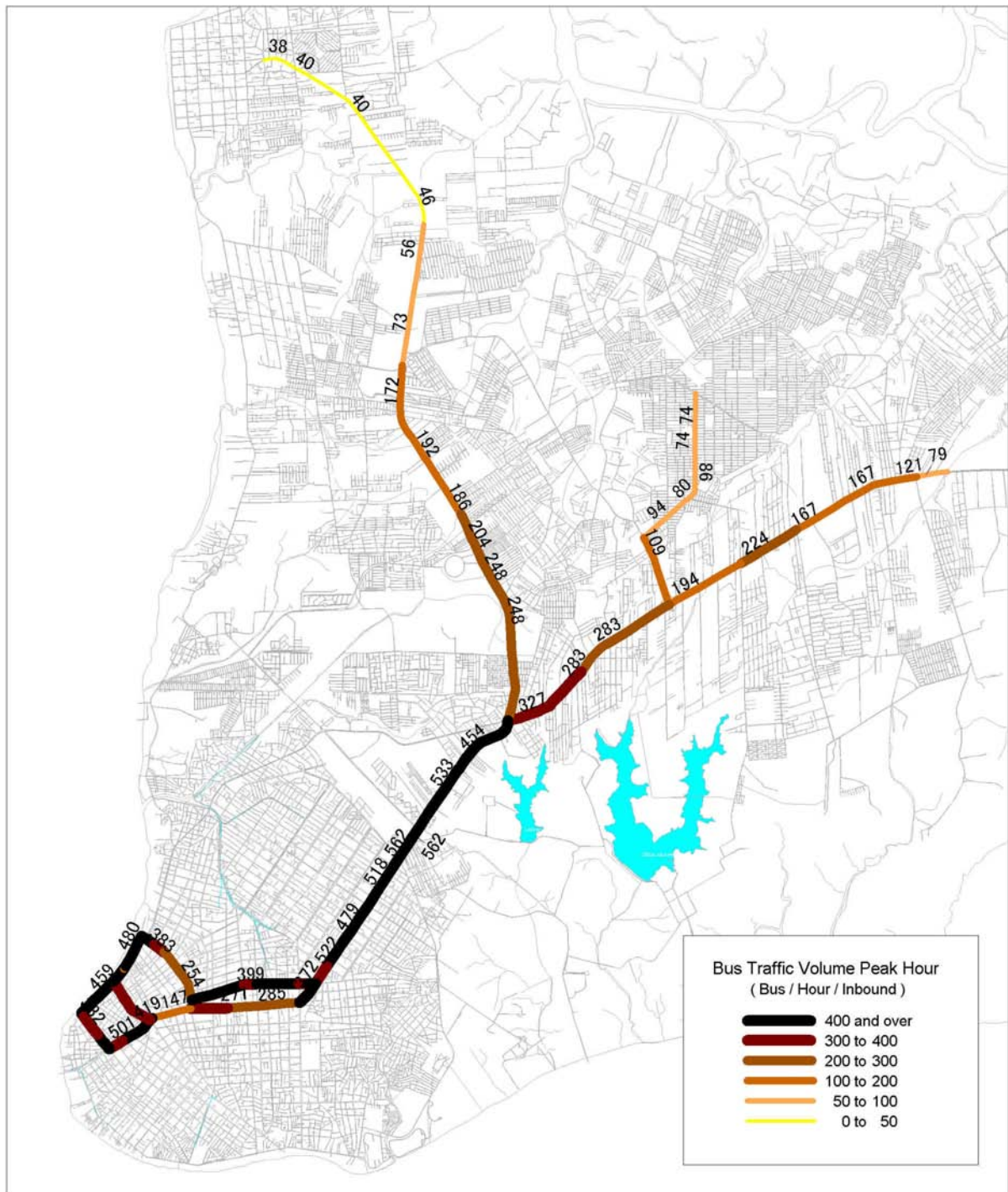


Figure 7.4-7 Peak Hour Bus Traffic Volume on Arterial Roads (Bus/Hour/Inbound)

## **7.5. BUS OPERATION CHARACTERISTICS**

### **7.5.1. BUS OPERATION SPEED**

The bus operation speed survey was conducted over three bus routes proposed for the Trunk Busway System: namely, the Icoaraci – Centro route passing Rodovia Augusto Montenegro, the Cidade Nova – Centro route passing Rodovia BR-316, and Marituba – Centro route passing Rodovia BR-316. As mentioned earlier, field workers, boarding the same buses used for the bus passengers survey, clocked the time of arrival and departure at every bus stop over the entire route from its origin to destination. The survey was conducted in the morning and the evening peak hour and the off-peak hour, a total of three hours.

#### **(1) Operation Speed Characteristics in the Morning Peak Hour**

The operation speed was more or less stable in the Expansion Area, but slowed down in the Central Area of Belem City. Figure 7.5-1 shows the variation of speed over the surveyed routes during the morning peak hour. Regarding the Icoaraci – Centro route along Rodovia Augusto Montenegro, the speed was about 25km/h on the four-lane road segment and ranged from 30 to 40km/h on the six-lane segment. The speed slowed down a little to 20km/h around the intersection with Rodovia BR-316. On Avenida Almirante Barroso, the operation speed slowly but steadily dropped as the bus approached Centro, and on Avenida Jose Malchal it sometimes dropped to less than 10km/h. The drop of speed was sharp on Avenida Marechal Hermes where many bus lines converged. Figure 7.5-2 shows the variation of operation speed by route segment, while Figure 7.5-3 shows the location of each numbered segment.

#### **(2) Operation Speed Characteristics in the Off-peak Hour**

The operation speed of the off-peak hour was faster by 5 to 10km/h than that of the morning peak hour. Figure 7.5-4 shows the variation of speed during the off-peak hour. The bus originating from Icoaraci operated at a speed of 35 to 45km/h on Rodovia Augusto Montenegro, slowed down slightly to about 30km/h around the intersection to Rodovia BR-316. On Avenida Almirante Barroso, the speed stayed around 30km/h until it slowed down to less than 20km/h inside the Central Area of Belem City. The speed from Avenida Jose Malcher through Centro was more or less the same as in the morning peak hour. The bus routed on Rodovia BR-316 operated at a stable speed of 25km/h to 30km/h.

#### **(3) Operation Speed Characteristics in the Evening Peak Hour**

The average operation speed during the evening peak hour did not vary much between the inbound and the outbound traffic. Figure 7.5-5 shows the variation of average speed for the inbound traffic during the evening peak hour. Figure 7.5-6 is the graph showing the speed variation of the inbound and the outbound traffic by hour from 6:30 to 18:00.



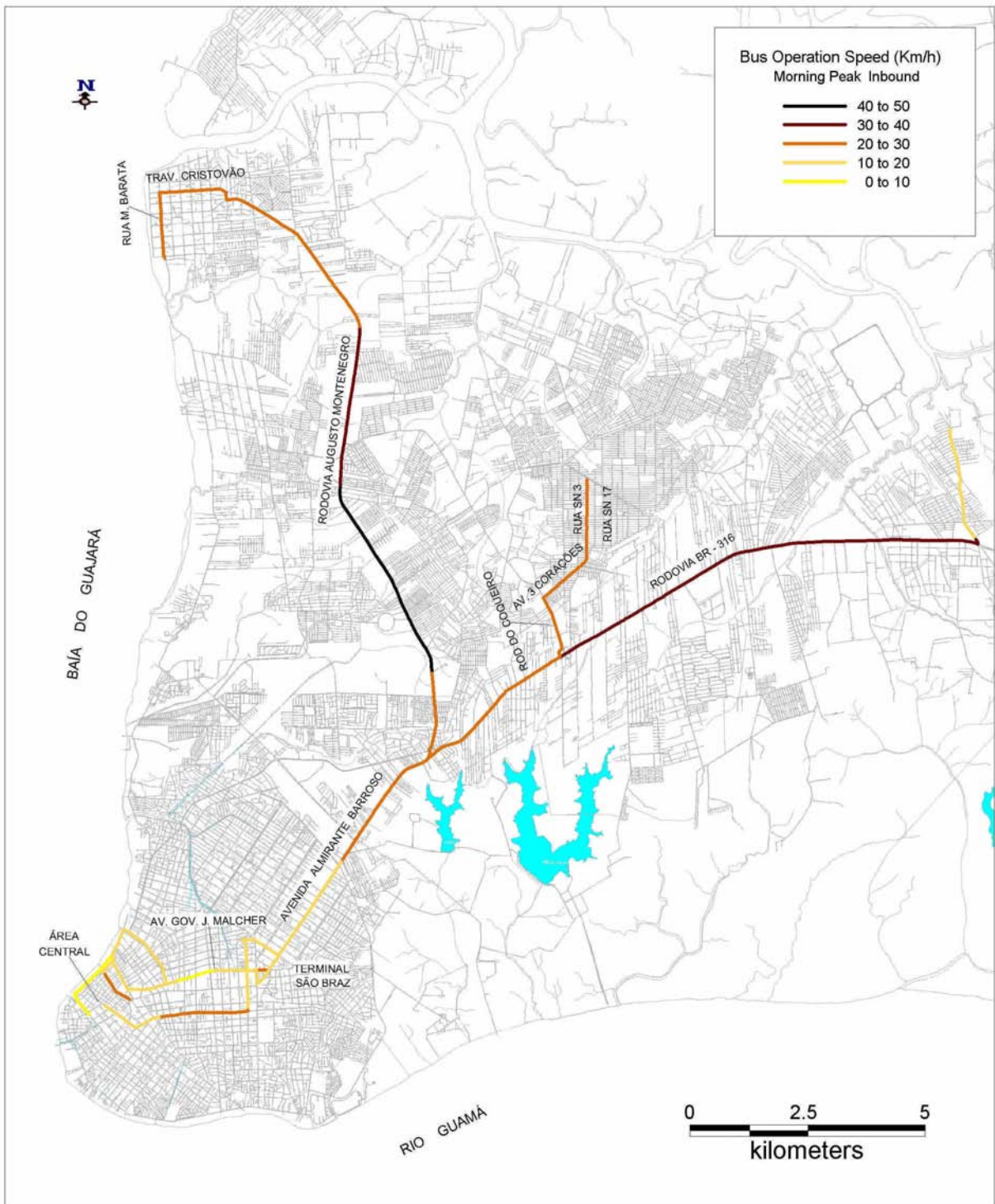


Figure 7.5-1 Inbound Operation Speed during Morning Peak Hour

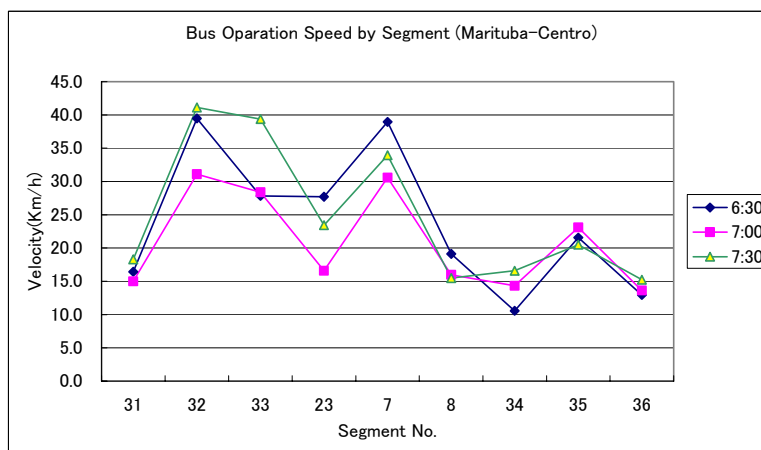
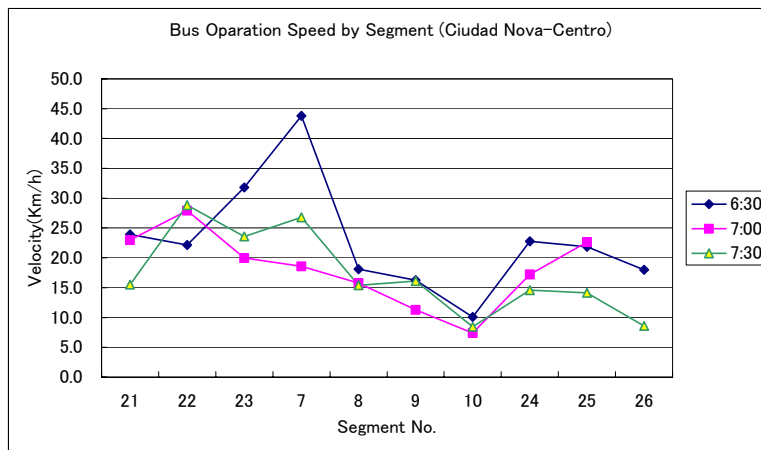
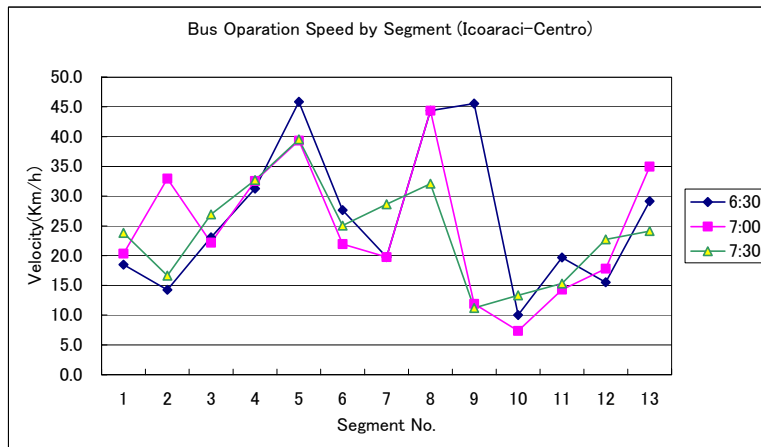


Figure 7.5-2 Inbound Operation Speed of Morning Peak Hour by Route Segment



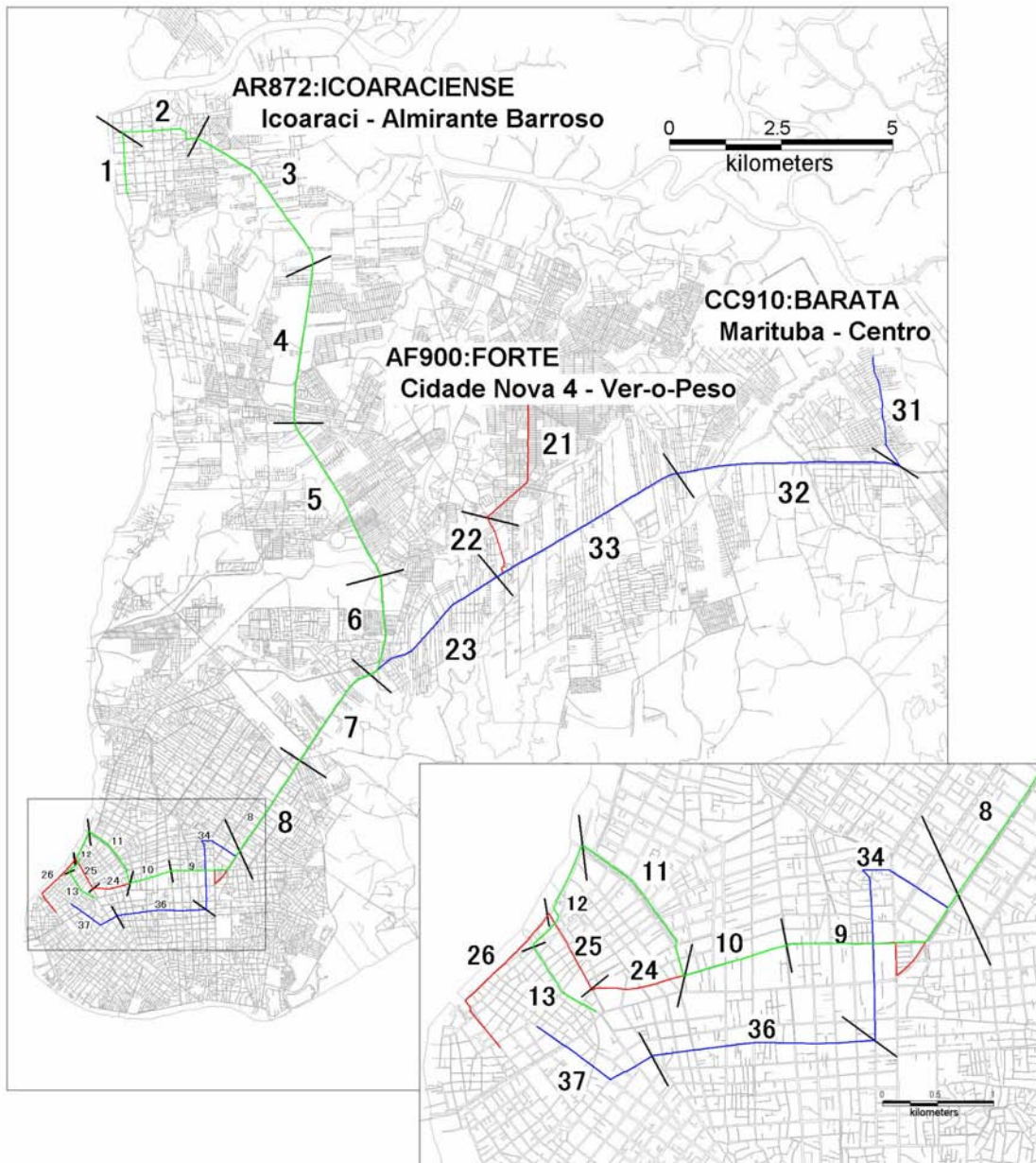


Figure 7.5-3 Location of Route Segments by Number

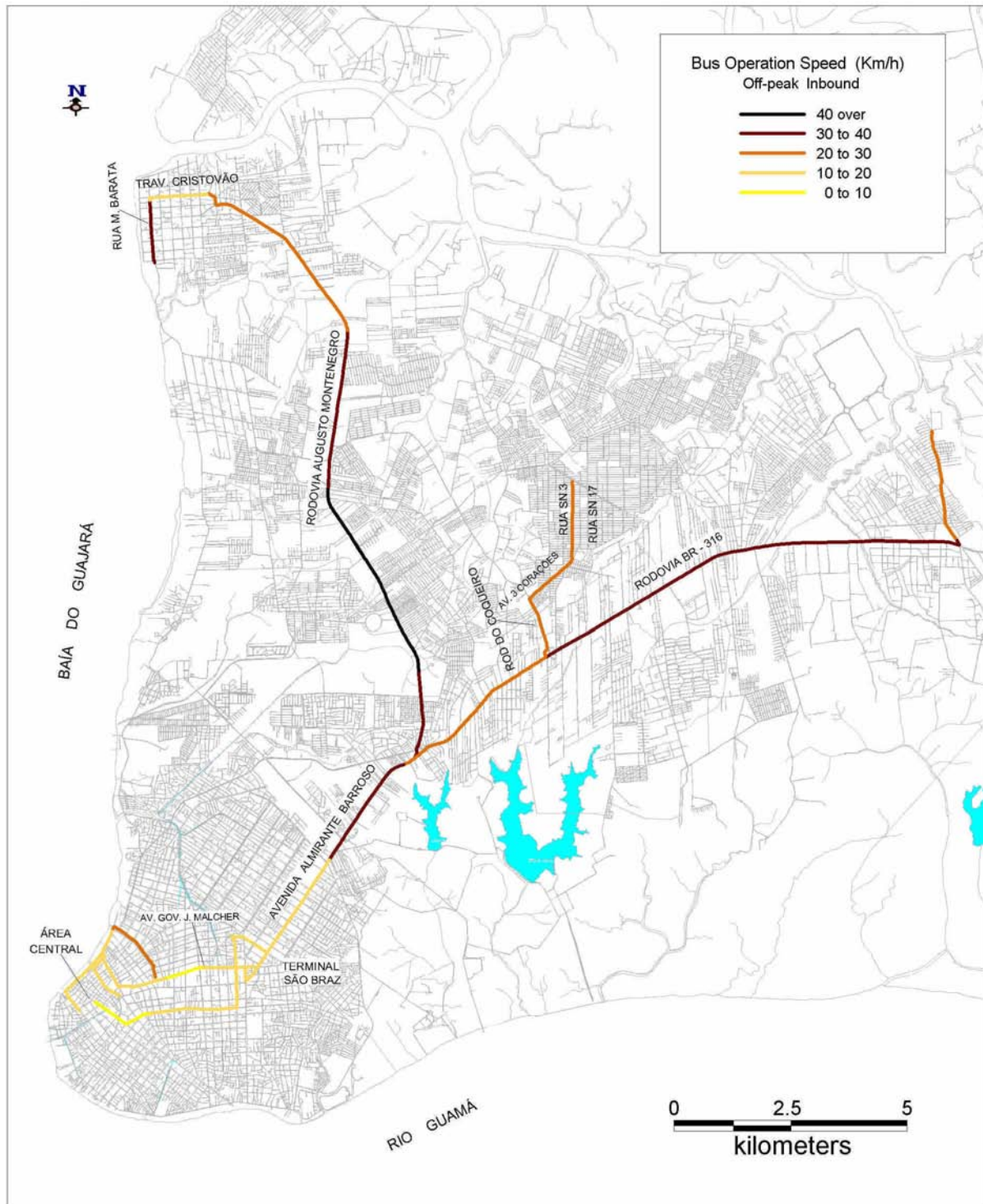


Figure 7.5-4 Inbound Operation Speed during Off-peak Hour

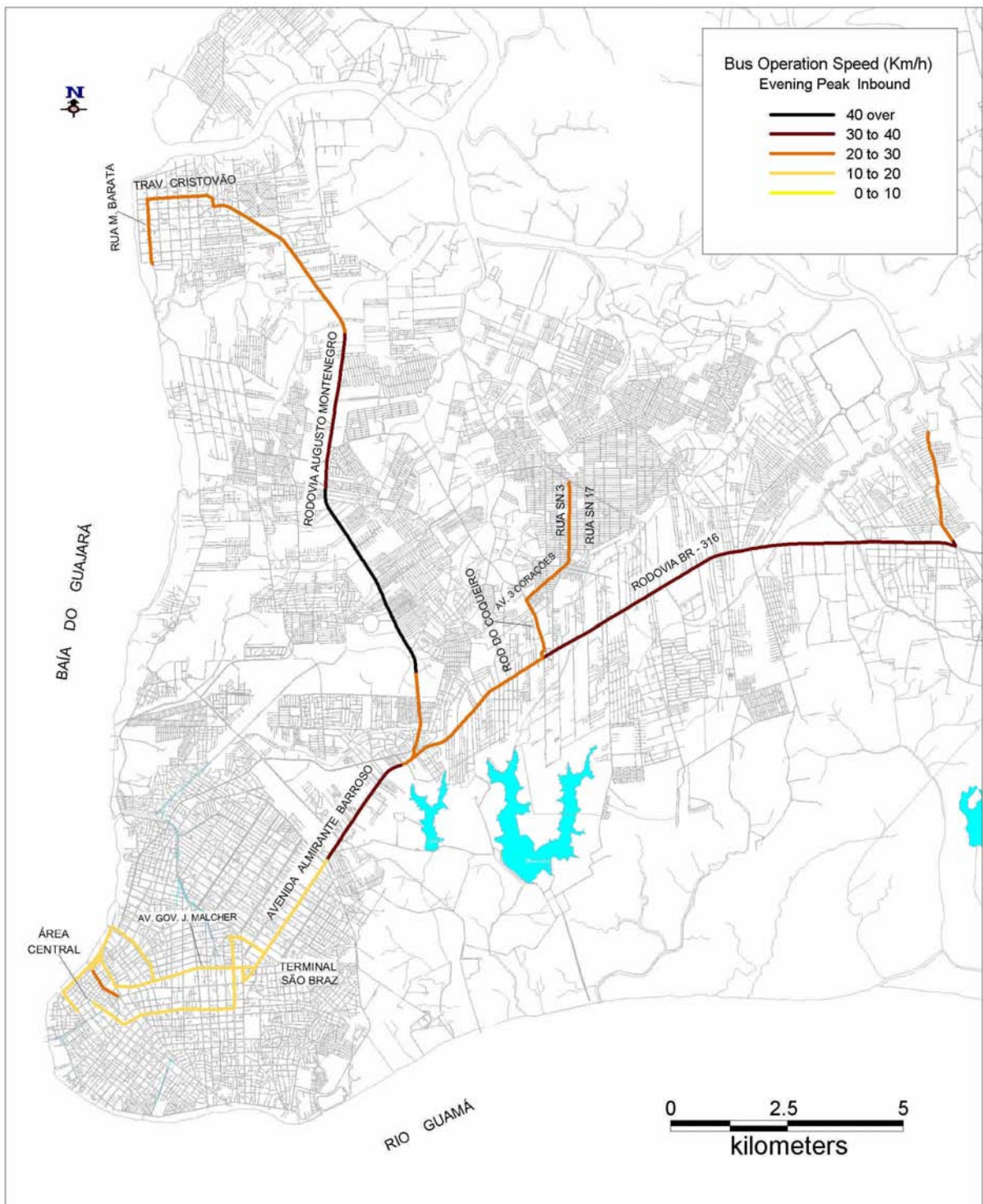


Figure 7.5-5 Inbound Operation Speed during Evening Peak Hour



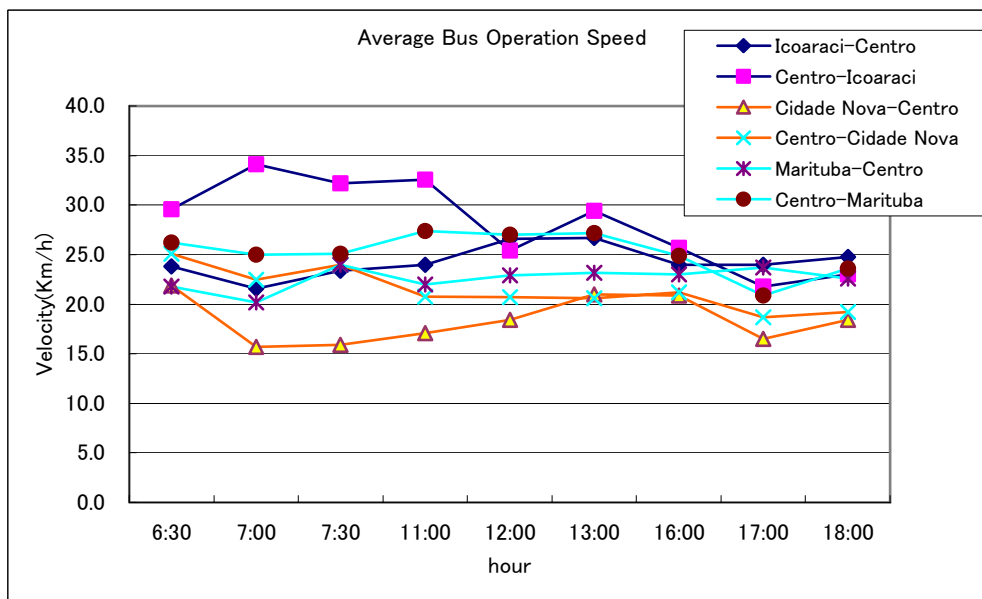


Figure 7.5-6 Hourly Average Operation Speed by Traffic Direction

The bus from Icoaraci operated at over 50km/h on some segment of Rodovia August Montenegro, but its speed on the other segments of the route was similar to the findings during the morning peak hour. The surveyed bus routes to the Central Area run some 40 to 55km roundtrip, and all originate from and return to the Expansion Area.

### 7.5.2. PASSENGER TRAVEL TIME

Bus passenger travel time was calculated from the findings of the bus operation condition survey, in which waiting passengers at bus stops were interviewed concerning nine questions. Five bus stops each were selected from the Central and the Expansion Area respectively. At every stop, 100 to 150 passengers were interviewed. A total of about 1,300 samples were taken during the interview survey. Each passenger was asked about the time taken to travel from origin to destination, and the answers were grouped into six time ranges for analysis. Ten bus stops selected for the passenger interview survey are shown in Figure 7.5-7.

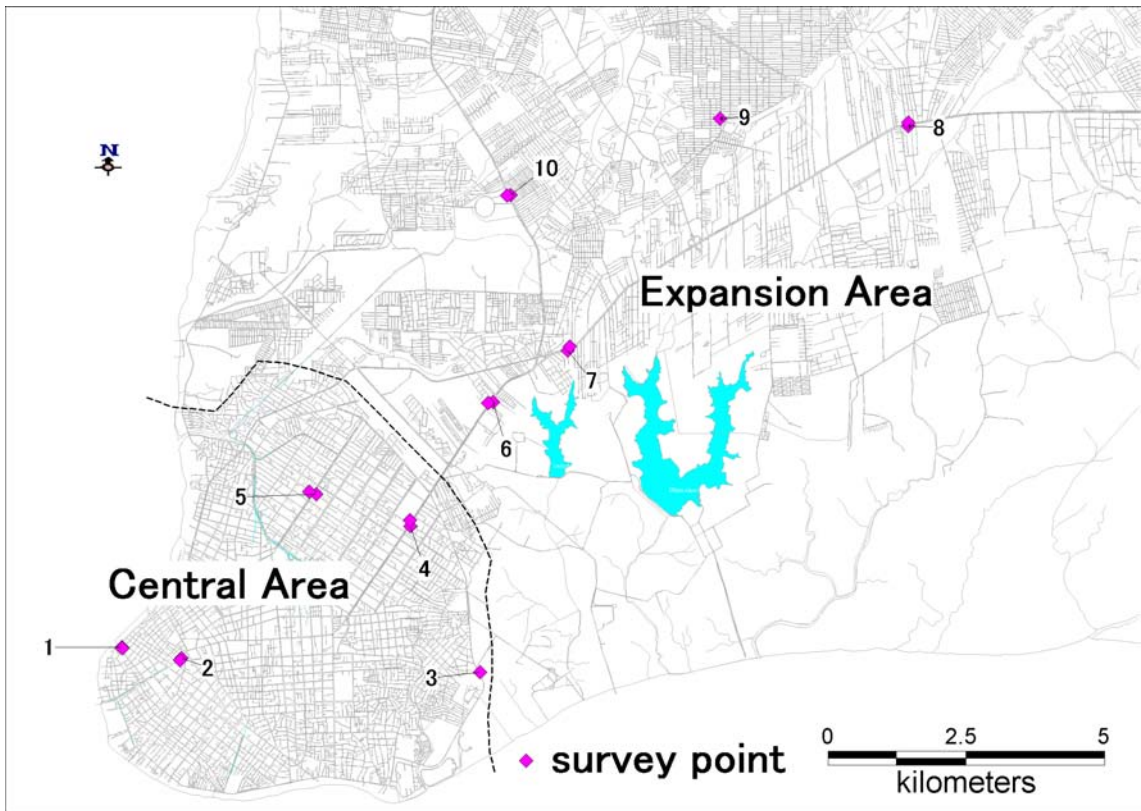


Figure 7.5-7 Location of Ten Bus Stops Selected for Interview Survey

At five bus stops in the Central Area, some 45% of the interviewed passengers answered that they reached their destinations in 30 minutes or less. At five bus stops in the Expansion Area, less than 30% of the interviewees reached their destinations in 30 minutes or less. Moreover, the percentage of passengers who traveled one hour or more on the bus to reach their destinations was 21% in the Expansion Area, nearly twice as large as in the Central Area. Figure 7.5-8 shows the six-range distribution of passenger travel time in two areas.



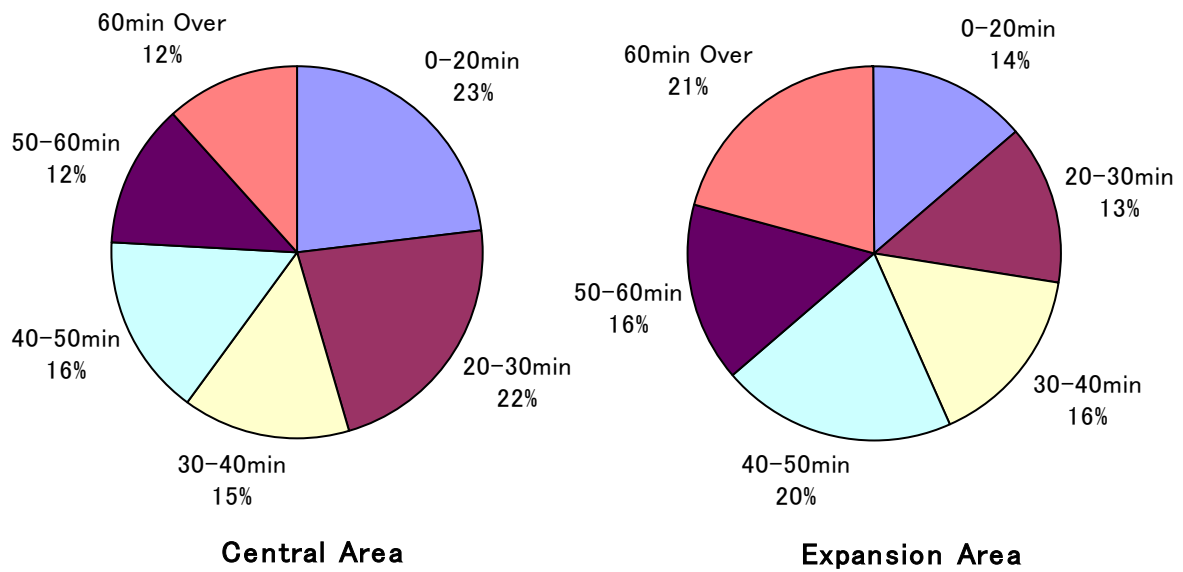


Figure 7.5-8 Distribution of Bus Passenger Travel Time by Area

### 7.5.3. PASSENGER BOARDING AND ALIGHTING TIME

The time required for passengers to board and alight from the bus was obtained from the findings of the bus operation speed survey and the bus passenger survey. The bus operation speed survey clocked the time of bus arrival and departure at every bus stop, which provides the passenger boarding and alighting time. The passenger survey provides the number of boarding and alighting passengers at every stop. Figure 7.5-9 shows the average boarding and alighting time by number of passengers who boarded the bus.

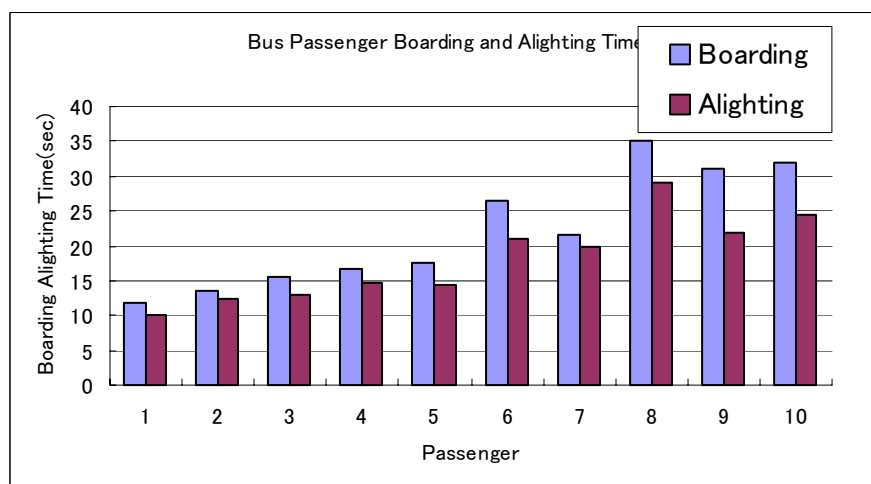


Figure 7.5-9 Bus Passenger Loading and Alighting Time

At bus stops with one passenger waiting, it took the bus 12 seconds for boarding, while it took about 10 seconds for alighting at bus stops where one passenger alighted. The larger the number of boarding and alighting passengers, the longer the bus has to park at bus

stops. At bus stops with eight or more passengers waiting to board, the bus took 30 seconds or more to load them. The alighting time was generally 15 to 20% shorter than the boarding time.

The average number of boarding was four per bus stop, and the bus parks about 16 seconds to service them. At bus stops crowded with boarding and alighting passengers, about ten passengers usually board the bus, and it takes the bus 30 seconds or so to load them. The average boarding time per passenger was 3.0 to 3.5 seconds. Table 7.5-1 shows the loading time at eleven bus stops with many boarding passengers.

Table 7.5-1 Boarding Passengers and Loading Time at Major Bus Stops

No.	Bus Route	Bus Stop	Boarding Passengers	Boarding Time (sec.)	Remarks
1	Marituba	12J	33	210	BR-316
2	Marituba	35J	24	177	BR-316 (Integrated Bus Terminal)
3	Marituba	130	22	55	
4	Marituba	73	21	130	Trav. Padre Eutiquio (Iguatemi)
5	Cidade Nova	311	18	60	
6	Cidade Nova	133/2	16	51	Av. Magalhães Barata/Nazare
7	Cidade Nova	1	16	64	Av. Marechal Hermes
8	Cidade Nova	257	15	127	Av. Magalhães Baraga/Nazare
9	Icoaraci	133/1	14	32	Av. Nazare
10	Marituba	293/1	13	33	
11	Icoaraci	111A	10	39	Icoaraci

#### 7.5.4. PASSENGER WAITING TIME AT BUS STOP

Passenger waiting time at bus stops was obtained during the interviews of the bus operation condition survey. Passengers waiting at bus stops were asked how long it usually took them to get on a bus, and their answers were tabulated into six time ranges. Figure 7.5-10 shows the six-range distribution of waiting time in the Central and the Expansion Area. One conspicuous difference between two areas is that the higher percentage of passengers waited 10 minutes or less in the Central Area where many bus lines converge.

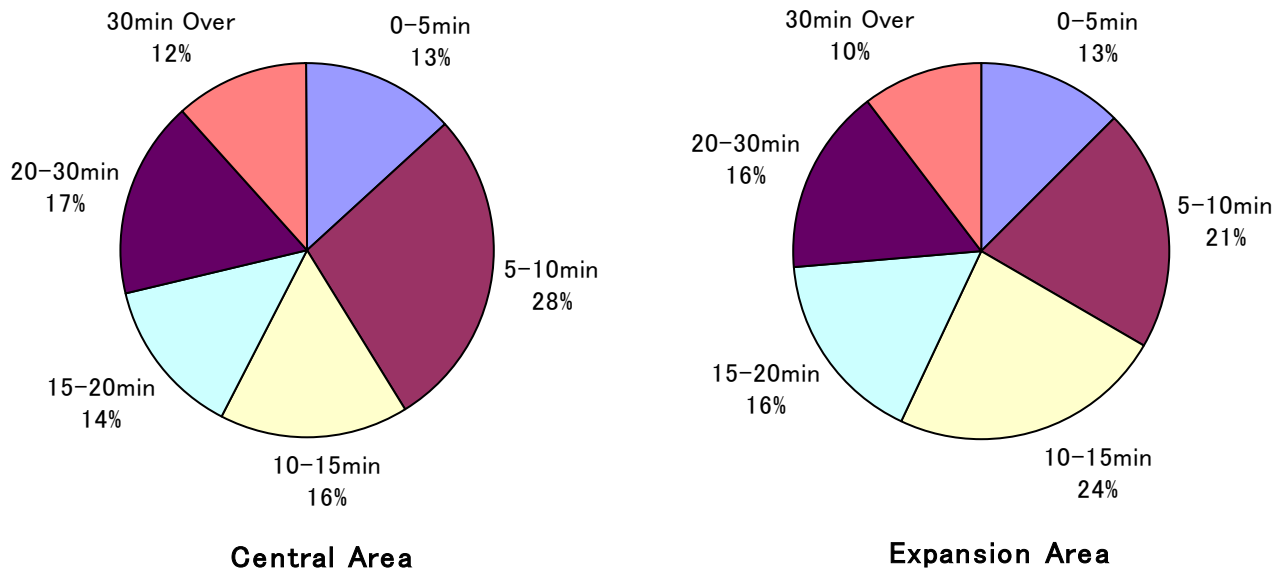


Figure 7.5-10 Passenger Waiting Time at Bus Stop by Area

### 7.5.5. BUS TRANSFER TIME

Bus transfer time was obtained during the interviews of the bus operating condition survey. Passengers waiting at bus stops were asked how many bus lines they used to reach their destinations, and their answers were tabulated into four frequency ranges. Figure 7.5-11 shows the three-range distribution of transfer frequency in the Central and the Expansion Area. About 75% of the interviewees in the Central Area reached their destinations without transfer. The percentage drops by ten points to 65% in the Expansion Area. 129 bus lines, or 78% of the total bus lines available in the study area, converge in the Central Area. Given this wide range of bus services, passengers find it easier to select a bus line that will take them directly to their destination without transfer. There are three integrated bus terminals in the Expansion Area, where passengers can transfer from one line to another without paying any additional fare, but this convenience is strictly limited to the bus lines of a company.

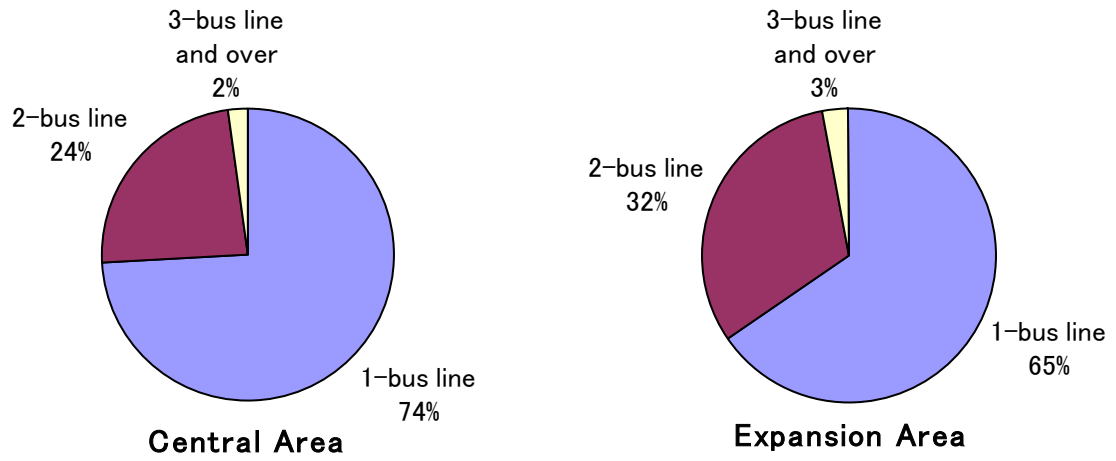


Figure 7.5-11 Bus Transfer Time

## **7.6. BUS FACILITY CONDITIONS**

### **7.6.1. BUSWAYS**

#### **(1) Av. Almirante Barroso**

The proposed Trunk Bus System covers such arterial roads as Av. Almirante Barroso, Rodovia BR-316, Rodovia Augusto Montenegro and Av. Independencia. Av. Almirante is a major arterial road, into which Rodovia BR-316 and Rodovia Augusto Montenegro merge. As shown in Figure 7.6-1, this avenue has the standard cross-section structure comprising the median of 2 to 4m in width, the four-lane two-way through roadway of 7m in width one way, flanked on both sides by the outer separation of 0.5m, the two-lane frontage road of 7m and the sidewalk of 3 to 5m. Other than the military installations and the botanical park, the roadside land use largely consists of two- to three-story buildings for commerce, business offices or residence. At present, conventional buses share the frontage road with general vehicles, and long distance buses.

#### **(2) Rodovia BR-316**

Rodovia BR-316 is the main arterial road connecting Marituba City and Belem. As shown in Figure 7.6-2, the road has the standard cross-section structure comprising the median of 3 to 10m, the six-lane two-way road (one-way width of 11m) and the sidewalk of 3 to 7m on both sides. The roadside is mostly undeveloped, occasionally dotted with large company premises. Buses share the outer lane with private vehicles. It will be relatively easy to provide a two-lane two-way exclusive busway (tentative) on the available road space.

#### **(3) Rodovia Augusto Montenegro**

Rodovia Augusto Montenegro is the main arterial road that connects Icoaraci and Belem Centro. As shown in Figure 7.6-3, this road comprises the median of 3 to 5m, the bicycle lane of 1.5m, the six-lane two-way road (one-way width of 11m) and the sidewalk of 3 to 5m. In Icoaraci, the six-lane road changes into the four-lane road. The bikeway extends from the intersection with Rodovia BR-316 through Icoaraci. Buses share the outer lane with general vehicles. It will be relatively easy to provide a two-lane two-way exclusive busway (tentative) on the available road space.

#### **(4) Inner Roads of Belem Centro**

Belem Centro has a gridiron layout of streets. Almost all of these streets are 10 to 12m in width with a sidewalk of 3 to 5m on both sides. As shown in Figure 7.6-5, they have three or four lanes with one-way traffic regulation. The roadside land use is already very dense, with closely packed buildings used for residential as well as commercial and business purposes. It is extremely difficult to widen the street width.

#### **(5) Rod. Mario Covas**

Rod Mario Covas is the two-lane two-way arterial road with no sidewalk, a ring road connecting to Rodovia BR-316 and Rodovia Augusto Montenegro just outside the fringe of Belem City. Buses share the outer lane with other vehicles. The roadside is largely undeveloped and barren, except for the section of about 2km near the Rodovia BR-316 intersection where commercial establishments stretch in dense formation. It will be very difficult to widen the road space in this section, requiring costly compensations for site clearance.



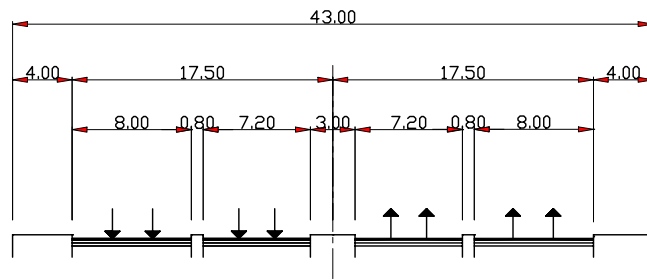


Figure 7.6-1 Typical Cross Section on Av. Almirante Barroso

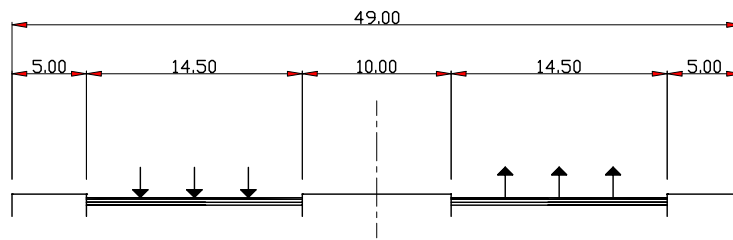


Figure 7.6-2 Typical Cross Section on Rodovia BR-316

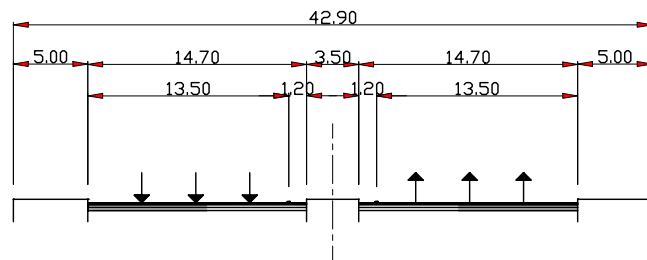


Figure 7.6-3 Typical Cross Section on Rod. Augusto Montenegro (1)

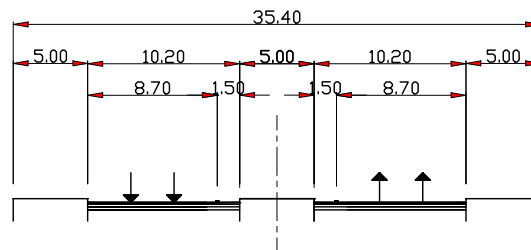


Figure 7.6-4 Typical Cross Section on Rod. Augusto Montenegro (2)

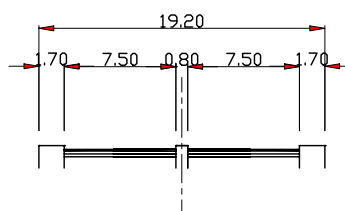


Figure 7.6-5 Typical Cross Section on Av. Pedro Cabral

## 7.6.2. BUS TERMINALS

165 or so bus companies are in operation in the study area. There are 47 bus terminals that function as points of origin and destination. These terminals service several bus routes each. There are three integrated bus terminals where passengers can transfer from one bus route to another without paying additional fare. There is one terminal for long distance buses to or from Brasilia, Sao Paulo and elsewhere.

### (1) Terminals for Urban Buses

As shown in Figure 7.6-6, some 47 urban bus terminals are more or less evenly distributed in Belem Centro, Cidade Nova, Marituba and Icoaraci. Facilities available at these terminals are not much different from those of bus stops, comprising only a roofed waiting space and a few benches each seating several passengers. These terminals provide no parking space for buses to stand by. Roadside parking is the only choice available for waiting buses.

### (2) Integrated Bus Terminals

Coqueiro Bus Terminal is located by the side of Rod Mario Covas in Cidade Nova. BR Bus Terminal is located near the intersection of Rod Mario Covas and Rodovia BR-316. Marex Bus Terminal is located in Maracangalha near Belem International Airport.

#### 1) *Coqueiro Bus Terminal*

This terminal collects passengers from local feeder bus routes in the vicinity of Cidade Nova and distributes them to bus routes to Belem and Icoaraci. The terminal is solely owned and managed by a local bus company and its servicing is limited to the bus routes of the same company. The terminal area is segregated from the surrounding area and passengers can transfer from one bus route to another without paying additional fare. The bus fleet is distinguishable by yellow-painted bodies. The operated buses are of conventional type with a capacity of 100 or so passengers. General plan of Coqueiro bus terminal shown in Figure 7.6-7.

#### 2) *BR Bus Terminal*

The terminal, its location facing BR-316, collects passengers of local feeder bus routes in the vicinity of Marituba and distributes them to bus routes to Belem Centro, Cidade Nova and Icoaraci. The terminal services the bus routes that are jointly operated by two local bus companies. The operated buses of these companies are undistinguishable from others. General plan of BR-316 bus terminal shown in Figure 7.6-8.

#### 3) *Marex Bus Terminal*

The terminal is located in the northern fringe of Belem Centro and functions as the connecting node between Centro and Icoaraci. The terminal is owned and operated by a local bus company and it is served by two company's bus routes. General plan of Marex bus terminal shown in Figure 7.6-9.

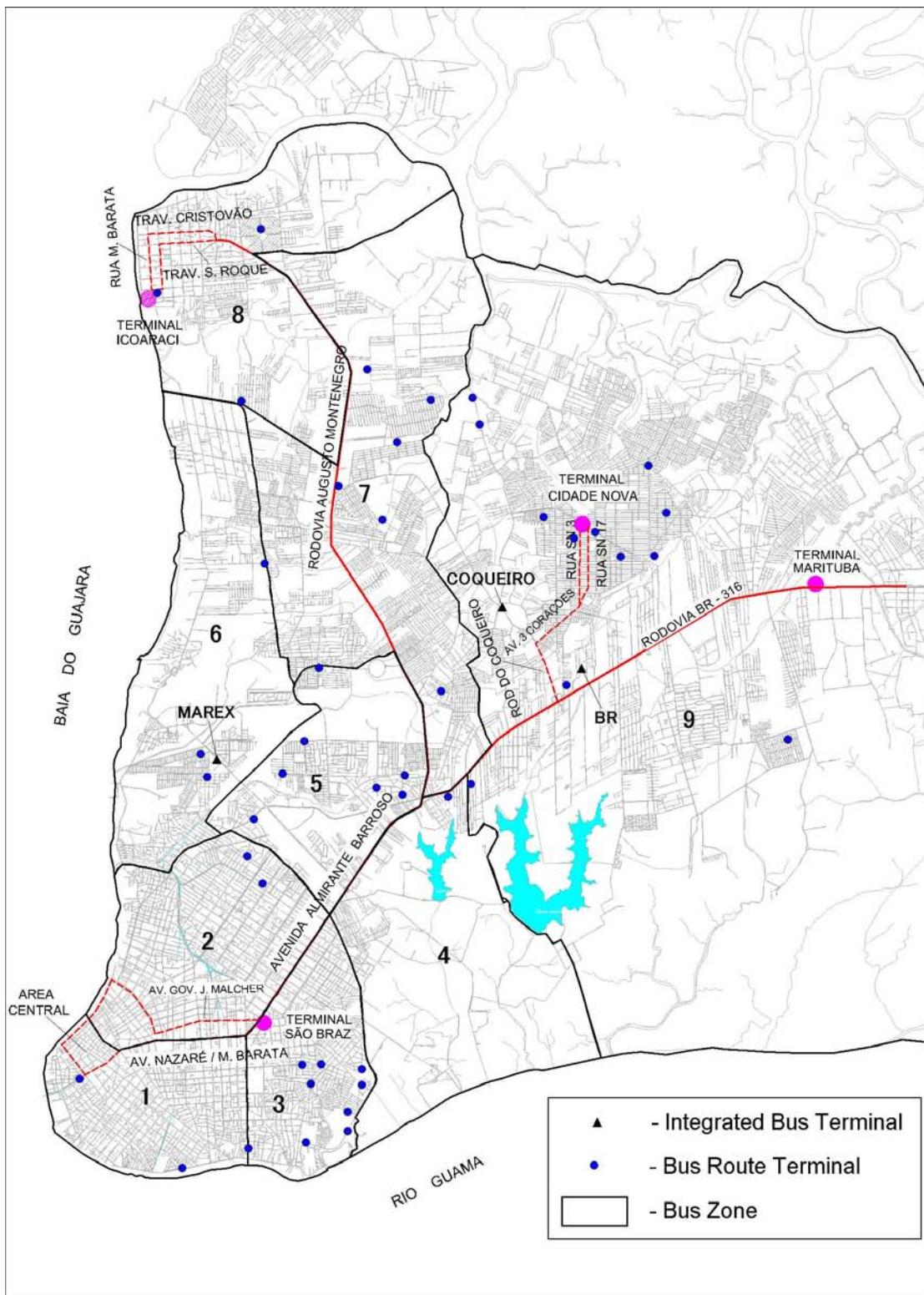


Figure 7.6-6 Location of Bus Terminal

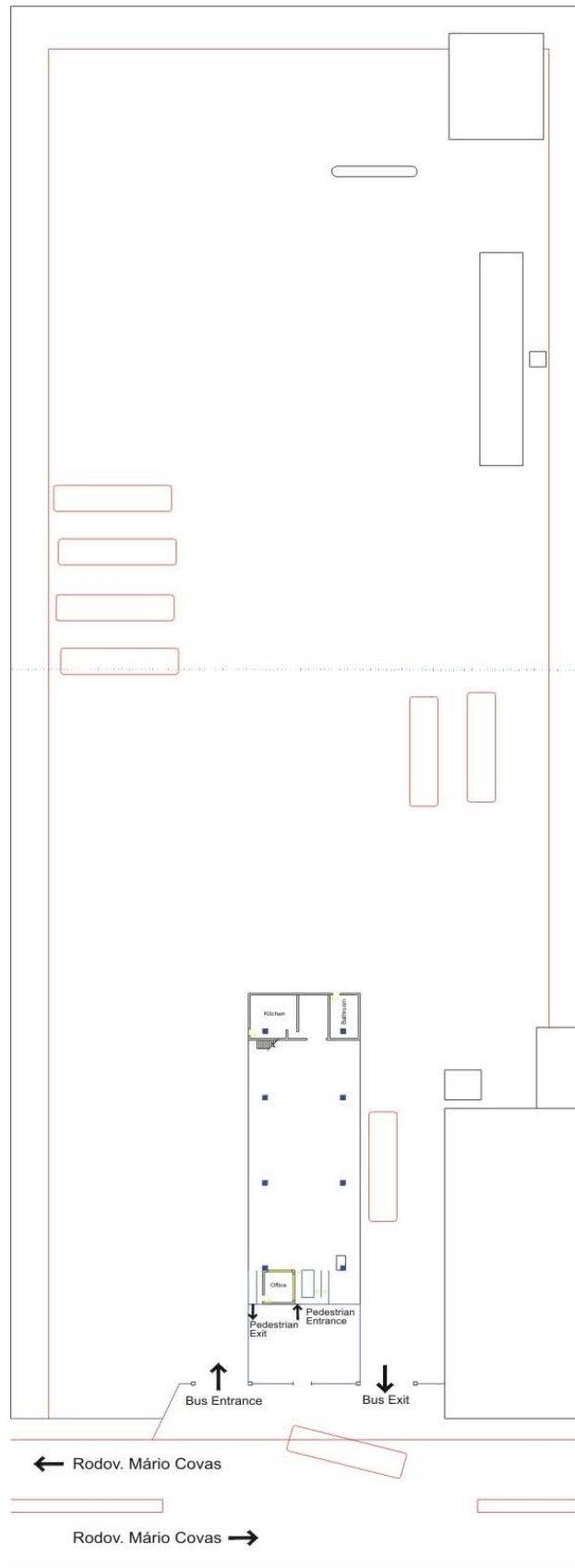


Figure 7.6-7 General Plan of Coqueiro Bus Terminal

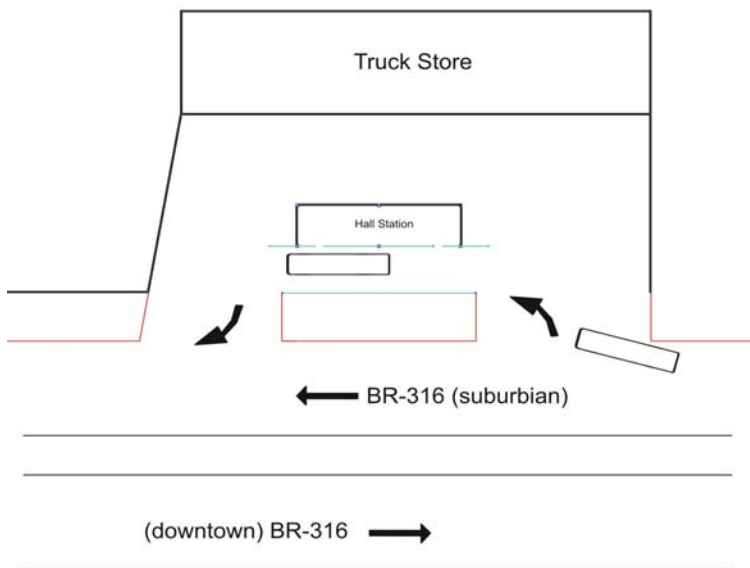
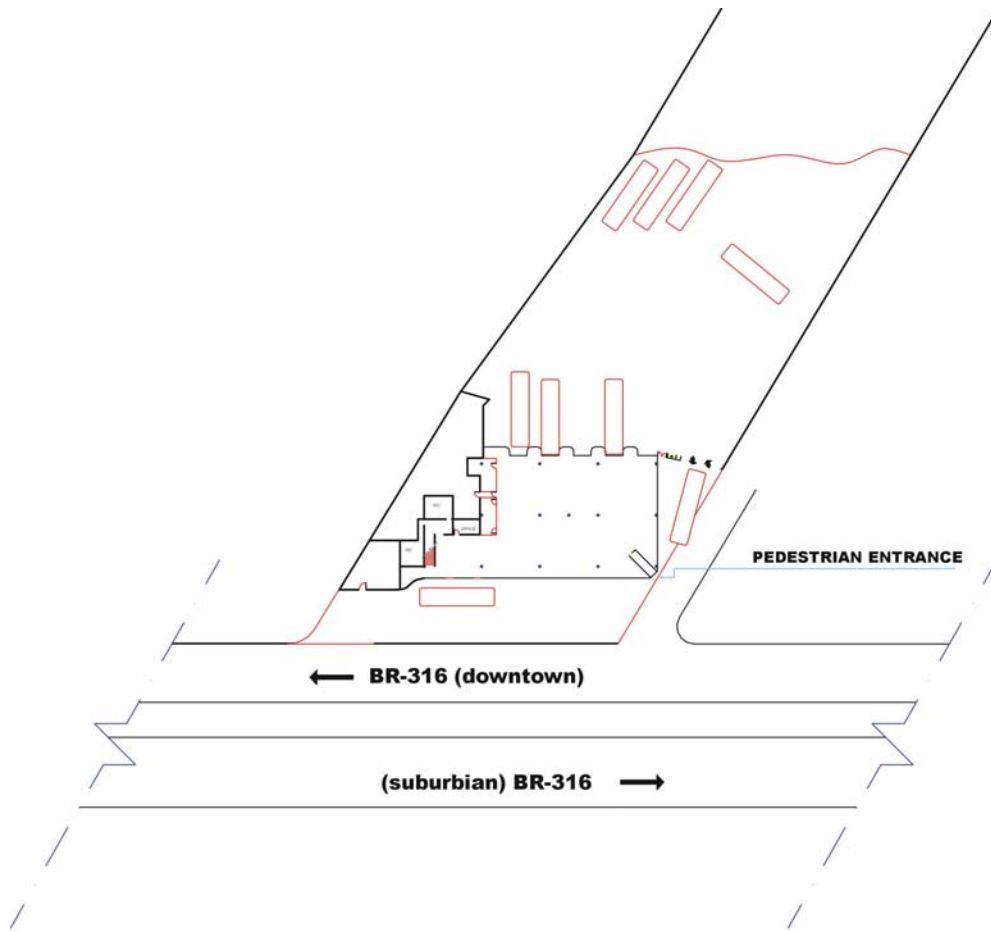


Figure 7.6-8 General Plan of BR-316 Bus Terminal



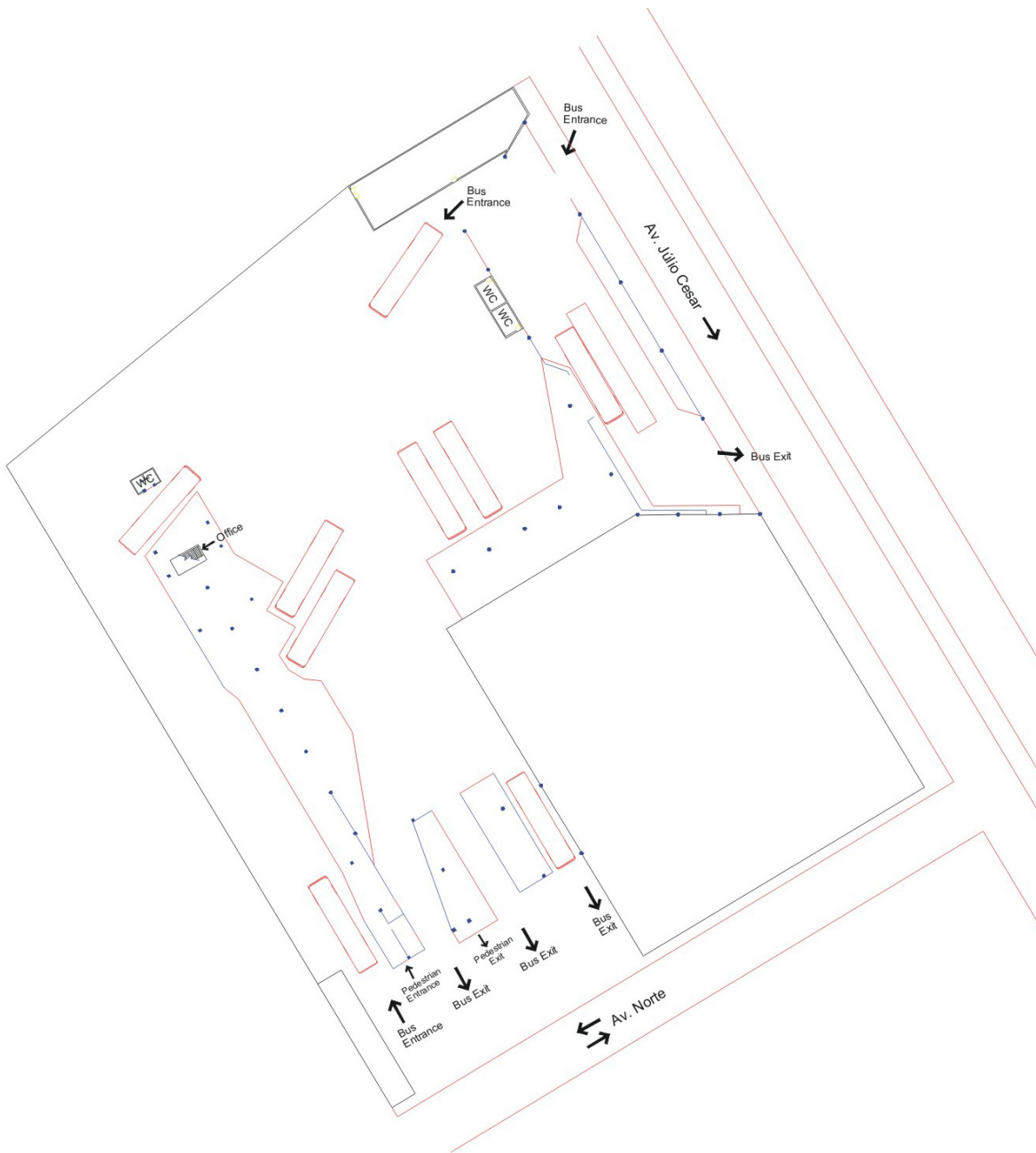


Figure 7.6-9 General Plan of Marex Bus Terminal

#### 4) Major Terminal Facilities

Facilities at three integrated bus terminals are summarized in Table 7.6-1 below.

Table 7.6-1 Facilities at Integrated Bus Terminals

Items	Integrated Bus Terminals		
	Coqueiro	BR	Marex
Terminal Area (ha)	0.6	0.5	0.8
No. of berths for arrival	4	4	5
No. of berths for departure	4	5	10
Parking space for buses (no. of vehicles)	10	2	3
Office space (square meters)	200	100	200
Kiosks	Yes	Yes	Yes
Waiting space for passengers	Yes	Yes	Yes

### (3) Long Distance Bus Terminal

The terminal is located in Belem Centro in the vicinity of Sao Braz. It has the area of 0.85ha and the management office is housed in a two-story building. Berths for incoming buses and those for outgoing buses are set up on the same level, connected by underground passages. The terminal services only long distance buses. Accordingly, passengers must go out of the premise to the nearest bus stop to ride an urban bus. Because the terminal provides no parking space for standby, long distance buses have to wait by roadside parking in the street nearby.

The terminal handles the daily average of 560 arriving and departing buses and 7,000 passengers. Some long distance buses are airconditioned, each seating 44 passengers. The terminal structure and facilities listed below are shown in Figure 7.6-10.

- 1) 1 arrival berth
- 2) 12 departure berths
- 3) Offices for long distance bus companies, an information counter, and ticket offices (of about ten companies)
- 4) Waiting space
- 5) Restaurants, kiosks, lavatories and shower booths
- 6) A parking space for private automobiles
- 7) A taxi stand and taxi parking lots
- 8) Offices of the terminal managing company
- 9) Greenery and open space

The terminal was previously operated and maintained by FTERPA, a public company of Para State, but privatized in Jan. 2000. A private company called SINART now operates the terminal. The fare rates are shown below.

- |  |         |
|--|---------|
| 1) Operation distance of 100km or less:          | R\$0.29 |
| 2) Operation distance of over 100km up to 200km: | R\$0.63 |
| 3) Operation distance of over 200km:             | R\$0.76 |

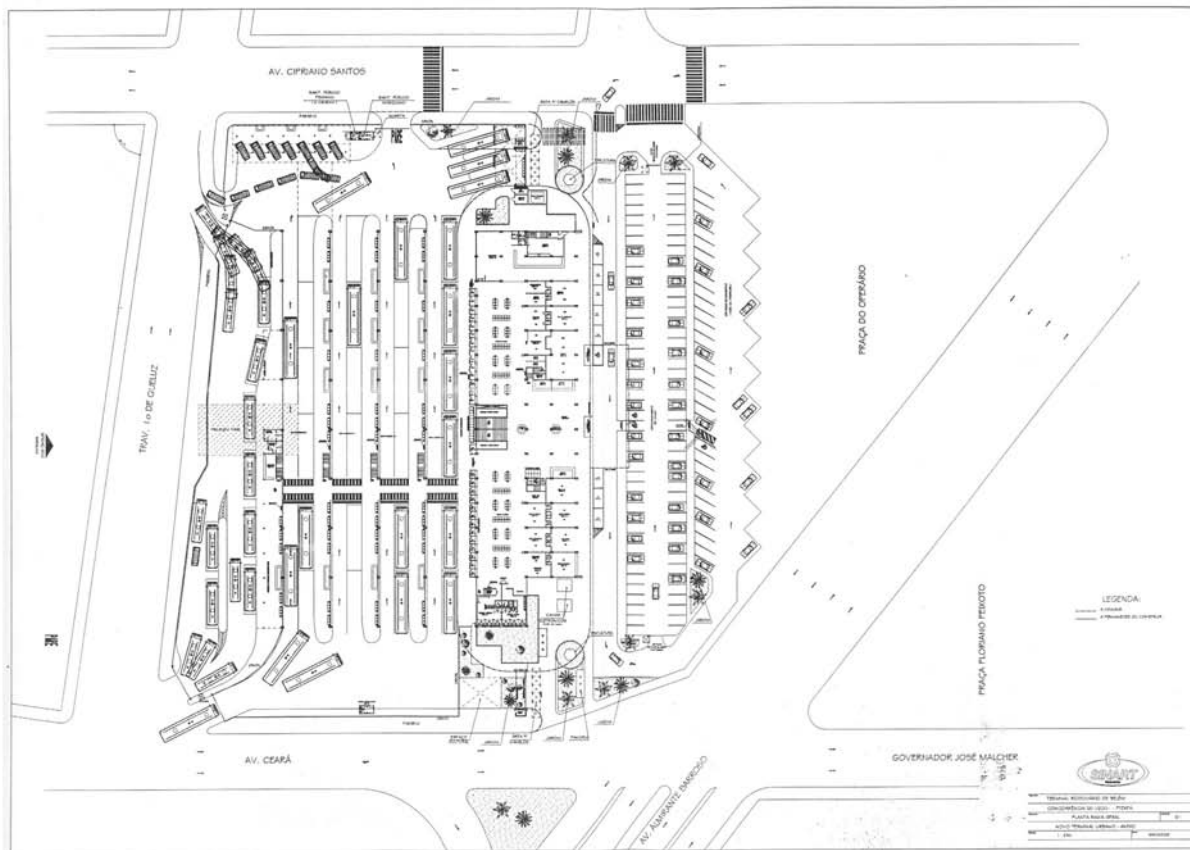


Figure 7.6-10 General Plan of Sao Braz Bus Terminal

### 7.6.3. BUS STOPS

The number of bus stops, counting both ways, totals 2,480 or thereabouts. Between Icoaraci and Belem Centro, there are about 160 bus stops with average spacing of 340m. Some 115 bus stops exist between Cidade Nova and Centro with average spacing of 330m. There are about 120 bus stops between Marituba and Centro with average spacing of 380m. Bus stop facilities commonly consist of roofed waiting space and a few benches. There is no information board showing a service schedule or route map.

The general conditions of the existing bus stop facilities are shown in Photo 7.6-1.



Photo 7.6-1 Bus Stop Facilities

## 7.7. BUS FLEET CONDITIONS

There are about 165 bus routes in the study area, and the total fleet in operation consists of about 1,900 conventional buses and a few articulated buses. In addition, a small fleet of microbuses are in operation on 5 routes. Specifications of these buses are summarized in Table 7.7-1.

Table 7.7-1 Bus Specifications

Vehicle Types	No. of Vehicles	Size Measurement			No. of Seats	Capacity (Passengers)
		Height (m)	Length (m)	Width (m)		
Conventional buses	1,953	2.5	13.1	3.0	44 ~ 52	100 ~ 110
Articulated buses	4	2.5	18.0	3.0	75	180 ~ 200
Minibuses	45	2.0	8.1	2.5	22 ~ 29	30 ~ 40

Note: The capacity includes standup passengers.



Photo 7.7-1 Conventional Bus



Photo 7.7-2 Articulated Bus





Photo 7.7-3 Minibus

## 7.8. BUS TARIFFS

### 7.8.1. TARIFF SYSTEM

The origin to destination distance of bus routes varies widely from 5km to over 27km in the study area. Despite the variation of operation distance, the flat rate system is uniformly adopted.

Passengers normally have to pay the tariff at every occasion of transfer from one bus route to another. However, the integrated system is in operation at three bus terminals where passengers can transfer without paying the tariff. This integrated system of transfer applies only to the fleet of one bus company which also runs the terminal or of two companies which jointly run the terminal. No attempt has ever been made to integrate the tariffs across several bus companies.

After boarding a bus through the rear door, each passenger goes through the turnstile and pays the tariff to the conductor, either in cash or by a ticket bought before boarding. Coupon tickets, monthly passes and ticketing cards of prepaid type are not in use. Passengers alight through the front door of the bus. Those passengers who are exempt from paying the tariff board the bus through the front door.

### 7.8.2. FARE RATES

The Transport Company of each municipal government controls the fare rates. CTBel of Belem City, for example, sets the rates as shown below. Neighboring cities of Ananindeua and Marituba adopt the same rates.

- 1) Buses without airconditioning: R\$1.00 (as of November, 2002)
- 2) Air conditioned buses: R\$1.70 (as of November, 2002)
- 3) School children and students: 50% discount of the above rates(R\$0.42)

Certain categories of people are exempt from paying the tariff. Exemptions are separately granted by various public edicts and organizations. In the study area, exemptions are based on the federal government decisions, the municipal ordinance of Belem City (Lei Organica do Municipio de Belem: LOMB), the policy adopted by the labor unions of local bus

companies and so on. At present, the following 18 categories of people are exempt from bus tariffs.

- 1) Children aged six or under
- 2) Elderly people aged sixty or over
- 3) Military police
- 4) State police
- 5) Post office workers
- 6) Firemen
- 7) Municipal police
- 8) Municipal traffic bureau personnel
- 9) Employees of private companies in the transport sector
- 10) Attendants of inmates in police custody
- 11) Handicapped people
- 12) Federal traffic police
- 13) State traffic police
- 14) Federal police
- 15) Court-appointed arbitrators of labor disputes
- 16) State court judges
- 17) Federal court judges
- 18) Inspectors of illegal employment

Table 7.8-1 compares bus tariffs in major cities of Brazil. The table shows that Belem sets lower rate (R\$1.00) among them.

Table 7.8-1 Bus Tariffs in Major Cities of Brazil

Cities	States	Predominant Tariffs (R\$)	The Introduced Date	Weighed Average
( 1) Porto Velho	RO	1,20	11/02/2002	Single
( 2) Rio Branco	AC	1,30	22/07/2002	Single
( 3) Manaus	AM	1,20	02/02/2002	Single
( 4) Boa Vista	RR	1,20	20/07/2002	Single
<b>( 5) Belém</b>	<b>PA</b>	<b>1,00</b>	<b>15/11/2002</b>	<b>Single</b>
( 6) Macapá	AP	1,00	15/07/2002	Single
( 7) Palmas	TO	1,05	06/05/2002	Single
( 8) São Luís	MA	1,20	10/06/2001	0,8388
( 9) Teresina	PI	1,10	04/11/2002	Single
(10) Fortaleza	CE	1,20	30/05/2002	Single
(11) Natal	RN	1,10	19/05/2002	Single
(12) João Pessoa	PB	0,95	04/07/2002	Single
(13) Recife	PE	1,05	28/11/2002	1,1500
(14) Maceió	AL	1,00	30/05/2001	Single
(15) Aracaju	SE	1,00	19/08/2001	Single

The Improvement of Transport System in the Metropolitan Area of Belem

(16)	Salvador	BA	1,10	19/05/2002	Single
(17)	Belo Horizonte	MG	1,15	28/12/2001	1,1162
(18)	Vitória	ES	1,20	26/11/2002	Single
(19)	Rio de Janeiro	RJ	1,30	10/10/2002	Single
(20)	São Paulo	SP	1,40	24/05/2001	Single
(21)	Curitiba	PR	1,50	10/11/2002	Single
(22)	Florianópolis	SC	1,10	01/08/2002	1,3369
(23)	Porto Alegre	RS	1,10	16/02/2002	Single
(24)	Cuiabá	MT	1,20	04/06/2001	Single
(25)	Campo Grande	MS	1,35	10/05/2002	Single
(26)	Goiânia	GO	1,25	02/11/2002	0,7500
(27)	Brasília	DF	1,30	17/11/2002	1,5600

Source: NTU – Associação Nacional das Empresas de Transportes Urbanos.

Notes: Last up-to-date in 03/12/2002.

- 1) There are other tariff rates.
- 2) Integrated tariff system between buses
- 3) Integrated tariff system between bus and railway
- 4) Integrated tariff system between bus and subway
- 5) Integrated system between bus and subway and between buses
- 6) Passengers must pay additional tariff of R\$1.00 at transfer.

## 7.9. BUS COMPANIES

There are a total of 29 private bus companies in the study area, and about eleven of them service bus routes within Belem Centro. About five companies carry passengers mainly on Icoaraci-Centro routes. About seven companies each service chiefly Cidade Nova-Centro routes and Marituba-Centro routes, respectively. Table 7.9-1 lists 29 bus companies with information on their respective routes, fleets and operating performances. Figure 7.9-1 shows the location of main offices of these companies.

The fleet of buses in operation in the study area totals 1,953 vehicles. Six companies operate a fleet of 100 buses or more, accounting for 53% (990 vehicles) of the total buses in operation. Eight companies run a fleet of 50 to 99 buses, and twelve companies have a fleet of less than 50. There are a total of 165 bus routes in the study area. Six larger companies mentioned above service 89 routes, or 57% of the total.

Table 7.9-1 List of Private Bus Companies

Name of Company	routes Operate (route)	No. of Bus In Company (vehicle)	Operation Kilometers (KM/day)	No of Passengers (person/day)
1. Arsenal (AA)	2	37	6,927	31,545
2. Transbcampos (AB)	2	39	8,103	40,674
3. Belém Lisboa (AC)	8	94	25,830	65,663
4. Alcindo Cacela (AD)	2	27	7,427	21,129
5. Transurb (AE)	4	43	12,040	36,511
6. Viacao Forte (AF)	29	325	88,997	208,495
7. Dom Manoel (AG)	7	112	25,054	83,520
8. Aero Club (AH)	2	27	5,609	23,266
9. Guajara (AI)	9	92	21,315	80,731
10. Beira Alta (AJ)	5	15	3,293	4,541
11. Perpetuo Socorro (AK)	12	151	40,777	111,569
12. Monte Cristo (AL)	4	85	18,508	52,631
13. São Luiz (AM)	4	57	9,352	55,530
14. Transpara (A N)	1	18	4,627	12,011
15. Rio Guama (AP)	4	63	11,912	44,856
16. Esperanca (AQ)	3	63	10,226	33,261
17. Icoaraciense (AR)	22	127	49,430	124,707
18. Transbel Rio (AS)	2	41	5,802	29,166
19. Nova Marambaia (AT)	15	131	42,491	94,306
20. Marituba (AU)	4	51	16	29,858
21. Aguas Lindas (AU)	13	75	21,875	46,750
22. Metropolitana (AU)	5	56	15,971	55,492
23. Barata (AU)	7	71	21,174	45,708
24. N.S. do Carmo (AV)	2	12	6,931	9,500
25. Bragantina (AZ)	3	12	3,702	5,304
26. Izabelense (BB)	3	29	13,854	-
27. Michele (BC)	4	16	16,960	3,500
28. Belem Rio (BD)	5	75	12,958	59,510
29. Pinheiro (BF)	1	13	3,196	9,169
<b>Total</b>	<b>165</b>	<b>1,957</b>	<b>514,357</b>	<b>1,418,903</b>

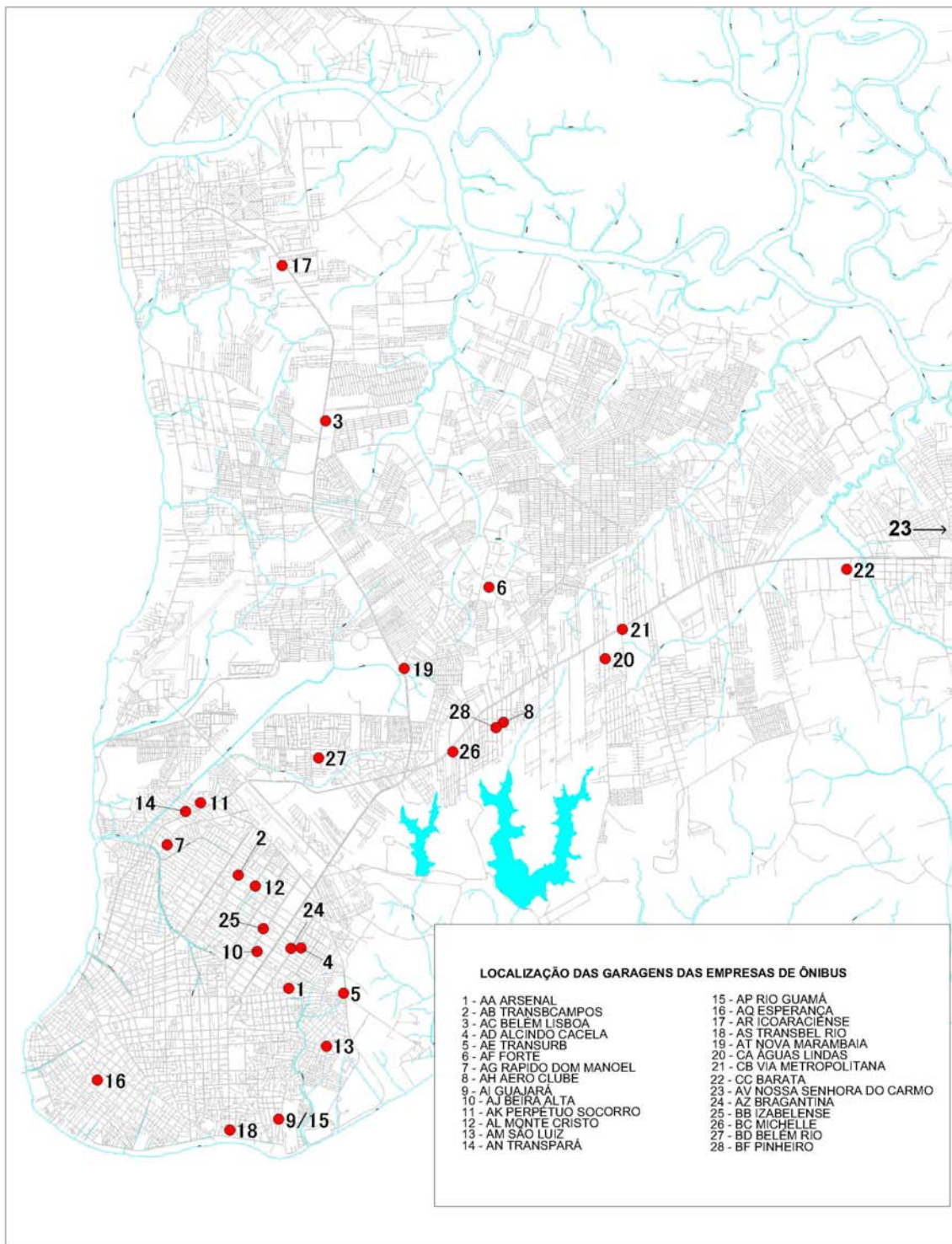


Figure 7.9-1 Location of 28 Bus Companies



## 7.10. ORGANIZATION

### 7.10.1. HISTORIC TRANSITION OF BUS TRANSPORT

Public bus transport began to be informally operated in Belem, beginning in 1911. Using small adapted trucks, although the “autobus” lines had a higher fare than the trolley car, they reached the suburban areas the trolley cars did not serve. Following that, they advanced into the urban area. The competition between buses and trolley cars accelerated the deterioration of the trolley car service and the increase of substitution of the “autobuses” due to an increase of costs of operation and rolling stock, besides the fixed fares.

The trolley car operation ended in April 1947 through Federal intervention on the Electric Company of Para. By that time, approximately 200 bus companies were already operating in disorganized form in Belem with one or two vehicles each.

In February of 1983, concession contracts between DETRAN and 19 operating companies were agreed. Those companies formed the Sindicato das Empresas de Transportes Urbanos de Belem (Syndicate of Urban Transport Companies of Belem) operating 49 bus routes. These contracts were valid for five years with automatic renewal for five more years.

These contracts were transferred to EMTU—Empresa Metropolitana de Transportes Urbanos (Metropolitan Company of Urban Transport) Public State Company—which was created in February 1983 and implemented in March of the same year. EMTU manages the public transport system of the Belem Metropolitan Area (BMA), composed of the Municipality of Belem and Ananindeua at that time.

In the Federal Constitution reinforced in 1998, the authority to manage public transport systems was transferred to the municipality. The Companhia de Transportes do Município de Belém (Transport Company of Belem Municipality)—CTBel—was established in December 1989. In August 1991 EMTU was dissolved, following the transfer of management of the metropolitan transport system in March 1990.

### 7.10.2. CURRENT SITUATION IN THE BELEM METROPOLITAN AREA

The BMA consists of five municipalities (Belém, Ananindeua, Marituba, Benevides and Santa Barbara do Para) through the Decree Law No. 27, of October 19, 1995, and has still not improved the institutional organization of administration, with authority over and responsibility for the several agents involved in metropolitan services, including the public bus transportation system. There are now three organizations related to the management of the bus routes operated in the BMA, as shown in Table 7.10-1.

Table 7.10-1 Organizations that Act in Management of the Bus Routes in the BMA

Name	Abbreviation	Administration	No. of Routes	Effectuation Date
Transport Company of Belem Municipality	CTBel	Belem Municipality	152	12/28/89
Municipal Department of Transport and Traffic	DEMUTRAN	Ananindeua Municipality	13	07/24/99
State Agency for Regulation and Control of Public Services	ARCON	State of Para	8	12/30/97

CTBel controls the municipal bus routes, besides the metropolitan routes that come into Belem from Ananindeua, Marituba and Benevides. DEMUTRAN controls the internal routes of Ananindeua Municipality and ARCON controls routes of the inter-municipal bus system in the BMA with different tariffs and services.

Belem municipality accounts for approximately 60% of the whole metropolitan territory, and has 71% of the total population. The Belem municipality controls the metropolitan transport system through CTBel, which is the main management organization of this system, with 400 employees, in five directories as shown in Figure 7.10-1.

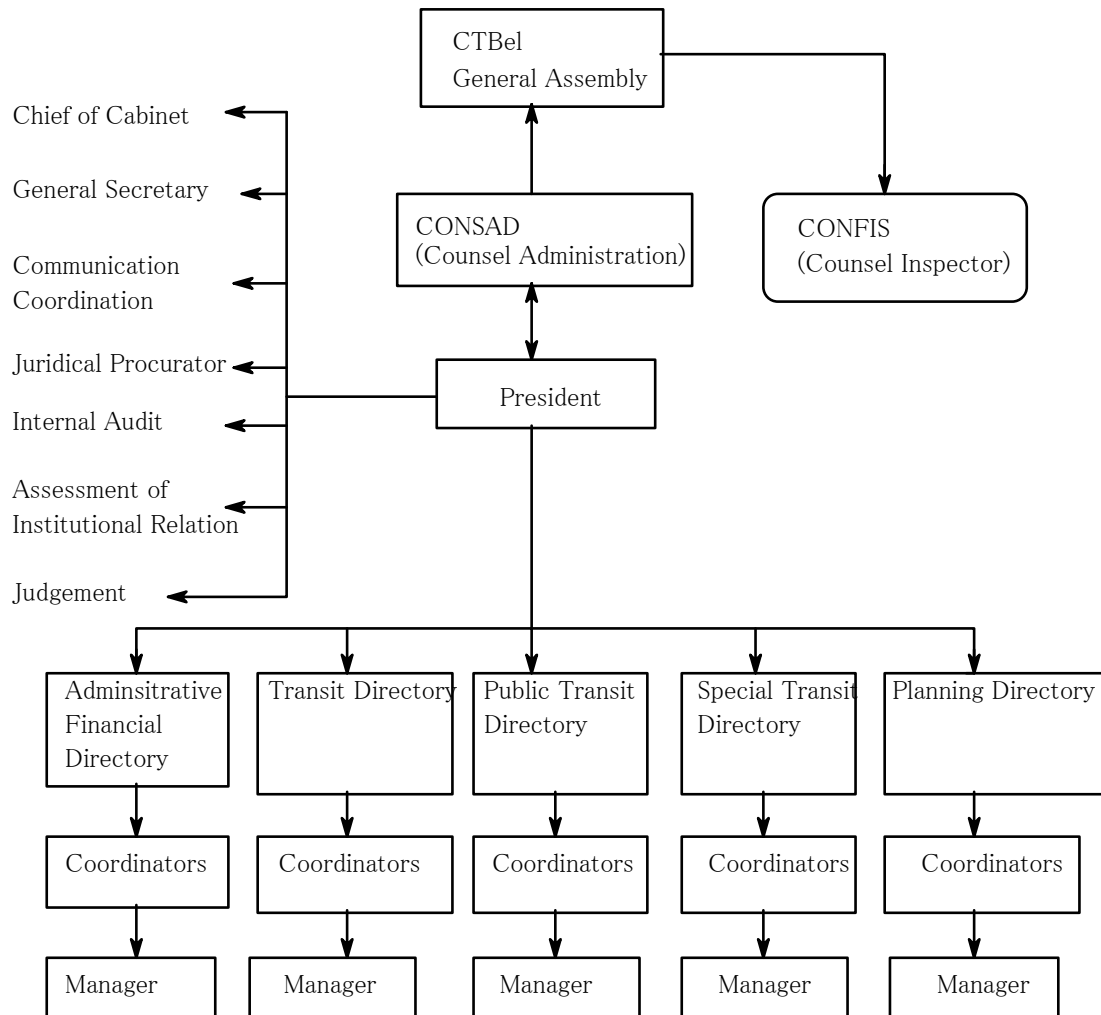


Figure 7.10-1 Organization Chart of CTBel

In the Organic Law of Belem Municipality, established in Title VI Chapter V, “Of Transport,” some important definitions related to institutional issues are mentioned as follows:

- The definition of benefit categories with gratuity and half of the fare
- The prohibition of route exclusivity by company
- The priority of public transport for road and transport systems
- The management of the urban traffic and transport system is made into a “public entity concession organized by a juridical system of private companies” and the execution of the transport service is delegated to private companies, after regulatory approval of the Common Council”;
- The permissions should be for a period of every four years from the establishment of the legal criteria, and can be annulled when the service conditions are not attained or the authorized companies cannot operate.

- The institution of the Municipal Transport Council is composed of an equal number of representative from public government and civil society.”

The Municipal Transport Council was created in March 1998 with links to CTBel. A main objective is to open a channel of participation to society in decisions related to municipal transport and traffic. It conducts tariff and operational studies. The CTBel president selects the president of this council and the council is composed of eighteen members: nine are representatives of every transport related class and syndicate, six are from several municipalities and three from the state government. The ordinary meeting of the council should be held at least once a year by convocation of the president or by one-third of its members, when necessary.

CTBel controlled the metropolitan bus routes operated within Belem municipality and between municipalities such as from Ananindeua to Belem. The related municipalities do not control the inter-municipal bus routes; the management, planning and supervising of those routes are under control of CTBel under a partnership agreement.

The partnership agreement was signed on January 15, 1999 with validity of 24 months, and was renewed in April 2001. Although the validity of the current partnership has expired, some actions between municipalities still continue according to the clauses of the partnership as follows:

- The municipalities preserve “municipal autonomy”.
- The rights to half the fare and gratuities are guaranteed to two municipalities.
- The fixed fare in the Belem municipality is valid in the other municipalities and should be approved by the mayor of the municipalities involved.
- The operational procedures are taken in the existing routes, and new routes should be created together with the municipalities under the previous agreement.
- The bus rules of the Belem municipality are valid in other municipalities.
- The penalties attributed to companies are paid in the municipality where the infraction occurred.

Other important clauses established in the partnership, however, were never carried out:

- The municipalities will delegate a representative to follow the CTBel works, and those can also participate in the meetings of Consultative Council and of company administration.
- The vehicle inspection and the supervising of operations are to be done by the two municipalities together.
- The management rate of 50% collected from the metropolitan routes by CTBel is to be transferred to the covenant municipalities.

Belem Municipality has the “Service Rule of Public Transport by Bus” approved in 1992. This instrument established in the general rules of Operation, Delegation, Supervision and Punishment in the Municipal Public Transportation System of its 14 chapters is in accordance with the Organization Law. The bus routes that serve other municipalities, as well as the internal routes of Ananindeua Municipality also submit to the rules established in this rule.

Due to the end of the validity of the two concession contracts in 1993, the delegation of the public transport services by CTBel is being done completely incompatibly with the legislation. Figure 7.10-2 shows the actual operation procedures of a new route.

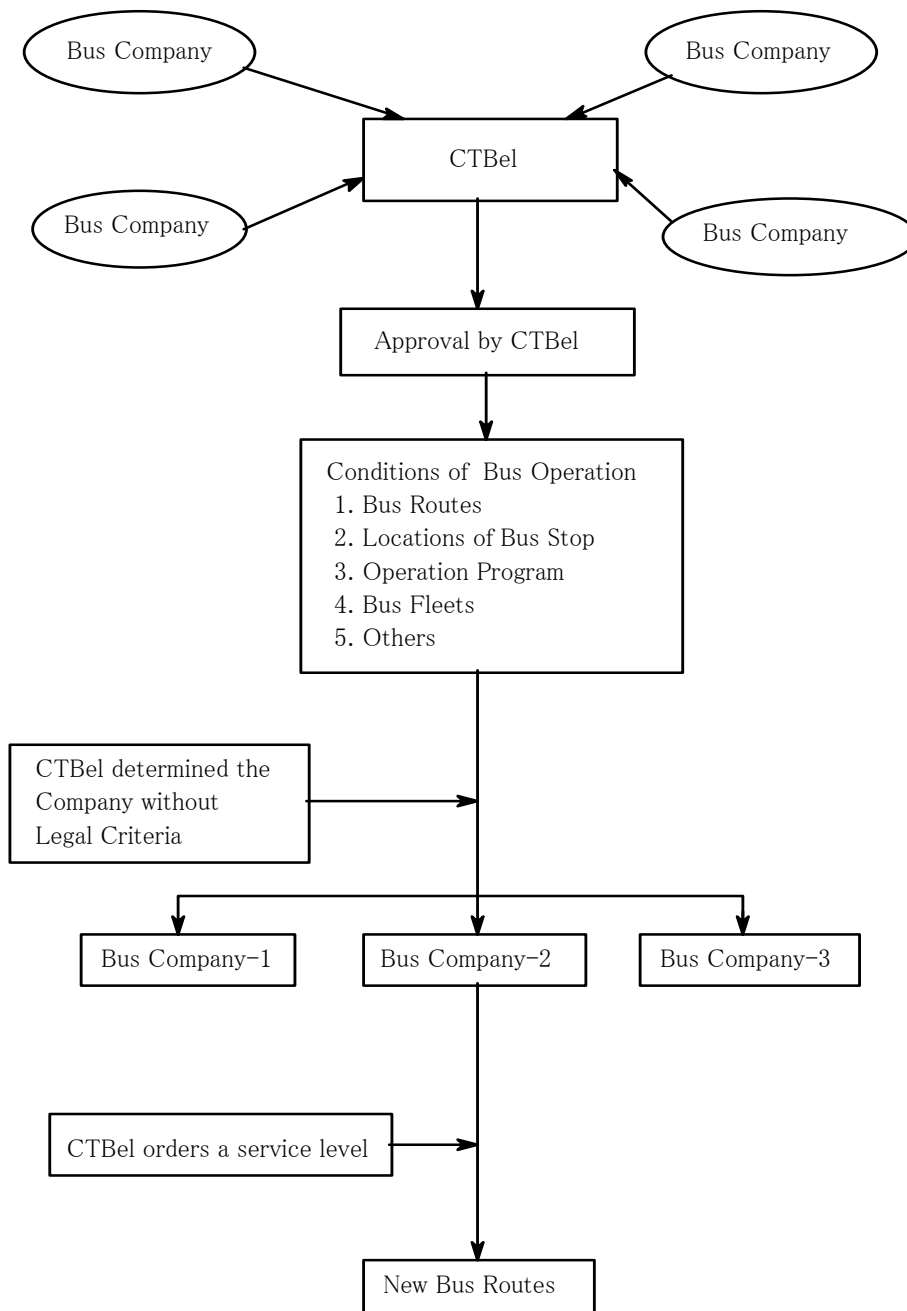


Figure 7.10-2 Procedures for Route Authorization

As can be seen, in the current procedure there is no new bid process, even if company performs the service, contradicting all the legislation in use.

Another organization that acts in the management of the public transport routes in the Belem Metropolitan Area is ARCON—The State Agency of Regulation and Control of Public Services. That is an autarchy with policy power created by “Law No. 6.099” with the purposes of regulating and controlling the public service work, within the competence of Para state.

ARCON can standardize the public service level, as well as bus fares, and also analyze the economic evolution and the efficiency of the bus services. ARCON conducts the bus user survey to assure that “they are paying the right price and receiving services of quality”.

ARCON manages the inter-municipal road transport system that before was under the Executive Secretary of Transport. In this system, there are eight metropolitan routes operated by two companies, that basically serve Benevides, and Santa Barbara in Para State and Mosqueiro District, and some of these bus routes reach to São Braz bus terminal. These fares are higher than those of urban routes.

The State Council of Regulation and Public Services Control—CONERC—consists of government representatives, of users, and of companies that operate the service, and acts aiming to maintain the equilibrium between consumers and public services.

The organizational structure of ARCON (see Figure 7.10-3) is divided into two areas, one is responsible for standardizing and supervising, and the other is of the financial and fare control of the services as shown below:

- Transport, involving concessions for the Inter-municipal Passenger Transport System, involved buses and other modes on roads, and the water transport system;
- Energy, involves only one concession operating in the whole state.

The creation law of ARCON foresees five technical groups for supervising and controlling the services that the agency will have under its responsibility.

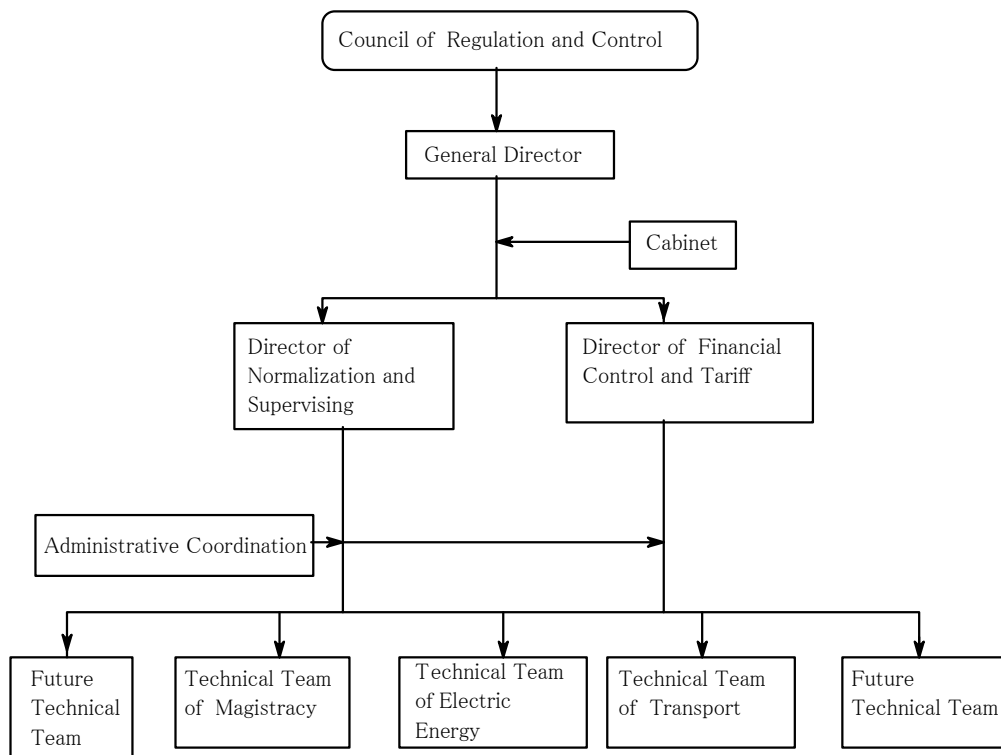


Figure 7.10-3 Organization Chart of ARCON

Besides ARCON and CTBel, in July 1999 the Ananindeua Municipality created DEMUTRAN—The Municipal Department of Transport and Transit—linked to the Secretary of Infrastructure of Ananindeua Municipality. Its purpose is to manage transit and transport in that municipality. The organizational structure of the department is composed of five divisions as shown in Figure 7.10-4, of which four are for transit management and only one for transport.



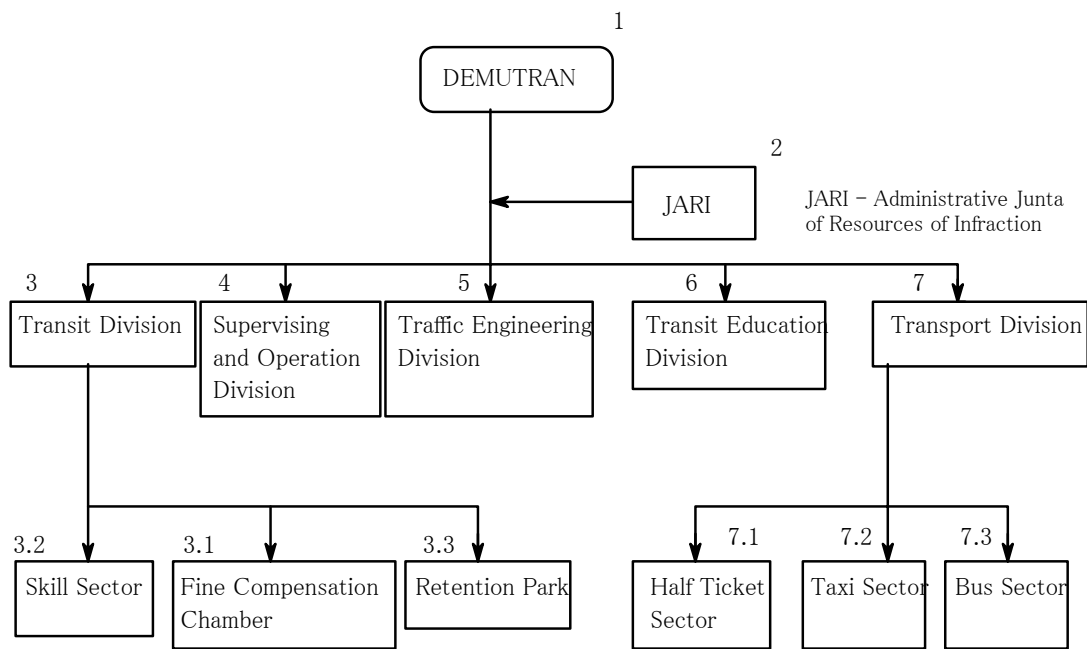


Figure 7.10-4 Organization Chart of DEMUTRAN

### 7.10.3. MANAGEMENT OF THE TRANSPORT SYSTEM IN OTHER BRAZILIAN CITIES

#### (1) Goiania

The city of Goiania, capital of the State of Goias, is composed of 15 municipalities and the total population is approximately 1.67 million, of which 1.1 million are in the capital. Goiania has a public transport fleet of 1066 buses, 1160 being from the Metropolitan Area.

The operational configuration of public transport was determinant in the formation of the new pattern of metropolitan transport system management of that area.

##### 1) Background

In 1976, Goiania Municipality delegated the management of the public passenger transport system for 30 years to Goias State. The state government in period from 1984 to 1986 implanted a new integrated transport system with construction of terminals in one corridor east-west, and organized a management and operation system for public transport, named “Transurb.”

In 1997, aiming to privatize the operation, the state government of Goias created Metrobus, leaving to Transurb only the function of management. In 1999 AGR—Goiania Agency of Regulation—was created to control and supervise public services and the dissolution of Transurb was decreed.

AGR has a small organizational structure, and is involved in regulation and control of the public services conceded by the state that includes transport, energy and others. The agency was totally involved in regulation and control of the transport services for both the urban and municipal areas. Despite this, it does not control the Goiania transport system and unregulated transport bus services rapidly increased from 1998. In 2000, 974 minibus services were authorized, among which only 740 minibuses were actually operated.

## 2) *Current Situation*

The Goiania Metropolitan Area—RMG—was created on December 30, 1999, through Complementary Law No. 27, as well as by the Council of Development, the Executive Secretary and the Found of Metropolitan Development. In this Law, it was established that AGR manages the inter-municipal urban public transport system of RMG.

On June 9th, 2000, Complementary Law No. 30 modified Complementary Law No. 27, integrated the “Council of Development of the Goiania Metropolitan Area, the Deliberative Chamber of Public Transport of the Goiania Metropolitan Area—CDTC,” with representatives of Goiania Municipality and other municipalities of the RMG. At that time, the management of transport system was still under AGR.

In October 2001, due to the problems generated from the increase of transport and traffic volumes in Goiania Municipality, as well as the difficulty in management by AGR, Complementary Law No. 34 was promulgated; it institutes the metropolitan network of public transport, including all the public transport services of the Goiania Metropolitan Area—RMG—and the reformation of the CDTC.

The membership of council is composed of the following:

- 1) The State Secretary of Infrastructure (chairman)
- 2) The President of the Goiania Agency of Regulation, Control and Supervision of Public Services
- 3) The Mayor of Goiania Municipality
- 4) The Secretary of Planning of Goiania Municipality
- 5) The Superintendent of Transit and Transport of Goiania Municipality
- 6) The President of the metropolitan public transport network management entity
- 7) The Mayor of Aparecida de Goiania Municipality
- 8) One municipal mayor representing the other municipalities components of the metropolitan area of public transport, elected by the mayors
- 9) One representative of the legislative assembly of Goiania State

In the Law, the public transport related clauses are as follows:

§ 5° - to the Deliberative Chamber of Public Transport, shows the competence to establish the management policy of the metropolitan public transport network, referring to VI of § 4° in this article.

- 1) To decide about the award of concessions, permissions and authorizations of transport services that have integrated or will integrate with the metropolitan public transport network
- 2) To establish the fare policy and fares, and to promote revisions and fare upgrades
- 3) To consider about the organization, the investments, the planning, the management, the control and supervision of services
- 4) To direct the procedures of revision and adaptation of state and municipal laws, about the public transport service, according to the principles and prescriptions of this complementary law
- 5) To decide in the last administrative instance, about interposes of the resources on the supervising processes judged by the managing entity of the metropolitan public

transport network

The CMTC—Metropolitan Company of Public Transport was also instituted in this law. The CMTC was created as a public company, constituted by Goias State and the RMG municipalities. The shareholder composition of the Metropolitan Company as follows:

- 50% for Goiania City
- 25% for Goias State
- 25% for the others RMG municipalities. However, other municipalities can buy the shares of the company in proportion to their percentage the population of the RMG area.

The Metropolitan Company of Public Transport will also have its own revenue from the remuneration of 3% of the gross income of the system. The composition of the Administrative Council and the Company Executive Directory follow the same proportion of shareholder composition. The organization of the Company Executive Directory, as well as the indication of each function, is shown in Figure 7.10-5.

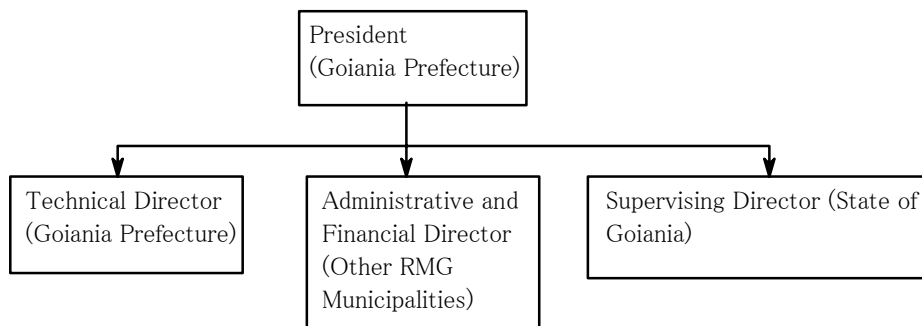


Figure 7.10-5 Organization Chart of CMTC

On December 10th, 2001, the Executive Management Group of the Metropolitan Network of Public Transports—GETRANS—was instituted with the function of CMTC. This group was instituted with the same organizational structure as CMTC. Currently, the Law of Creation of CMTC is in the Goias Municipality Chamber for approval, since it is against the Organic Law of the Municipality.

## (2) Curitiba and Porto Alegre

In Curitiba, the IPPUC—Institute of Urban Survey and Planning of Curitiba—was visited, as was the URBS—Curitiba Urbanization S.A., responsible for the management of transport and transit in Curitiba and part of the Metropolitan Area; the visit in Curitiba emphasized operational issues.

The main motive to visit Porto Alegre was to understand the model of operational partnership between the companies operating in that city. This model indicates the possibility of implementing a similar model in the BMA.

The Curitiba public bus transport system is known worldwide as a model of efficiency. This success can be traced to the continuity of planning actions since the 1960s, as well as the close integration between the transport planning and land use/occupation actions. This integration is because in Curitiba the IPPUC combines coordination with planning, integrating other institutions politics where the public transport of URBS is included.

The main motive of the visit in Porto Alegre was to understand the model of operational partnership between the concessionaries that operate the public transport system in the city, to see the possibility to implement a similar model in the BMA, by having the Syndicate of Transport Companies of Belem—SETRA-BEL—adopt it.

Figure 7.10-6 shows the organizational structure of the Municipality Secretary of Transport and Circulation—SMT, and the Public Company of Public Transport—EPCT, besides other individual secretaries involved with the urban transport in the Porto Alegre Municipality.

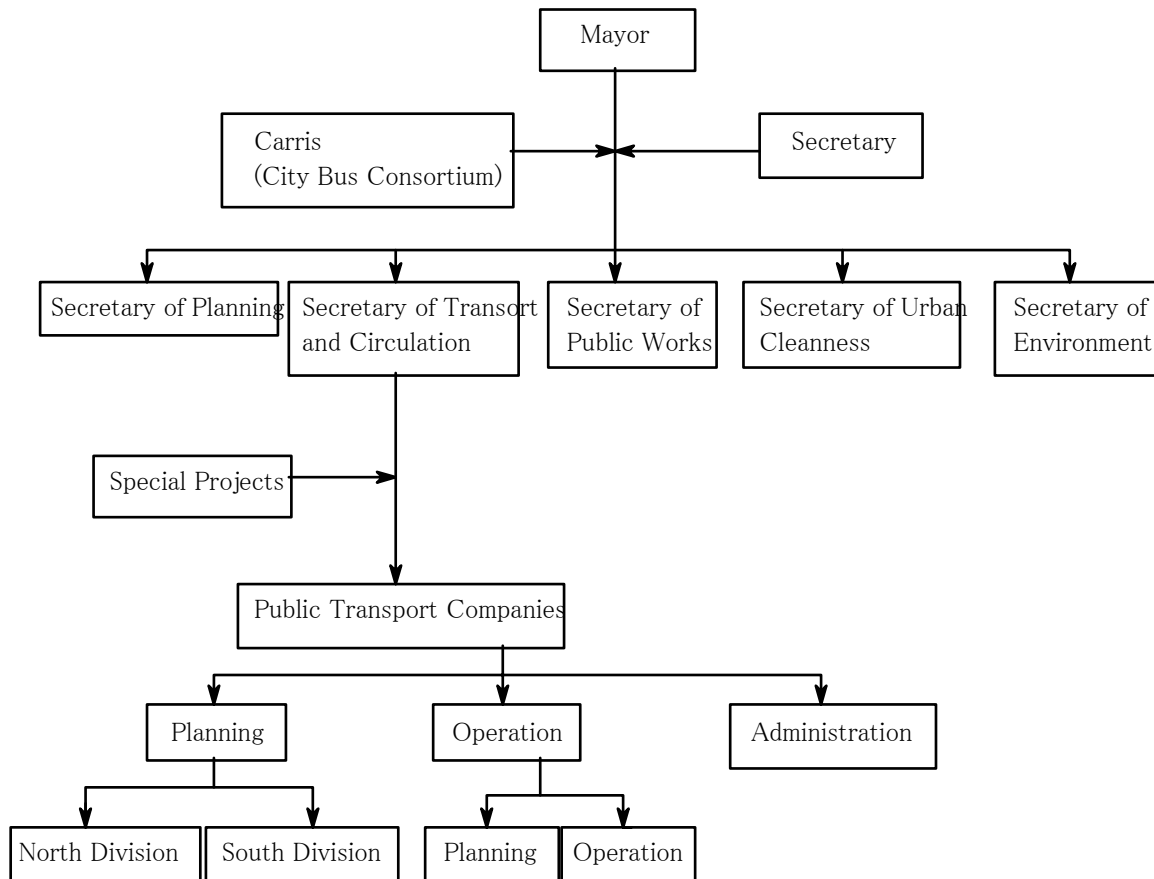


Figure 7.10-6 Organizational Structure of SMT and of EPCT

The Porto Alegre Public Transport System is divided into four company partnerships recognized by SMT, the first three of which are formed by private companies and the last of which is formed by public company with the following fleets:

- Conorth: 450 buses;
- South: 470 buses;
- Unibus: 370 buses; and
- Carris: 315 buses (public company)

The formation of these partnerships allowed the rationalization of the bus system with introduction of the trunk system. Under the system, the superposed bus lanes that operated before are eliminated, and only carpool lanes for a minimum of three thousand passengers at peak hours and conventional operation to reach the Centro remain.

Each group operates in a distinct area (corridors or basins) and the operation on its lanes is composed of vehicles of several companies. The revenue is proportionally divided into the companies that form the partnerships under control of EPCT.

In Belem, it is important to form partnerships between companies that operate in the Expansion Area, especially on corridors of Rodovia Augusto Montenegro, BR-316 and in the Coqueiro/Cidade Nova area.

### 7.11. CURRENT PROBLEMS AND ISSUES

The analysis of the available information and the findings of various public transportation surveys during the on-going Feasibility Study point to a number of problems and issues of the current bus operation in the study area, as summarized in Table 7.11-1 below.

Table 7.11-1 Problems and Issues of Current Public Transportation

	Problems and Issues	Remarks
Routing	<ol style="list-style-type: none"> <li>1) Many people live in suburban areas and work in the central part of Belem. Therefore, major bus routes in the study area are those that connect each of the suburban agglomerations (Icoaraci, Cidade Nova and Marituba) to Belem Centro. While Centro is well serviced by urban bus, none of the three suburban agglomerations has bus routes for inner trips.</li> <li>2) Approximately 165 bus routes are in operation in the study area. 64 routes, or 40%, pass Av. Almirante, causing severe traffic congestion.</li> <li>3) Marituba-Centro and Ananindeua-Centro bus routes mainly pass Av. Nazare and Av. Gov. Jose Malcher, causing severe traffic congestion.</li> <li>4) There are about 40 urban bus routes in Belem Centro to service inner trips. In addition, approximately 90 bus routes from the suburbs enter Centro. Altogether, 130 routes, or 79% of the total bus routes, are in operation within Belem Centro. The percentage of bus in the motorized traffic is very high, aggravating the problem of traffic congestion in Centro.</li> </ol>	<ol style="list-style-type: none"> <li>1) Passenger generation and attraction are concentrated in a limited number of zones.</li> <li>2) Concentrated bus routing</li> <li>3) Concentrated bus routing</li> <li>4) Excessive supply of bus service in Centro</li> </ol>
Operation System	<ol style="list-style-type: none"> <li>1) Passengers have to wait long time for unpredictable arrivals of buses. They often fail to reach their destinations on time and are beginning to avoid bus transportation.</li> <li>2) There are more than 130 bus routes in operation in Belem Centro. The average number of passengers per bus is very small, ranging from 10 to 20. The imbalance of supply and demand hampers efficient bus operation.</li> <li>3) The frequency of bus service does not vary much between peak and off-peak hours, indicating an inefficiency of bus operation.</li> </ol>	<ol style="list-style-type: none"> <li>1) Failure to run bus service on schedule</li> <li>2) Inefficiency of bus operation in Centro</li> <li>3) Failure to adjust the level of service in relation to supply and demand</li> </ol>
Tariff System	<ol style="list-style-type: none"> <li>1) Passengers pay their tariff to, and get the change from, the bus conductor after boarding. Considerable time is spent on this exchange at boarding time, slowing the operation speed and hampering the stable on-schedule operation.</li> <li>2) As many as 18 categories of people are exempt from paying the bus tariff, unnecessarily complicating the problem of the tariff system.</li> </ol>	
Facilities	<ol style="list-style-type: none"> <li>1) Bus bays are not provided at most of the bus stops. Buses pick up passengers at the roadside and obstruct the flow of traffic behind. This practice reduces the road capacity and causes frequent traffic jams.</li> <li>2) Roads used by bus routes are often poorly maintained, seriously impeding stable operation.</li> <li>3) Bus terminals do not have such facilities as parking space for buses to stand by and information boards showing bus schedules and route maps. Buses on standby at the roadside are another cause of traffic obstruction.</li> </ol>	<ol style="list-style-type: none"> <li>1) Inadequate bus stop design</li> <li>2) Inadequate road maintenance</li> <li>3) Inadequate bus terminal facilities</li> </ol>
Organization	<p>Bus companies must get a permit from the traffic bureau of a municipality in which they want to operate (e. g., CTBel in Belem City). If they want to service more than one municipality, they will have to get permits from all municipalities concerned. The coordination between neighboring municipal traffic bureaus over bus routing and operation is not well established. This is another factor that hampers the efficient operation of bus service in the study area.</p>	
Others	<p>The opinion survey of bus passengers has found the following grievances on the current bus operation, listed in the order of magnitude of responses.</p> <ol style="list-style-type: none"> <li>1. On-board lawlessness</li> <li>2. On-board discomforts (frequent and sudden acceleration and braking, omitting to stop at bus stops, and others)</li> <li>3. Excessive waiting time</li> <li>4. High tariff</li> </ol>	