

### 2.2.3 Transport Condition

(1) Overall Condition

1) Transport Mode

Table 2-25 shows the transport modes in the Metropolitan Region of Rio de Janeiro.

**Table 2-25 Existing Transportation Modes in the Metropolitan Region of Rio de Janeiro**

| Mode       |  | Operation   | Supervision                                    | Stations/Stops   | Fleet  | Line                                    |   |
|------------|--|---|--|--|--|---|---|
| Bus        | International  | Permission  | Federal government (ANTT)                      | Novo Rio Terminal  | -  | 6 lines use by Novo Rio                 |   |
|            | Inter State  | Permission  | Federal government (ANTT)                      | 471 stops<br>2 terminals                                     | -  | 181 lines in the Rio State              |   |
|            | Inter Municipal  | Concession and Permission (About 200 companies)   | State government (DETRO)                       | 20 terminals   | 5,688 in RMRJ<br>6,816 in RJ (Fetranspor)  | 565 in RMRJ<br>1,103 in RJ (Fetranspor) |   |
|            | Municipal  | Rio   | Concession (about 50 companies)                | Municipality government (SMTR)                               | 2,136 stops with shelters<br>26 terminals  | About 9,000 buses                       | About 900 lines   |
|            |  | Niteroi   | Concession (2 companies)                       | Municipality government (NITTRANS)                           | 1 terminal   | About 672 buses                         | 54 lines  |
|            |  | Others  | Permission                                     | Municipality government                                      | 9 terminals (Sao Goncalo, Guapimirim, Itaborai, Mage, Marica, Nilopolis, Nova Iguacu, S.J. Demeriti) | -                                       | Sao Goncalo: 68<br>Marica: 13<br>Belford Roxo: 26<br>Nova Iguacu: 76<br>Queimados: 12<br>Duque de Caxias: 23<br>S.J. Demeriti: 9<br>Japeri: 2<br>(not confirmed for other municipalities) |
| BRT (Rio)  | TransOeste<br>TransCarioca<br>TransOlympica<br>TransBrasil | Municipality (SMTR)   | 50 stations<br>44 stations<br>16 stations<br>- | 110 fleets<br>217 fleets<br>86 fleets<br>-                   | 56 km<br>39 km<br>26 km<br>31 km   |   |   |
| Subway     |  | Concession (Metro RJ)   | State (AGETRANSP)                              | Line 1: 19 stations<br>Line 2: 26 stations<br>(10 in shared) | 32 fleet<br>182 cars   | Line 1: 16 km<br>Line 2: 30.2 km        |   |
| Rail       |  | Concession (SuperVia)   | State (AGETRANSP)                              | 99 stations  | 164 fleets<br>609 cars   | 8 lines (270 km)                        |   |
| Teleferico |  | Contract (Odebrecht – SuperVia)   | State (SETRANS)                                | 6 stations   | 152 cars   | 1line (3.5 km)                          |   |
| Tram       | Santa Teresa   | State government (Central)  | State (SETRANS)                                | Revitalization process                                       |  |   |   |
|            | Corcovado  | Private (Companhia Trem do Corcovado)   | ANTT   | 3  | 4  | 1 line (3.8 km)                         |   |
| Boat       |  | Concession (Barcas)   | State (AGETRANSP)                              | 8 port   | 19 ships   | 6 lines                                 |   |
| Taxi       |  | Permission  | Municipality (Ex. Rio -> SMTR)                 | -  | About 30,000 vehicles (Rio City)   | -                                       |   |
| Airport    |  | Federal government (INFRAERO)   | -  | 3 in RMRJ<br>5 in Rio State                                  | -  | -                                       |   |
| Sea Port   |  | Companhia Docas do Rio de Janeiro<br>Pier Maua S/A  | -  | 4 for cargo<br>2 for container<br>1 for passengers           | -  | -                                       |   |
| Freight    | Truck  | Private company (registration) (examples, Utilissimo Tranportes LTDA., A. Cupello Transporte LTDA.) | Federal government (ANTT)                      | -  | -  | -                                       |   |
|            | Rail   | Concession (MRS Logística S.A.)   | Federal government (ANTT)                      | -  | -  | 1 region (1,674 km)                     |   |

Source: Several websites and data provided by operators

2) Network

This table shows the transport network in the Metropolitan Region of Rio de Janeiro. New BRT and metro networks are planned for the near future.

[Existing]



[Planned]



Source: JICA Study Team

Figure 2-105 Network of Public Transport in the Metropolitan Region of Rio de Janeiro

(2) Public Transport Related to the State Government in Rio

1) Rail

Rail is operated in and around the municipality of Rio de Janeiro by SuperVia, with an increasing amount of passengers.

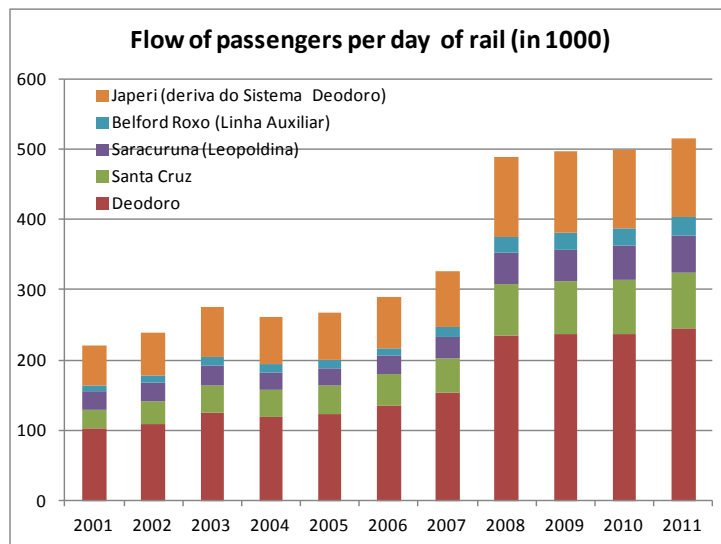
Table 2-26 Existing Rail Condition

| Mode | Operation             | Supervision       | Stations/Stops | Fleet                  | Line             |
|------|-----------------------|-------------------|----------------|------------------------|------------------|
| Rail | Concession (SuperVia) | State (AGETRANSP) | 99 stations    | 164 fleets<br>609 cars | 8 lines (270 km) |



Source: SuperVia

Figure 2-106 Rail Network Map



Source: <http://www.armazemdedados.rio.rj.gov.br/> (Tabela 1265 -Fluxo de passageiros por dia, por subsistema do sistema ferroviário - Município do Rio de Janeiro - 1995-2011)

Figure 2-107 Average Daily Passengers of Rail

Railway crossing is shown in Figure 2-108.



Source: JICA Study Team

Figure 2-108 Railway Crossing of SuperVia



2) Metro

The metro is operated in the central Rio by Metro Rio and number of passengers is increasing.

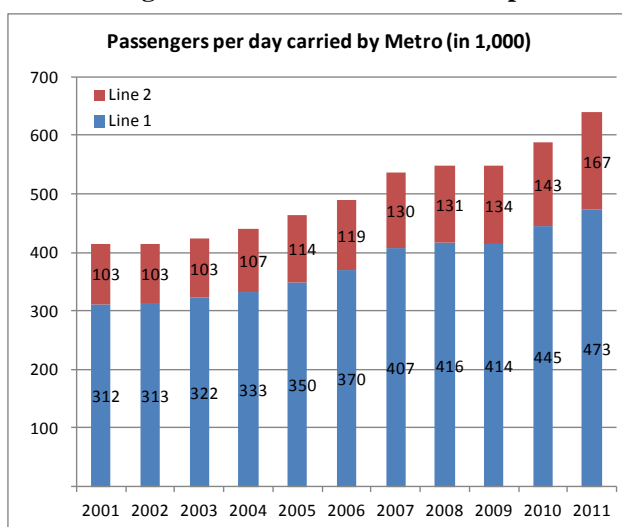
Table 2-27 Existing Condition of the Metro

| Mode   | Operation             | Supervision       | Stations/Stops   | Fleet                | Line                             |
|--------|-----------------------|-------------------|--|----------------------|----------------------------------|
| Subway | Concession (Metro RJ) | State (AGETRANSP) | Line 1: 19 stations<br>Line 2: 26 stations<br>(10 in shared) | 32 fleet<br>182 cars | Line 1: 16 km<br>Line 2: 30.2 km |



Source: Metro Rio

Figure 2-109 Metro Network Map



Source: <http://www.armazemdedados.rio.rj.gov.br/> (Tabela 1268 - Fluxo médio de passageiros por dia nas linhas da Rede Metroviária - Município do Rio de Janeiro - 1995-2011).

Figure 2-110 Average Daily Passengers of Metro

3) Tram

The tram is operated in the tourist area of central Rio.

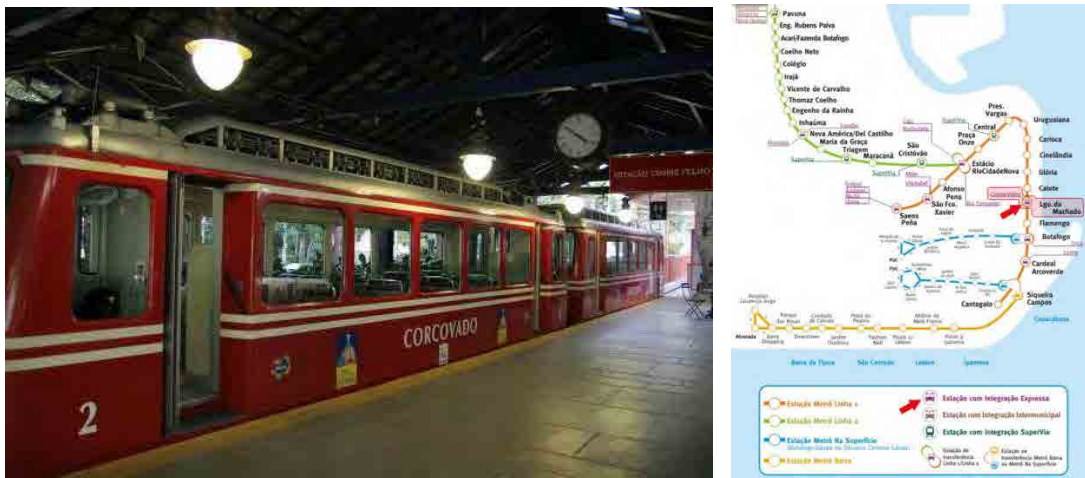
**Table 2-28 Existing Condition of the Tram**

| Mode | Operation    | Supervision                          | Stations/Stops  | Fleet                  | Line |                 |
|------|--------------|--------------------------------------|-----------------|------------------------|------|-----------------|
| Tram | Santa Teresa | State government (Central)           | State (SETRANS) | Revitalization process |      |                 |
|      | Corcovado    | Private(Companhia Trem do Corcovado) | ANTT            | 3                      | 4    | 1 line (3.8 km) |

Source: JICA Study Team

i) **Corcovado**

This tram is only for tourists going to Corcovado. Tickets are reserved via website.



Source: Corcovado Tram HP

**Figure 2-111 Photo and Location of Corcovado Tram**

ii) **Santa Teresa**

The Santa Teresa Tram is operated by the state government. Currently, a process of revitalization is undergoing.



Source://www.rio.rj.gov.br/web/riotur/exibeconteudo?article-id=157387

**Figure 2-112 Photo of Santa Teresa Tram**

4) Cable Car

The cable car is operated on one line as a branch of the railway network through a poor area of Rio by SuperVia. One year has passed since the cable car started operating and it has achieved the planned number of passengers.

**Table 2-29 Existing Condition of Cable Car**

| Mode       | Operation                       | Supervision     | Stations/Stops | Fleet    | Line           |
|------------|---------------------------------|-----------------|----------------|----------|----------------|
| Teleferico | Contract (Odebrecht – SuperVia) | State (SETRANS) | 6 stations     | 152 cars | 1line (3.5 km) |

Source: JICA Study Team

**Table 2-30 Number of Passengers of Cable Car**

| Passengers |                     |
|------------|---------------------|
| First year | More than 2,500,000 |
| → Daily    | About 7,000         |

Source: SuperVia HP



Source: SuperVia HP

**Figure 2-113 Network and Photo of the Cable Car**

5) Boat

Boats are being operated by Barcas between the municipality of Rio de Janeiro and surrounding municipalities and islands. The waterway is also one of the important transport modes of Rio de Janeiro.

**Table 2-31 Existing Condition of Boat**

| Mode | Operation           | Supervision       | Stations/Stops | Fleet    | Line    |
|------|---------------------|-------------------|----------------|----------|---------|
| Boat | Concession (Barcas) | State (AGETRANSP) | 8 ports        | 19 ships | 6 lines |

Source: JICA Study Team

**Table 2-32 Average Number of Boat Passengers**

| Average Number of Passengers |               |
|------------------------------|---------------|
| Daily                        | About 106,000 |

Source: Barcas website ([www.grupoccr.com.br/barcas/](http://www.grupoccr.com.br/barcas/))



Source: Barcas website ([www.grupoccr.com.br/barcas/](http://www.grupoccr.com.br/barcas/))

**Figure 2-114 Photos of Boats**



6) Intercity Bus and Bus Terminal

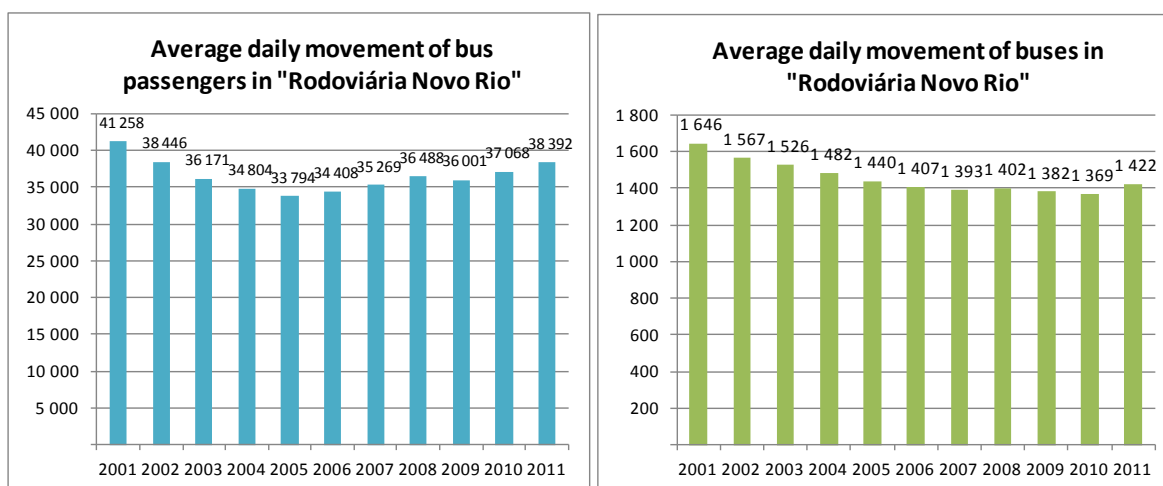
As for the bus operations, the state government is in charge of inter-municipality lines and bus terminals. The number of passengers has been stable in recent years.

**Table 2-33 Existing Condition of Intercity Bus**

| Mode |                 | Operation                                       | Supervision              | Stations/Stops | Fleet  | Line                                       |
|------|-----------------|---|--------------------------|----------------|--|--|
| Bus  | Inter municipal | Concession and Permission (About 200 companies) | State government (DETRO) | 20 terminals   | 5,688 in RMRJ<br>6,816 in RJ<br>(Fetranspor) | 565 in RMRJ<br>1,103 in RJ<br>(Fetranspor) |

Source: JICA Study Team

[No. of passengers and bus lines using Novo Rio Terminal]



Source: <http://www.armazemdedados.rio.rj.gov.br/> (Tabela 1252 - Movimento anual e média diária de ônibus e passageiros e média de passageiros por ônibus na Rodoviária Novo Rio - Município do Rio de Janeiro - 1992 – 2011)

**Figure 2-115 Average Daily Demand in Novo Rio Terminals**



Source: <http://www.transportal.com.br/rodoviaria-novorio/>

**Figure 2-116 Location and Photo of Novo Rio Terminal**

(3) Public Transport Related to the Municipal Government in Rio

1) Bus

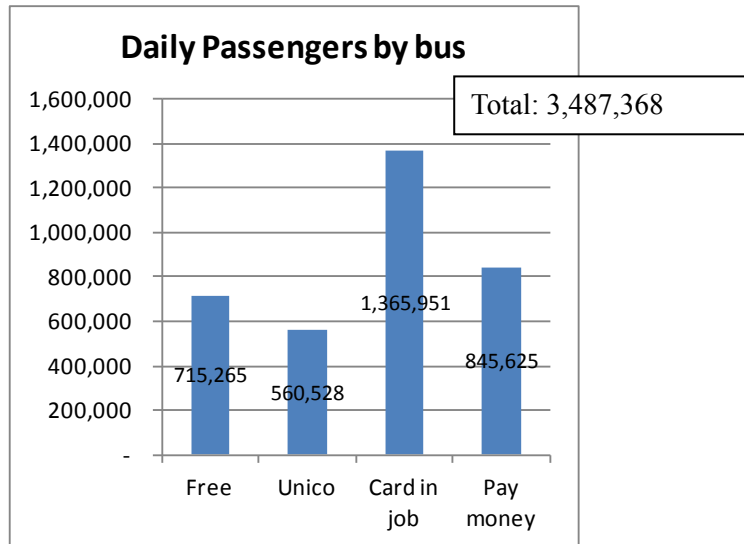
Municipal governments are in charge of local bus operation. The bus is the most important mode of transport in Rio. The number of passengers per day is about 3.5 million in the municipality of Rio de Janeiro.

**Table 2-34 Existing Conditions of Local Buses**

| Mode |           | Operation | Supervision                     | Stations/Stops                  | Fleet  | Line              |   |
|------|-----------|-----------|---------------------------------|---------------------------------|--|-------------------|---|
| Bus  | Municipal | Rio       | Concession (about 50 companies) | Municipal government (SMTR)     | 2,136 stops with shelters<br>26 terminals  | About 9,000 buses | About 900 lines   |
|      |           | Niteroi   | Concession (2 companies)        | Municipal government (NITTRANS) | 1 terminal   | About 672 buses   | 54 lines  |
|      |           | Others    | Permission                      | Municipal government            | 9 terminals (Sao Goncalo, Guapimirim, Itaborai, Mage, Marica, Nilopolis, Nova Iguacu, S.J. Demeriti) | -                 | Sao Goncalo: 68<br>Marica: 13<br>Belford Roxo: 26<br>Nova Iguacu: 76<br>Queimados: 12<br>Duque de Caxias: 23<br>S.J. Demeriti: 9<br>Japeri: 2<br>(not confirmed for other municipalities) |

Source: JICA Study Team

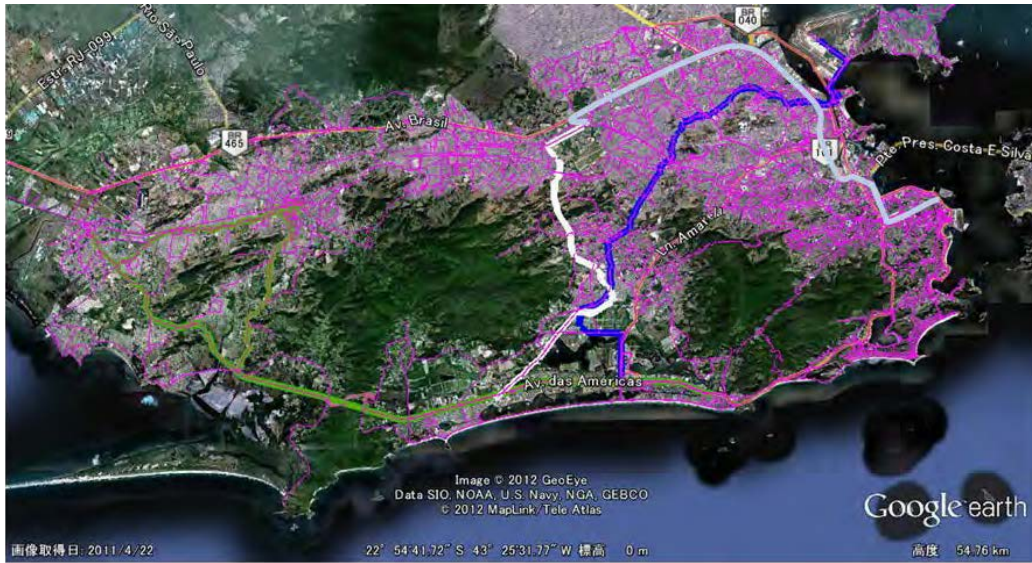
[Average daily passengers in May 2012]



Source: Data provided by SMTR

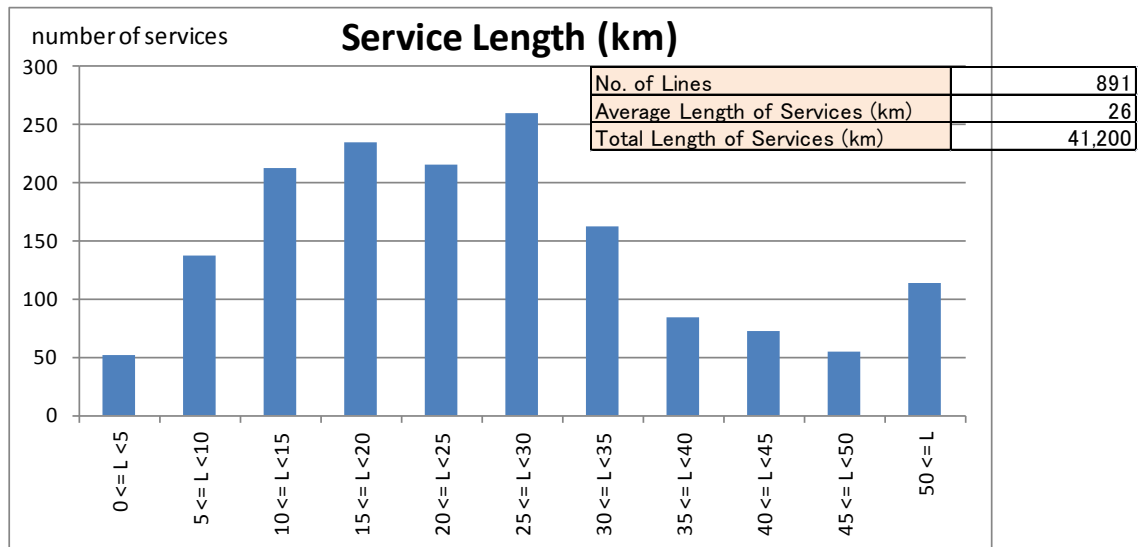
**Figure 2-117 Average Number of Passengers of Local Buses**

[Local bus lines]



Source: Data provided by SMTR

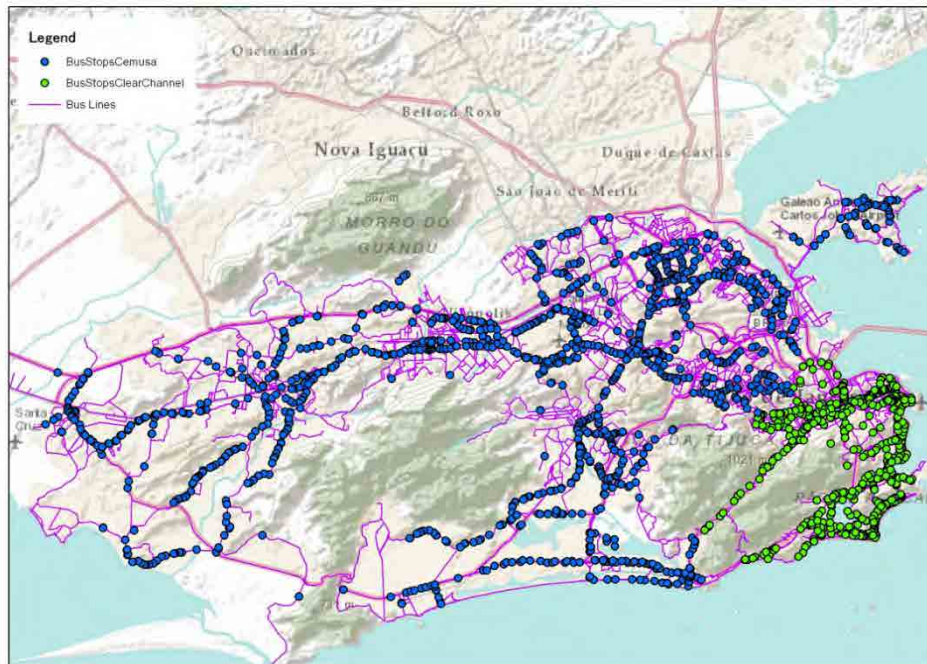
Figure 2-118 Local Bus Line in the City of Rio de Janeiro



Source: JICA Study Team

Figure 2-119 Average Operation Length of Bus Services

[Bus stops with shelter]



Source: Data provided by SMTR

Figure 2-120 Location of Bus Stops in the City of Rio de Janeiro

Table 2-35 Bus Stops in the City of Rio de Janeiro

| Concessionaire | No. of Stops |
|----------------|--------------|
| Cemusa         | 1,477        |
| Clear Channel  | 659          |
| Total          | 2,136        |

Source: JICA Study Team



[BRS maps]

Copacabana

Leblon/Ipanema



Pres. Antônio Carlos/1º de Março, Rio Branco



President Vargas

> Central



> Marginal



Source: Fetranpor (<http://www.fetranpor.com.br/brs/copacabana.php>)

Figure 2-121 Maps of BRS



2) BRT (Bus Rapid Transit)

BRT is the new rapid transport system. Leading up to the Olympic Games, four new lines will be constructed. As a result, about 2 million people per day will be carried by BRT system.

**Table 2-36 Existing BRT Condition**

| Mode |           | Operation     | Supervision         | Stations/Stops | Fleet      | Line  |
|------|-----------|---------------|---------------------|----------------|------------|-------|
| Bus  | BRT (Rio) | TransOeste    | Municipality (SMTR) | 50 stations    | 110 fleets | 56 km |
|      |           | TransCarioca  |                     | 44 stations    | 217 fleets | 39 km |
|      |           | TransOlympica |                     | 16 stations    | 86 fleets  | 26 km |
|      |           | TransBrasil   |                     | -              | -          | 31 km |

Source: JICA Study Team

**Table 2-37 Actual Passengers of BRT**

| Forecast   | Passenger per day |
|------------|-------------------|
| TransOeste | 60,000            |

Source: RioOnibus Interview

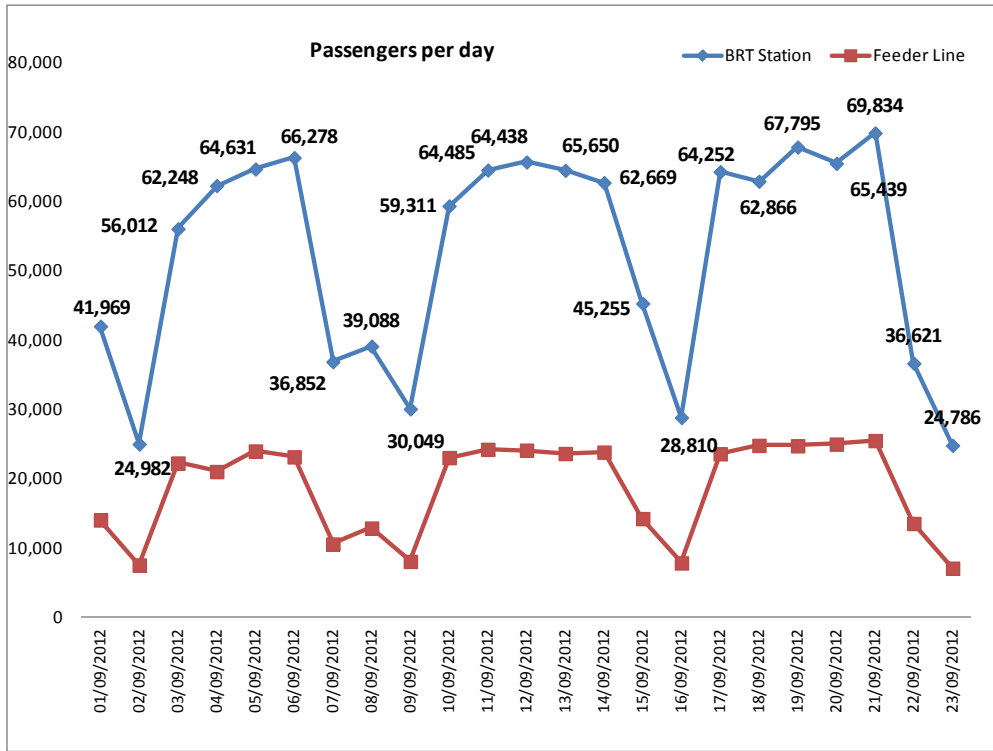
**Table 2-38 Planned Passengers of BRT**

| Forecast      | Passenger per day | Year of Operation |
|---------------|-------------------|-------------------|
| TransOeste    | 220,000           | 2012              |
| TransCarioca  | 450,000           | 2013              |
| TransOlympica | 250,000           | 2014              |
| TransBrasil   | 1,000,000         | 2015-2016         |

Source: RioOnibus Interview

[Existing BRT passengers condition in September 2012]

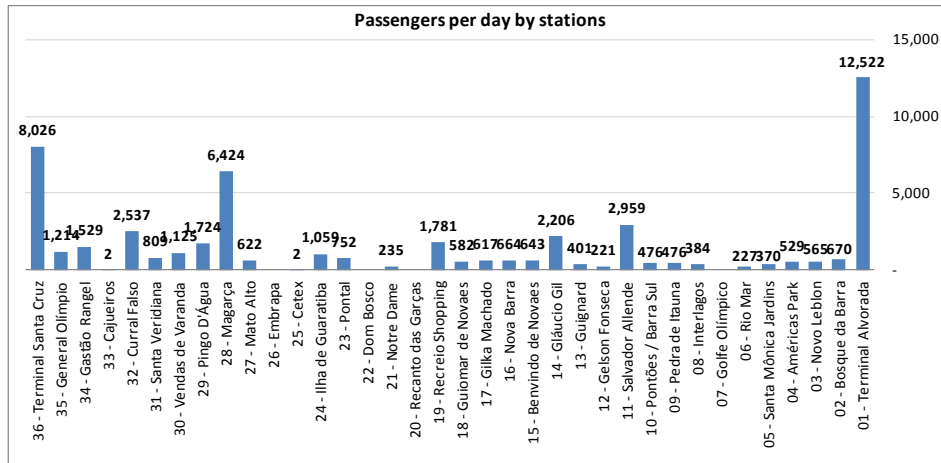
➤ Daily passengers in all stations



Source: JICA Study Team

Figure 2-122 Daily Passengers of BRT

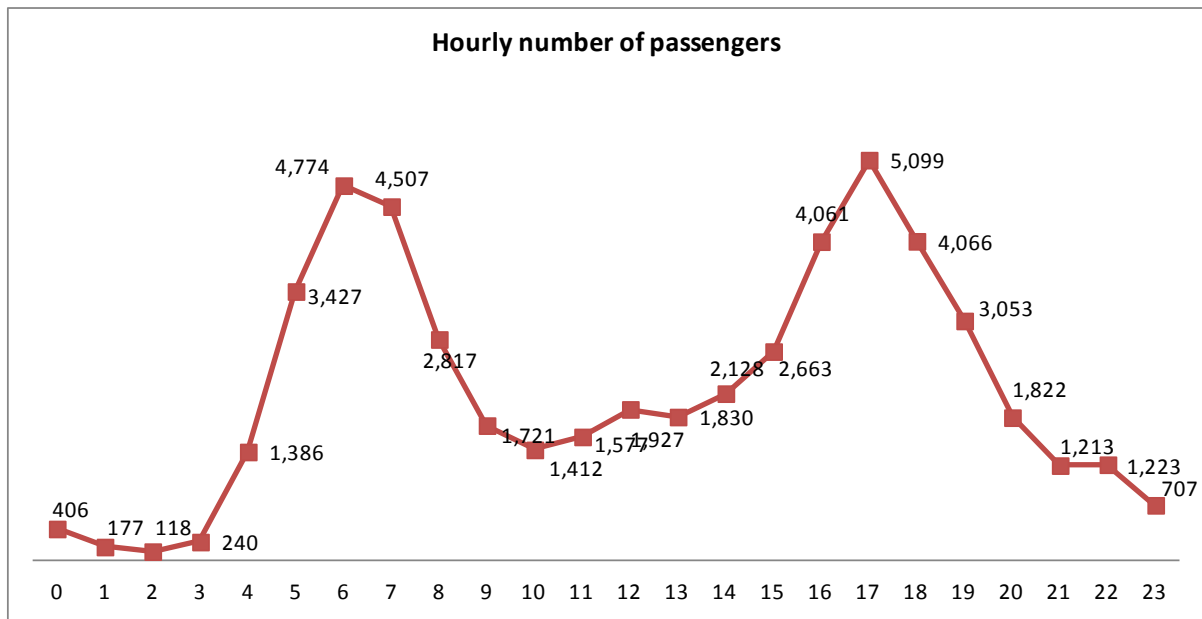
➤ Daily average passengers by station



Source: JICA Study Team

Figure 2-123 Daily Passengers of BRT by Station (Average between 1-23 September 2012)

➤ Hourly average number of passengers



Source: JICA Study Team

Figure 2-124 Hourly Average Number of Passengers of BRT (Average between 1-23 September 2012)

[BRT network]



Source: JICA Study Team

Figure 2-125 Maps of BRT

Table 2-39 Stations and Terminals of BRT

| No.      | TransOeste | TransCarioca | TransOlimpica | TransBrasil |
|----------|------------|--------------|---------------|-------------|
| Terminal | 3          | 7            | 2             | 2           |
| Station  | 63         | 43           | 15            | 30          |
| Total    | 66         | 50           | 17            | 32          |

| Name                    | Integration Point |
|-------------------------|-------------------|
| Aeroporto Internacional | BRT - Airport     |
| Alvorada                | BRT - BRT         |
| Av. Brasil              | BRT - BRT         |
| Parque Olimpico         | BRT - BRT         |
| Recreio                 | BRT - BRT         |
| Terminal das Missoes    | BRT - Bus         |
| Terminal Guanabara      | BRT - Bus         |
| Terminal Margaridas     | BRT - Bus         |
| Vicente de Carvalho     | BRT - Metro       |
| Jardim Oceanico         | BRT - Metro L4    |
| Deodoro                 | BRT - SuperVia    |
| Madureira               | BRT - SuperVia    |
| Mercadao                | BRT - SuperVia    |
| Olaria                  | BRT - SuperVia    |
| Santa Cruz              | BRT - SuperVia    |
| Terminal Central        | BRT - SuperVia    |
| Total                   | 16                |

Source: JICA Study Team

3) Taxi

Along with bus transport, taxis are also administrated by the municipal governments.

**Table 2-40 Existing Taxi Condition**

| Mode | Operation  | Supervision                   | Stations/Stops | Fleet                            | Line |
|------|------------|-------------------------------|----------------|----------------------------------|------|
| Taxi | Permission | Municipality (Ex. Rio - SMTR) | -              | About 30,000 vehicles (Rio City) | -    |

Source: JICA Study Team

**Table 2-41 Number of Taxi Vehicles Permitted by the Municipality (Example)**

| City           | No. of .<br>Taxis | Source                            |
|----------------|-------------------|-----------------------------------|
| Rio de Janeiro | 32,000            | Interview with SMTR               |
| Niterói        | 1,900             | NITTRANS website                  |
| Sao Goncalo    | 1,200             | O São Gonçalo (Newspaper website) |

Source: JICA Study Team



(4) Public Transport Related to the Federal Government in Brazil

1) Long Distance Bus

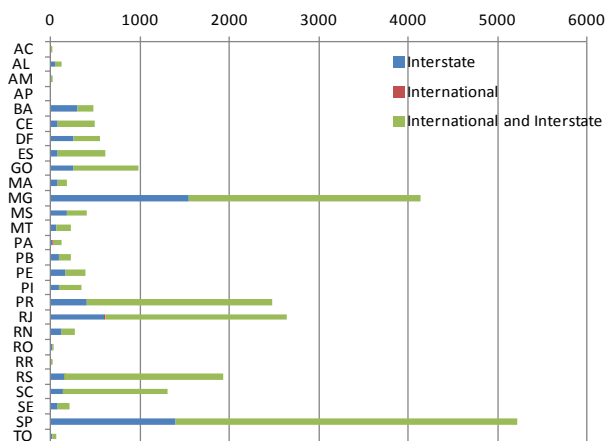
Long distance buses such as interstate and international buses are authorized by federal government. The organization who is in charge of administration is the National Land Transport (Agência Nacional de Transporte Terrestre: ANTT). The number of buses and passengers for long distance routes in Rio de Janeiro are in third grade following Minas Gerais and Sao Paulo.

**Table 2-42 Existing Long Distance Bus Condition**

| Mode |               | Operation  | Supervision               | Stations/Stops           | Fleet | Line                       |
|------|---------------|------------|---------------------------|--------------------------|-------|----------------------------|
| Bus  | International | Permission | Federal government (ANTT) | Novo Rio Terminal        | -     | 6 lines use Novo Rio       |
|      | Interstate    | Permission | Federal government (ANTT) | 471 stops<br>2 terminals | -     | 181 lines in the Rio State |

Source: JICA Study Team

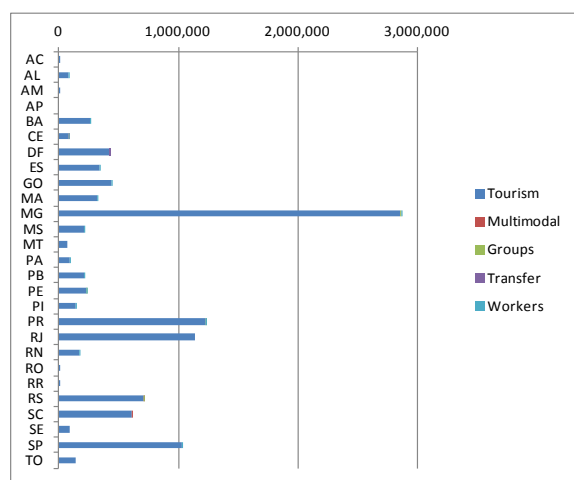
[Number of buses]



Source: ANTT Annual Report 2011

**Figure 2-126 Number of Buses Authorized by ANTT**

[Number of passengers]



Source: ANTT Annual Report 2011

**Figure 2-127 Number of Passengers Transported by Interstate and International Buses**

2) Airport

Three airports are located in RMRJ and five in the Rio State. The number of passengers is gradually increasing, but the volume of cargo is decreasing.

**Table 2-43 Existing Airport Condition**

| Mode    | Operation                     | Supervision | Stations/Stops              | Fleet | Line |
|---------|-------------------------------|-------------|-----------------------------|-------|------|
| Airport | Federal government (INFRAERO) | -           | 3 in RMRJ<br>5 in Rio State | -     | -    |

Source: JICA Study Team

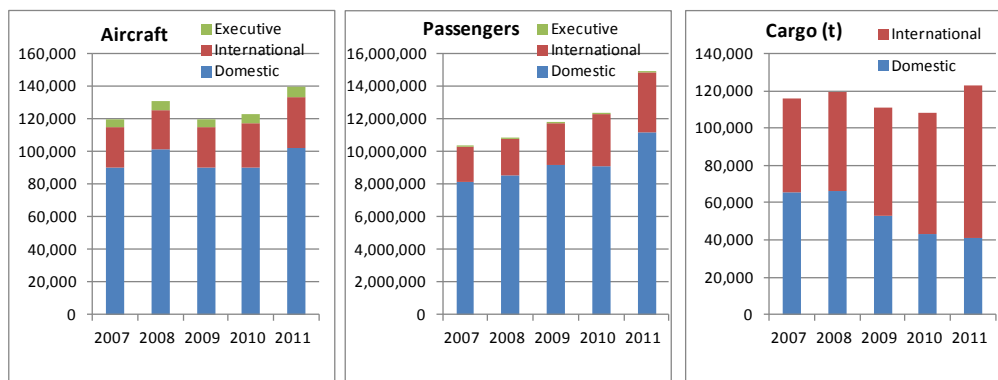
➤ Map of Airports



Source: JICA Study Team

**Figure 2-128 Location of Airports in the State of Rio de Janeiro**

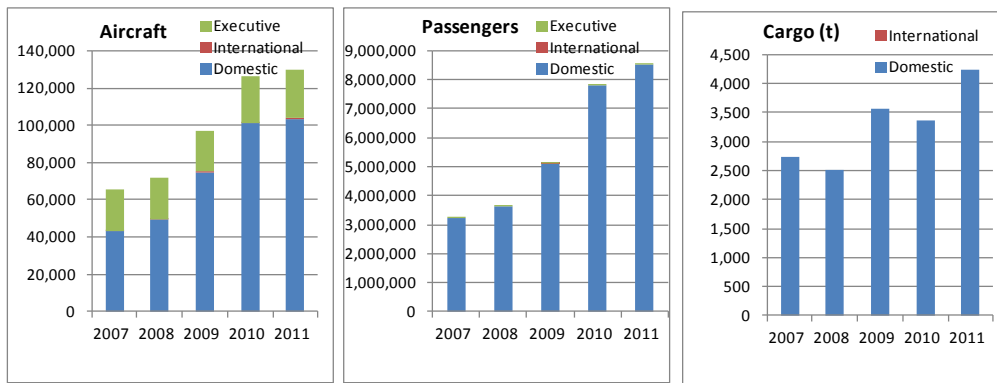
➤ Aeroporto Internacional do Rio de Janeiro-Galeão



Source: JICA Study Team

**Figure 2-129 Yearly Aircraft, Passenger, and Cargo Movement in Galeao Airport**

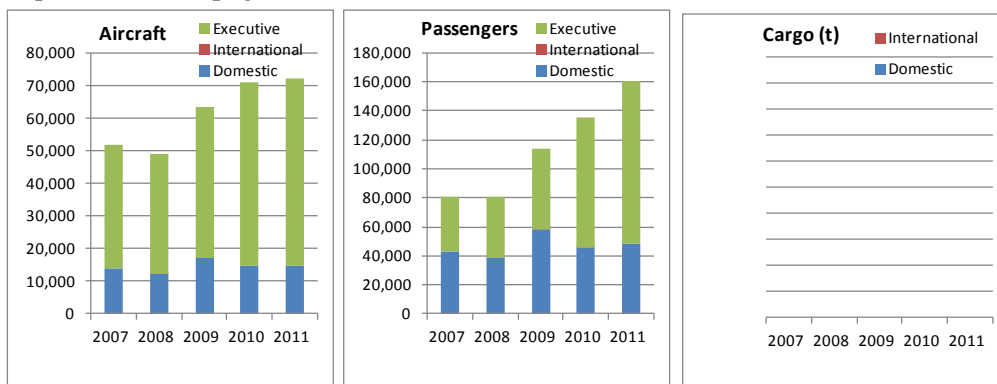
➤ Aeroporto do Rio de Janeiro–Santos Dumont



Source: JICA Study Team

Figure 2-130 Yearly Aircraft, Passenger, and Cargo Movement in Santos Dumont Airport

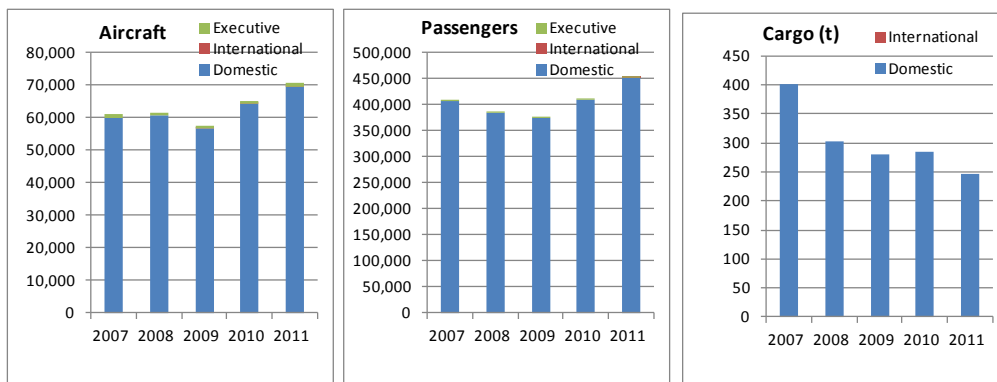
➤ Aeroporto de Jacarepaguá–Roberto Marinho



Source: JICA Study Team

Figure 2-131 Yearly Aircraft, Passenger and Cargo Movement in Roberto Marinho Airport

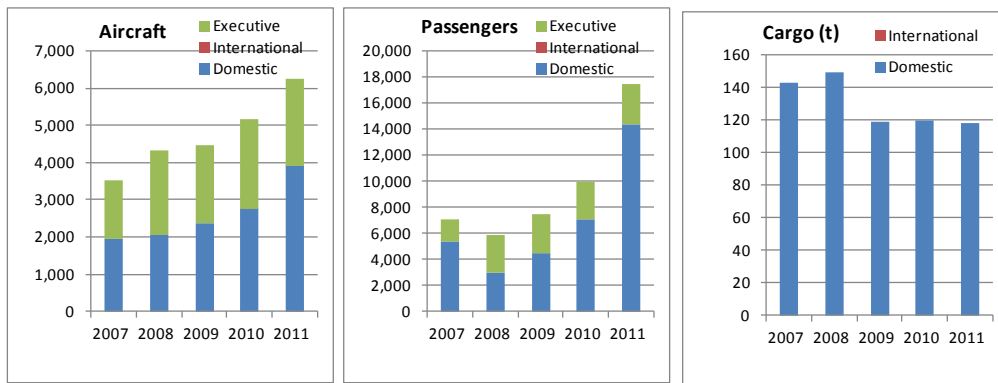
➤ Aeroporto de Macaé



Source: JICA Study Team

Figure 2-132 Yearly Aircraft, Passenger and Cargo Movement in Macaé Airport

➤ Aeroporto Internacional de Campos



Source: JICA Study Team

**Figure 2-133 Yearly Aircraft, Passenger, and Cargo Movement in Campos Airport**

3) Ports

Four sea ports for cargoes, two sea ports for containers, and one sea port for passengers are located in the Rio State.

**Table 2-44 Existing Sea Port Condition**

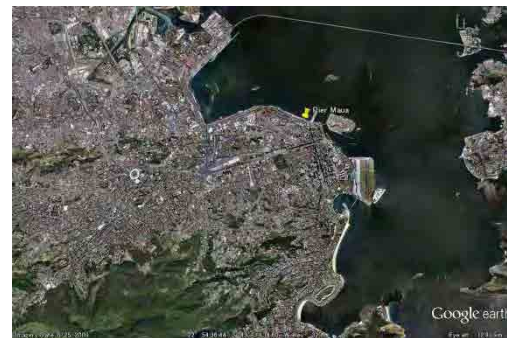
| Mode     | Operation                         | Supervision | Stations/Stops                    | Fleet | Line |
|----------|-----------------------------------|-------------|-----------------------------------|-------|------|
| Sea Port | Companhia Docas do Rio de Janeiro | -           | 4 for Cargoes<br>2 for Containers | -     | -    |
|          | Pier Maua S/A                     |             | 1 for Passengers                  |       |      |

Source: JICA Study Team

i) Passengers

[Porto do Rio de Janeiro: Pier Maua]

- Location: Avenida Rodrigues Alves, 10 - de Janeiro-Brazil
- Length: 1,050 m
- Operating Area: 61,800 m<sup>2</sup>

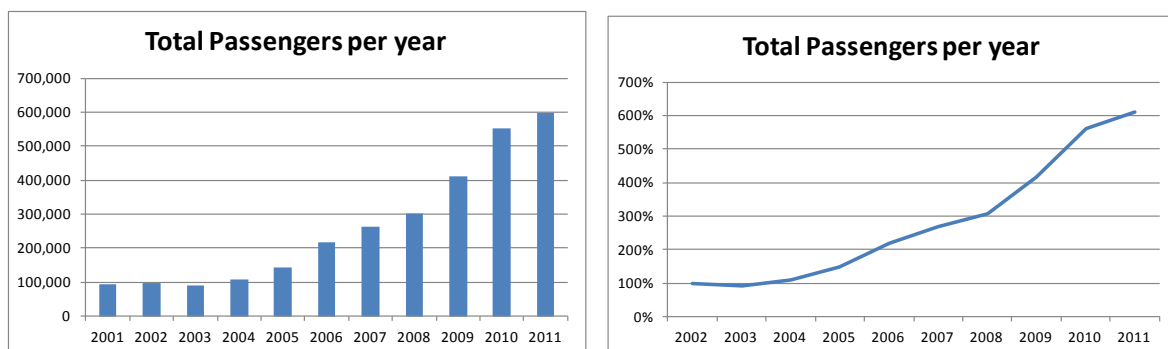


Rio



Source: Pier Maua HP (<http://www.piermaua.com.br/>)

**Figure 2-134 Photo Images of Pier Maua**



Source: Docas do Rio HP (<http://www.portosrio.gov.br/>)

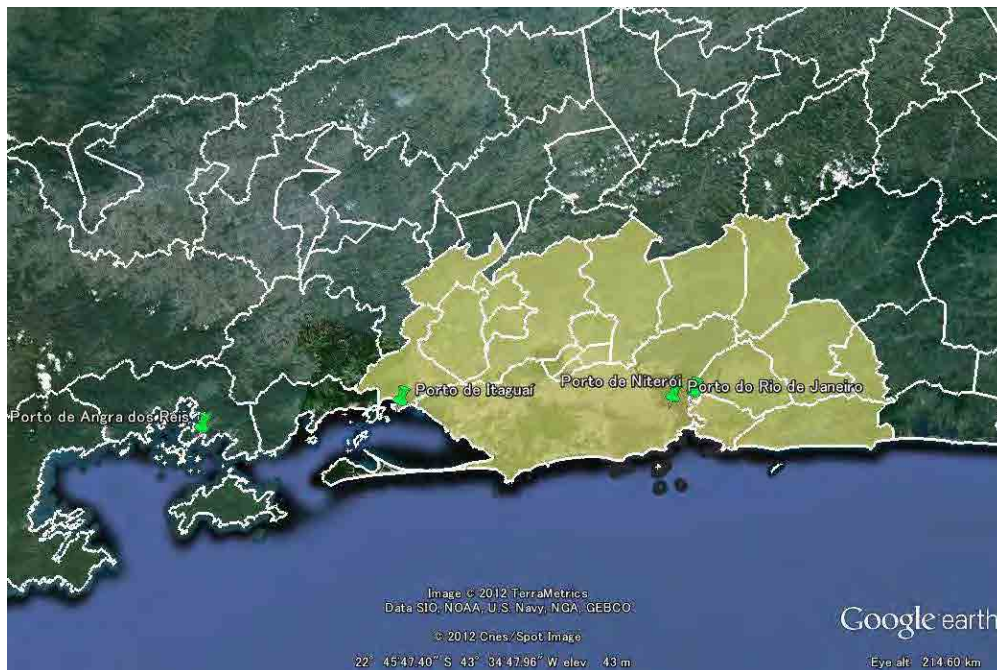
**Figure 2-135 Location and Passengers of Pier Maua**



ii) Cargo

[Port for cargoes]

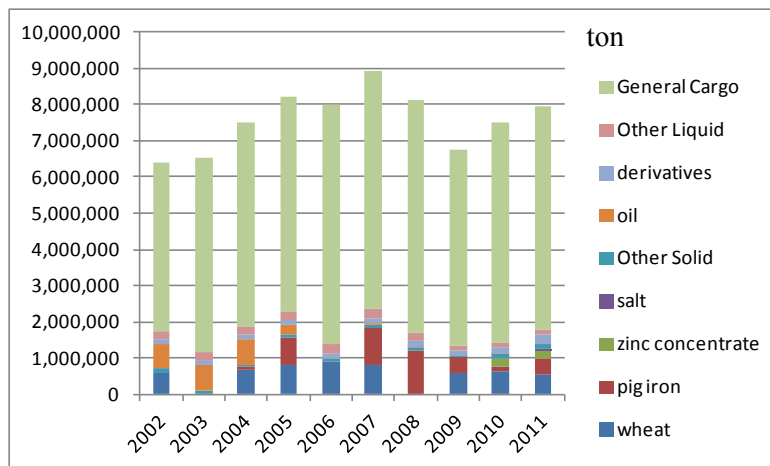
➤ Map of Ports



Source: JICA Study Team

Figure 2-136 Location of Ports for Cargoes in the State of Rio de Janeiro

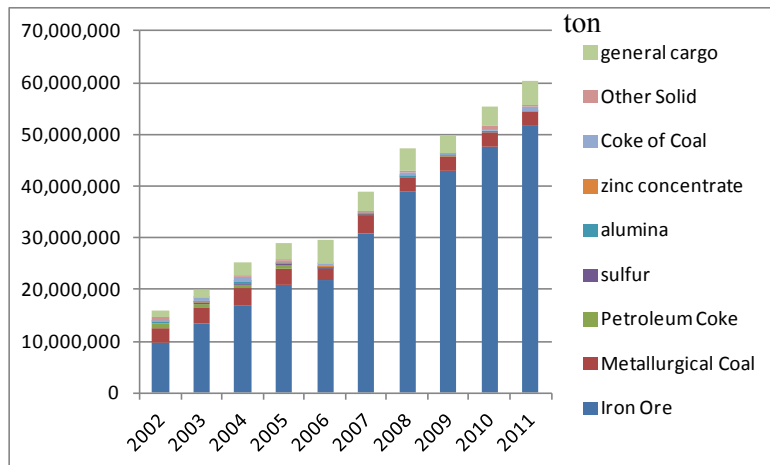
➤ Porto do Rio de Janeiro



Source: JICA Study Team

Figure 2-137 Yearly Cargo Volume of Port of Rio de Janeiro

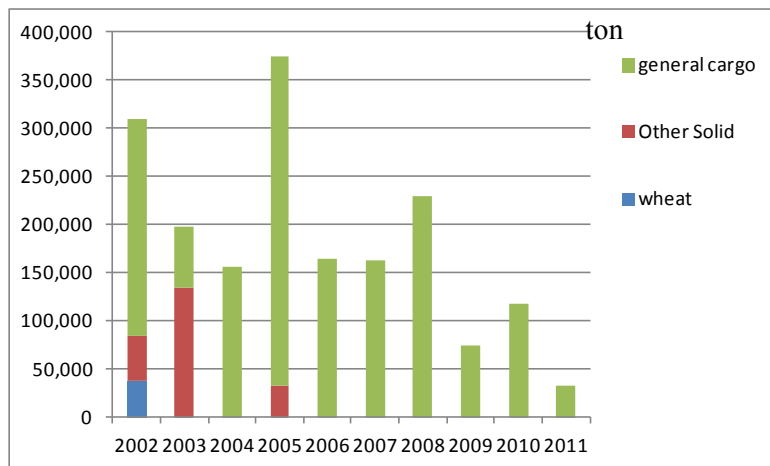
➤ Porto de Itaguaí



Source: JICA Study Team

Figure 2-138 Yearly Cargo Volume of Port of Itaguaí

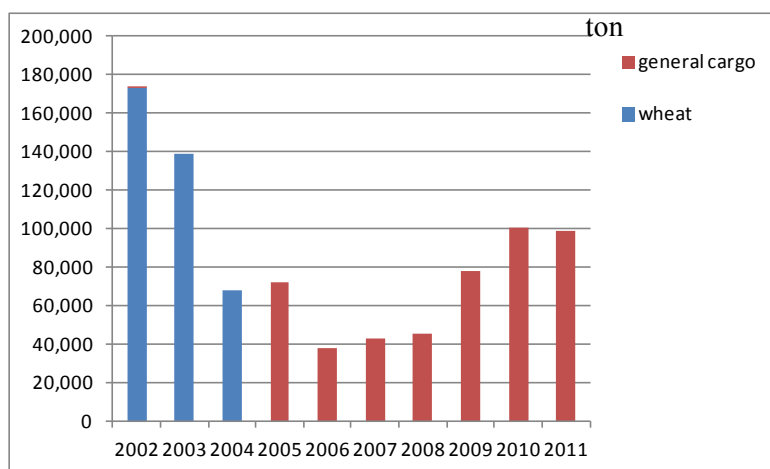
➤ Porto de Angra dos Reis



Source: JICA Study Team

Figure 2-139 Yearly Cargo Volume of Port of Angra dos Reis

➤ Porto de Niterói

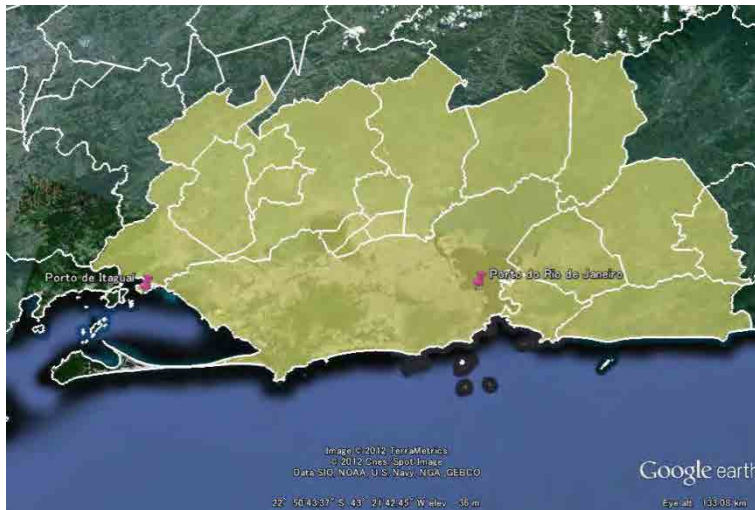


Source: JICA Study Team

Figure 2-140 Yearly Cargo Volume of Port of Niterói

[Port for containers]

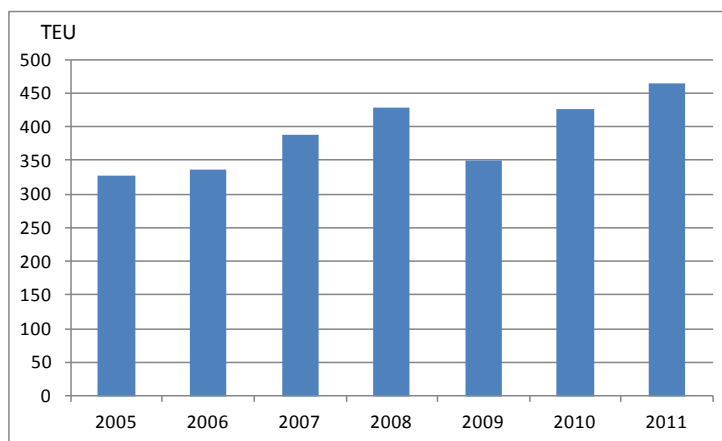
➤ Map of Ports



Source: JICA Study Team

**Figure 2-141 Location of Port for Containers in the State of Rio de Janeiro**

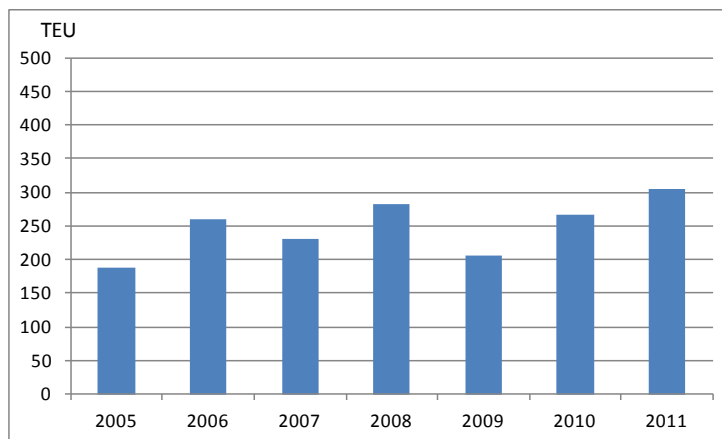
➤ Porto do Rio de Janeiro



Source: JICA Study Team

**Figure 2-142 Yearly Container Volume of Port of Rio de Janeiro**

➤ Porto de Itaguai



Source: JICA Study Team

**Figure 2-143 Yearly Container Volume of Port of Itaguai**

(5) Freight Transport

Land freight transport, such as truck and rail is also administrated by the federal government, ANTT.

**Table 2-45 Existing Freight Transport Condition**

| Mode    | Operation | Supervision  | Stations/Stops            | Fleet | Line                |
|---------|-----------|--|---------------------------|-------|---------------------|
| Freight | Truck     | Private company (registration) (example: Utilissimo Tranportes LTDA., A. Cupello Transporte LTDA.) | Federal government (ANTT) | -     | -                   |
|         | Rail      | Concession (MRS Logística S.A.)  | Federal government (ANTT) | -     | 1 region (1,674 km) |

Source: JICA Study Team

1) Trucks

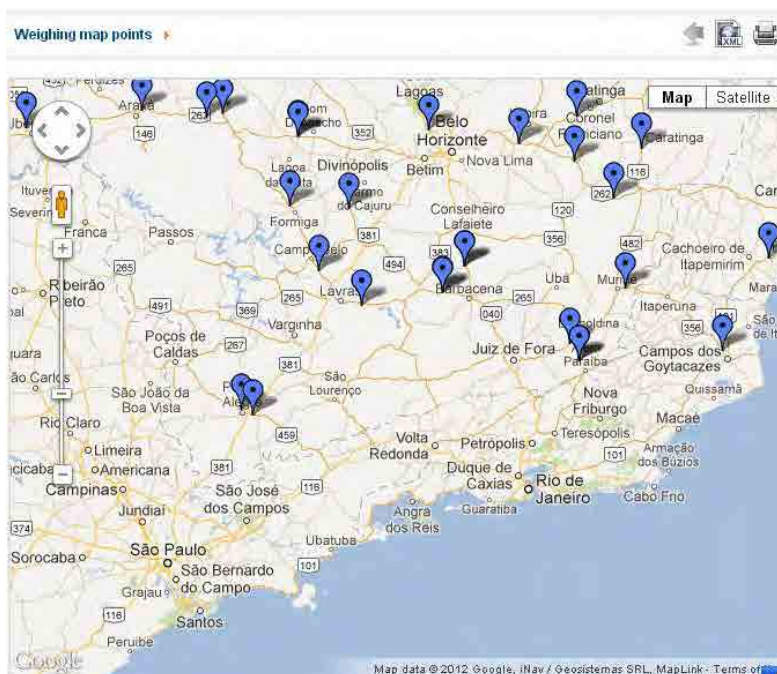
[Number of trucks in Brazil]

**Table 2-46 Number of Trucks Registered by ANTT**

| Table 1 – RNTRC – Updated on 31/12/2011 |                   |                    |                   |
|---|-------------------|--------------------|-------------------|
| Type Transp.                            | Number of Records | Number of Vehicles | Vehicle / Carrier |
| Companies Freight Trucking              | 540,388           | 749,400            | 1.4               |
| Cooperative Freight Trucking            | 100,934           | 854,315            | 8.5               |
| Autonomous Freight Carriers             | 278               | 11,496             | 41.3              |
| <b>TOTAL</b>                            | <b>641,600</b>    | <b>1,615,211</b>   | <b>2.5</b>        |

Source: ANTT Annual Report 2011

[Map of weighing points]



Source: ANTT HP

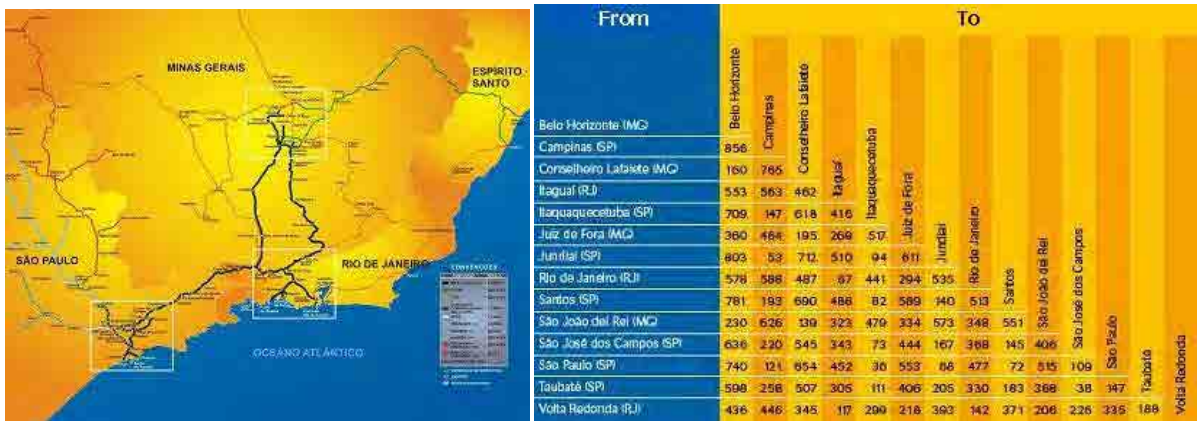
**Figure 2-144 Map of Weighing Points**



2) Rail

[Network]

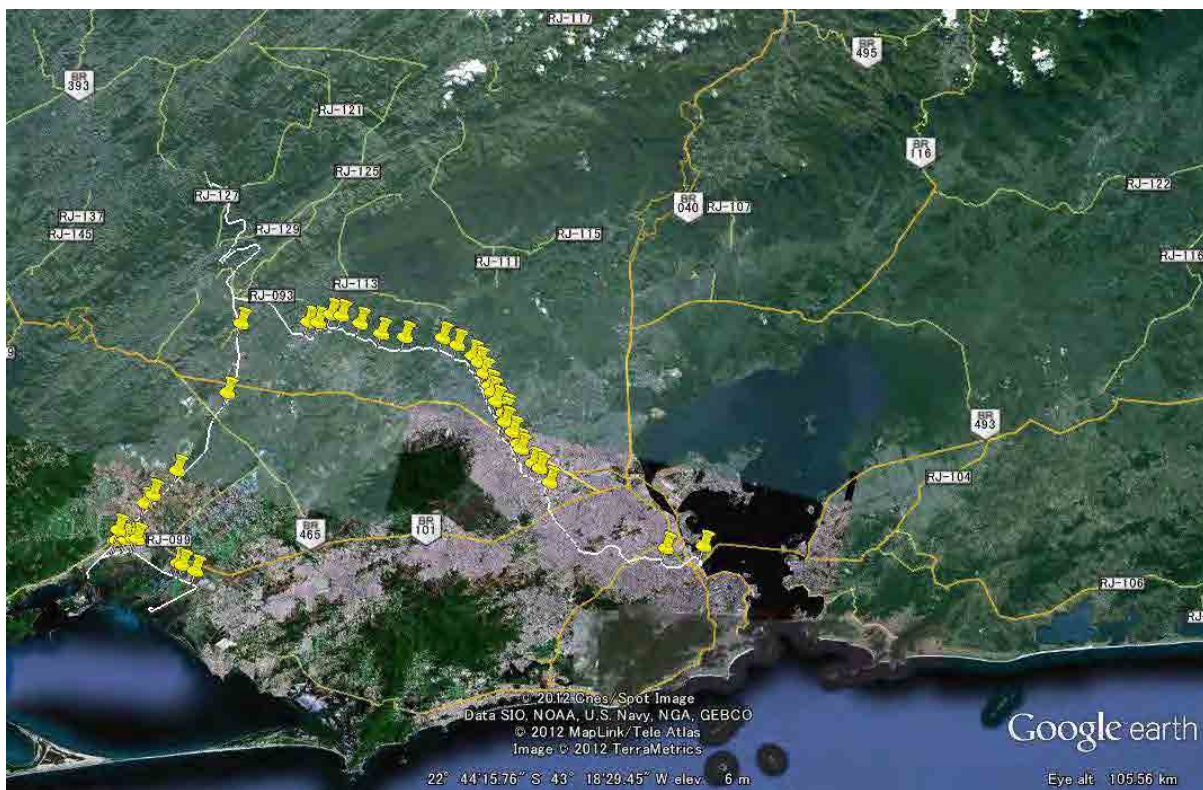
[Distance (km)]



Source: MRS website (<http://www.mrs.com.br/ingles/index.php>)

Figure 2-145 General Information of MRS Railway

[Network (white line) and crossing (yellow pins)]

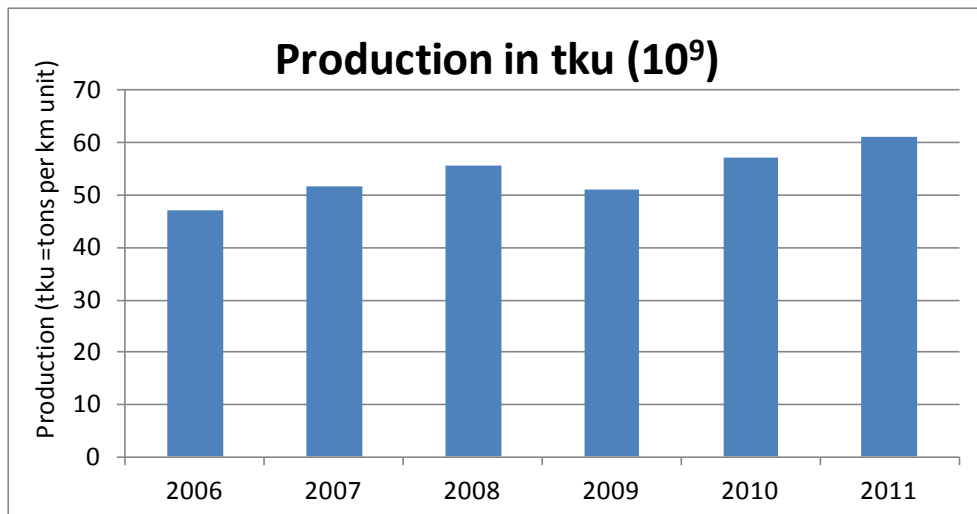


Source: JICA Study Team

Figure 2-146 MRS Rail Network in the Metropolitan Region of Rio de Janeiro



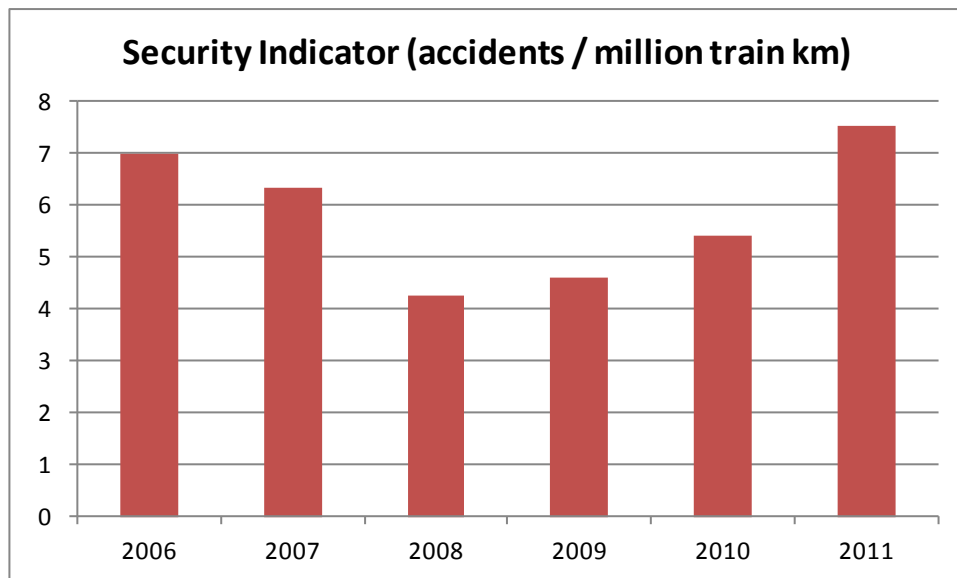
[Production indicator]



Source: ANTT Annual Report 2011

Figure 2-147 Production (tku, 10<sup>9</sup>) of MRS Railway

[Security indicator]



Source: ANTT Annual Report 2011

Figure 2-148 Security Indicator (Train Accidents per million Train km) of MRS Railway

## 2.3 CURRENT CONDITION OF ITS IN RIO DE JANEIRO

### 2.3.1 ITS-Related Agencies of Rio De Janeiro Metropolitan Area

(1) Outline of Government Organization and Hierarchy in Rio De Janeiro State and Rio De Janeiro Municipality

1) Federal Government

The National Transportation Agency (*Agência Nacional de Transportes Terrestres:ANTT*) is a national agency responsible for land transportation in Brazil. The role of ANTT is to institute management criteria for service of interstate/international bus operation and administer bus concessionaires. Regarding the federal road, there are two concessionaires that administer the federal road in the state of Rio de Janeiro. These are CCR-Ponte, which administers the Niteroi Bridge connecting the municipality of Rio de Janeiro and the municipality of Niterói, and Autopista Fluminense, which administers a section of the road from Niteroi to Espírito Santo on the Federal Road BR-101. The other federal roads are administered by the regional offices, which are lower bodies of DNIT. DNIT is also in charge of the development of train and port infrastructure such as dredging and lockage.

The National Traffic Department (*Departamento Nacional de Trânsito:DNATRAN*) is in charge of the institution of regulation on land transportation.

The National Telecommunication Agency (*Agência Nacional de Telecomunicações: ANATEL*), which is instituted based on General Telecommunication Law (9.472/1997), is responsible for implementing the national telecommunication policy, managing the national spectrum and orbital usage, standardizing and performing telecommunication products type approval.

The following table shows the federal government organizations and the concessionaires/private companies' related ITS sector.

**Table 2-47 Federal Government Organizations on ITS-Related Agencies**

| Federal Government Organization  | Concessionaire/Private Company     |
|--|------------------------------------|
| ANTT   | <b>CCR-Ponte (Road)</b>            |
| <b>DNIT(Road)</b>  | <b>Autopista Fluminense (Road)</b> |
| CONTRAN  |                                    |
| DENATRAN   |                                    |
| ANATEL   |                                    |
| ABNT   |                                    |
| Note: ITS-related organization/concessionaire/private companies which have information to be aggregated to ITS Center are described in bold. |                                    |

Source: JICA Study Team

2) State of Rio De Janeiro

Public transportation services in the state of Rio de Janeiro are mainly handled by the State Secretariat of Transport (*Secretaria de Estado de Transportes*:SETRANS). SETRANS has four agencies that administer the concessionaires of train, metro, bus, and bus terminal. The *Casa Civil* of the state government furthermore, raise concerns to public transportation from a perspective of ITS-related actions such as the National System for Automatic Vehicle Identification (*Sistema Nacional de Identificação Automática de Veículos*:SINIAV) and Integrated Monitoring and Automatic Registration of Vehicles (*Sistema Integrado de Monitoramento e Registro Automático de Veículos*:SIMRAV) legislated by DETRAN under DENATRAN.

The DER which belongs to the Secretary of State for Works (*Secretaria de Estado de Obras*: SEOBRAS) manages state roads and its traffic flow with optical character recognition (OCR). The Secretary of State for Economic Development (*Secretaria de Estado do Desenvolvimento Econômico*: SEDEC) is in charge of weather monitoring and the Secretary of State for the Environment (*Secretaria de Estado do Ambiente*: SEA) is in charge of environmental monitoring concerning public transportation because weather and environmental information are essential to manage the road properly.

The following table shows the state organizations and concessionaires/private companies' related ITS sector.

**Table 2-48 State Government Organizations on ITS-Related Agencies**

| State Organization   | Concessionaire/Private Company          |
|--|---|
| DETRAN-RJ  | <b>SuperVia (Train)</b>                 |
| PRODERJ-RJ   | <b>Tram (Train)</b>                     |
| AGETRANSP-RJ   | <b>Metro (Metro)</b>                    |
| AMTU   | <b>SindpassBus concessionaire (Bus)</b> |
| CENTRAL-SETRANS  | <b>TransOnibus (Bus)</b>                |
| RIO TORIHOS-SETRANS  | <b>Seranspass (Bus)</b>                 |
| DETRO-SETRANS  | <b>Setransduc (Bus)</b>                 |
| CODERTE-SETRANS  | <b>Setrerj (Bus)</b>                    |
| <b>DER-RJ</b>  | <b>Sinterj(Bus)</b>                     |
| AMTU-SETRANS   | <b>Sinfrerj (Bus)</b>                   |
| <b>CBMERJ-Civil Defense-SEDEC</b>  | <b>Setransol (Bus)</b>                  |
| <b>SIMERJ-CESTAD-Civil Defense-SEDEC</b>   | <b>Novo Rio (Bus terminal)</b>          |
| <b>INEA-SEA</b>  | <b>Rota 116 (Road)</b>                  |
|  | <b>CCR-Vialagos (Road)</b>              |
|  | <b>CCR-Barcas (Road)</b>                |
| Note: ITS-related organization/concessionaire/private companies which have information to be aggregated to ITS Center are described in bold. |   |

Source: JICA Study Team

3) Municipality of Rio De Janeiro

Public transportation services in the municipality of Rio de Janeiro are handled by the City Department of Transportation (*Secretaria Municipal de Transportes: SMTR*). There is no agency or organization in SMTR that administer the concessionaires. They alone play as the Coordinator of Concessions (*Coordenadoria de Concessões*).

Road management and operation, such as monitoring traffic volume and road conditions, and provision of information to drivers is conducted by the Traffic Engineering Company of Rio de Janeiro (*Companhia de Engenharia de Tráfego do Rio de Janeiro: CET-Rio*) which belongs to SMTR. The Control Center as well as the equipment such as CCTV cameras, VMSs, and traffic lights, is aggregated in COR which takes appropriate action in cases of emergency occurring in the municipality and transmits information to the press and the public in real time.

The Municipal Conservation and Public Utilities (*Secretaria Municipal de Conservação e Serviços Públicos : SECONSERVA*) manages the roads and garbage collection, which are outsourced to a public company named the Municipal Urban Cleaning Company (*Companhia Municipal de Limpeza Urbana: COMLURB*). The following table shows the municipal organizations and concessionaires/private companies' related ITS sector.

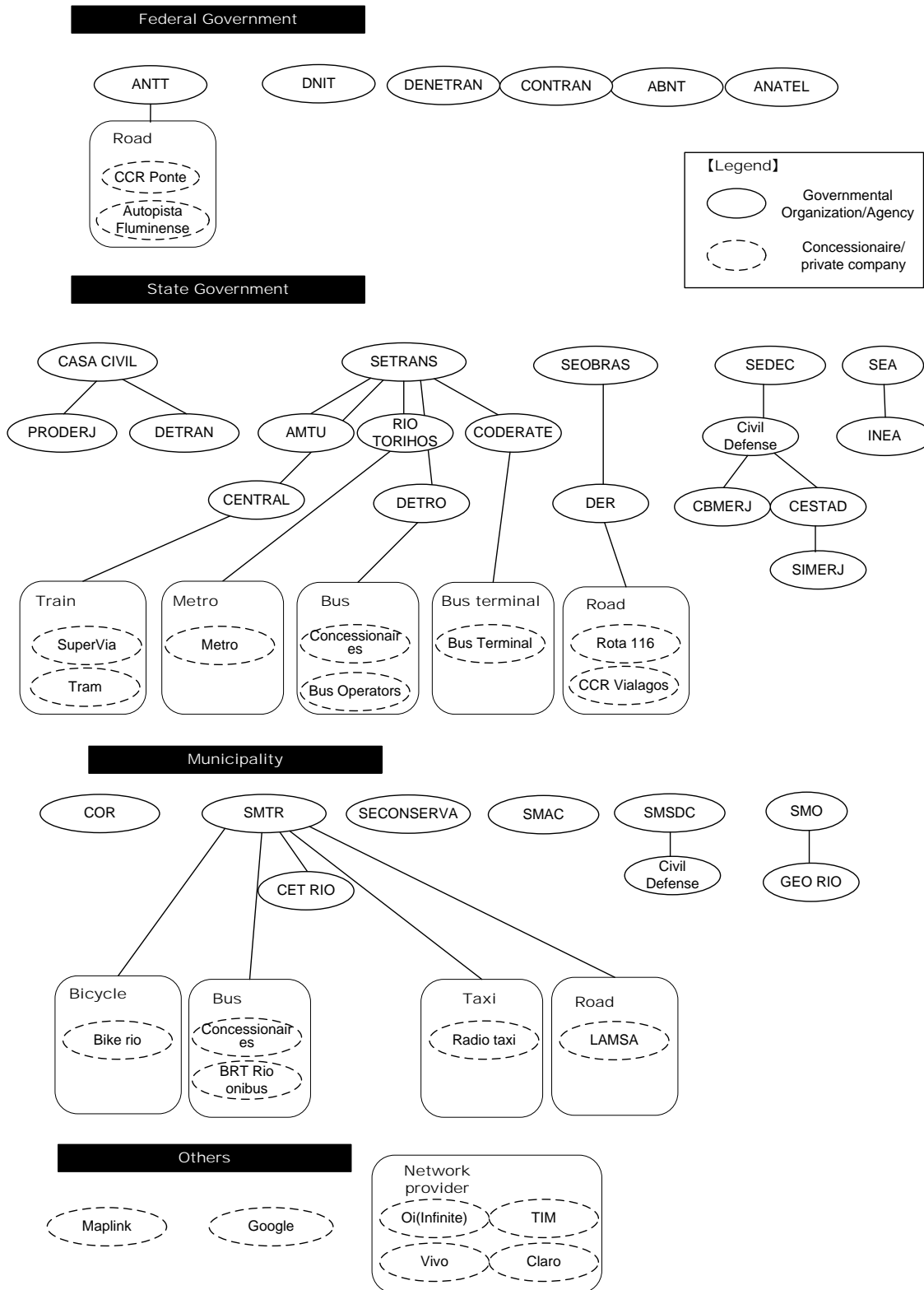
**Table 2-49 State Government Organization on ITS-Related Agencies**

| Municipality Organization  | Concessionaire/Private Company |
|--|--------------------------------|
| COR  | Bike-Rio (Rental Bicycle)      |
| SMTR   | <b>Internorte (Bus)</b>        |
| <b>CET-Rio-SMTR (Road)</b>   | <b>Intersul (Bus)</b>          |
| SECONSERVA   | <b>Transcarioca (Bus)</b>      |
| <b>SMAC</b>  | <b>Santa Cruz (Bus)</b>        |
| Civil Defense-SMSDC  | <b>Radio Taxi (Taxi)</b>       |
| <b>Geo-Rio-SMO</b>   | <b>Coopamar (Taxi)</b>         |
|  | <b>Chile Taxi (Taxi)</b>       |
|  | <b>Lamsa (Road)</b>            |
| Note: ITS-related organization/concessionaire/private companies which have information to be aggregated to ITS Center are described in bold. |                                |

Source: JICA Study Team

4) Hierarchy of the ITS-related agencies and companies

The ITS-related agencies are systematized in the diagram shown in Figure 2-149 Hierarchy of the ITS-Related Agencies and Companies.



Source: JICA Study Team

Figure 2-149 Hierarchy of the ITS-Related Agencies and Companies



(2) Clarification of ITS-Related Agencies and Responsibilities in Rio De Janeiro

As mentioned in the previous clause, there are many ITS-related agencies. The role of each agency is listed in Table 2-50.

**Table 2-50 Role of ITS-Related Agencies**

| Category                  | Agencies             | Role   |
|---------------------------|----------------------|--|
| <b>Federal Government</b> |                      |  |
| Transportation            | ANTT                 | <ul style="list-style-type: none"> <li>• Institution of criteria for service of interstate/international bus operation concessionaires</li> <li>• Administration of interstate/international bus and rail way concessionaires</li> </ul>                         |
|                           | DNIT                 | <ul style="list-style-type: none"> <li>• Administration of the federal road</li> <li>• Development of train and port infrastructure such as dredging and lockage</li> </ul>  |
|                           | CONTRAN              | <ul style="list-style-type: none"> <li>• Establishment of regulatory standards and guidelines of the National Transit;</li> <li>• Coordination of organization of the National Traffic System, aiming the integration of its activities</li> </ul>               |
|                           | DENATRAN             | <ul style="list-style-type: none"> <li>• Institution of regulation for vehicle management</li> </ul>   |
|                           | ANATEL               | <ul style="list-style-type: none"> <li>• Implementing the national telecommunication policy</li> <li>• Managing the national spectrum and orbital usage</li> <li>• Standardizing and performing telecommunication products type approval</li> </ul>              |
|                           | ABNT                 | <ul style="list-style-type: none"> <li>• Institution of Brazilian industrial standard</li> </ul>   |
| Concessionaire            | CCR-Ponte            | <ul style="list-style-type: none"> <li>• Administration of Niteroi Bridge</li> </ul>   |
|                           | Autopista Fluminense | <ul style="list-style-type: none"> <li>• Administration of BR-101 (Niteroi to Espírito Santo)</li> </ul>   |
| <b>State Government</b>   |                      |  |
| Transportation            | DETRAN-RJ            | <ul style="list-style-type: none"> <li>• Registration of vehicle</li> <li>• Issue of drivers license</li> <li>• Issue of identification card</li> <li>• Issue of number plate of vehicle</li> </ul>  |
|                           | PRODERJ              | <ul style="list-style-type: none"> <li>• IT development for the state of Rio de Janeiro</li> </ul>   |
|                           | AGETRANSP            | <ul style="list-style-type: none"> <li>• Monitoring performance of concessionaire companies</li> </ul>   |
|                           | AMTU                 | <ul style="list-style-type: none"> <li>• Urban transportation planning for the Metropolitan Area of Rio de Janeiro</li> </ul>  |
|                           | Central-RJ           | <ul style="list-style-type: none"> <li>• Planning of rail way</li> <li>• Investment and construction supervision for the concessionaire (SuperVia, Tram, and Teleferico)</li> <li>• Institution of management criteria for the concessionaires</li> </ul>        |
|                           | Rio TORIHOS-SETRANS  | <ul style="list-style-type: none"> <li>• Planning of the metro and seaway</li> <li>• Investment and construction supervision for the concessionaire (Metro)</li> <li>• Institution of management criteria for the concessionaires</li> </ul>                     |
|                           | DETRO-SETRANS        | <ul style="list-style-type: none"> <li>• Administration of intercity/interstate bus and cargo</li> <li>• Vehicle inspection</li> <li>• Institution of management criteria for the concessionaires</li> </ul>   |
|                           | CODERTE-SETRANS      | <ul style="list-style-type: none"> <li>• Planning of bus terminal for intercity/interstate bus</li> <li>• Administration of bus terminal and bus concessionaires</li> <li>• Institution of management criteria for the concessionaires</li> </ul>                |
|                           | DER-RJ               | <ul style="list-style-type: none"> <li>• Administration of state road</li> <li>• Road maintenance</li> <li>• Planning and implementing of project</li> <li>• Traffic regulation and fine collection</li> <li>• Communication with road user and media</li> </ul> |

|                     |  |   |
|---------------------|--|---|
| Public safety       | CBMERJ-Civil Defense-SEDEC                     | <ul style="list-style-type: none"> <li>• Dispatching of ambulance and fire engine/rescue team</li> <li>• Investigating of safety of building</li> </ul>   |
|                     | SIMERJ-CESTAD-Civil Defense-SEDEC              | <ul style="list-style-type: none"> <li>• Metrological observation</li> <li>• Metrological analysis</li> <li>• Weather forecast</li> <li>• Preparation of weather alert message</li> </ul>   |
|                     | INEA-SEA                                       | <ul style="list-style-type: none"> <li>• Issue of license for construction</li> <li>• Monitoring of rain/water level and atmospheric data</li> <li>• Prediction of flood</li> <li>• Maintenance of river</li> </ul>                       |
| Concessionaire      | SuperVia                                       | <ul style="list-style-type: none"> <li>• Train operator</li> </ul>  |
|                     | Metro  | <ul style="list-style-type: none"> <li>• Metro operator</li> </ul>  |
|                     | Novo Rio                                       | <ul style="list-style-type: none"> <li>• Administration of intercity/interstate/international bus terminal</li> </ul>   |
|                     | Rota116  | <ul style="list-style-type: none"> <li>• Administration of RJ-116( Itaborai to Macuco)</li> </ul>   |
|                     | CCR-Vialagos                                   | <ul style="list-style-type: none"> <li>• Administration of RJ-124( Rio Bonito to Sao Pedro Da Aldeia)</li> </ul>  |
|                     | CCR-Barcas                                     | <ul style="list-style-type: none"> <li>• Ferry operator</li> </ul>  |
| Private Company     | Tram   | <ul style="list-style-type: none"> <li>• Santa Teresa Tram</li> </ul>   |
|                     |  | <ul style="list-style-type: none"> <li>•</li> </ul>   |
| <b>Municipality</b> |  |   |
| Transportation      | COR  | <ul style="list-style-type: none"> <li>• Information integration for Rio de Janeiro related agencies</li> <li>• Dissemination of information on public transportation, weather information, atmospheric information, and so on</li> </ul> |
|                     | SMTR   | <ul style="list-style-type: none"> <li>• Administration of the concessionaire of public transportation (Bus concessionaire, taxi)</li> <li>• Planning of road and public transportation</li> </ul>  |
|                     | CET-Rio-SMTR                                   | <ul style="list-style-type: none"> <li>• Collocation and management of CCTV images, traffic volume, speed and accident</li> <li>• Control of traffic signal</li> <li>• Maintenance of equipment</li> </ul>                                |
|                     | SECONSERVA                                     | <ul style="list-style-type: none"> <li>• Road maintenance</li> <li>• Garbage collection</li> </ul>  |
| Public safety       | SMAC   | <ul style="list-style-type: none"> <li>• Monitoring air quality of the municipality</li> </ul>  |
|                     | Civil Defense-SMSDC                            | <ul style="list-style-type: none"> <li>• Disaster management of the municipality</li> </ul>   |
|                     | Geo-Rio-SMO                                    | <ul style="list-style-type: none"> <li>• Responsible for slope retention</li> <li>• Disseminating alert to the public through the press and municipal bodies</li> </ul>   |
| Concessionaire      | Lamsa  | <ul style="list-style-type: none"> <li>• Administration of Linha Amarela (Barra da Jijuca to Ilha do Fundao)</li> </ul>   |
|                     | Internorte, Intersul, Tfanscarioca, Santa Cruz | <ul style="list-style-type: none"> <li>• Municipal bus operator</li> </ul>  |
|                     | BRT Rio Onibus                                 | <ul style="list-style-type: none"> <li>• BRT operator</li> </ul>  |
| Company             | Radio Taxi, Coopamar, and Chili Taxi           | <ul style="list-style-type: none"> <li>• Taxi companies which provide transport services in Rio de Janeiro Metropolitan Area</li> </ul>   |
|                     | Bike Rio                                       | <ul style="list-style-type: none"> <li>• Rental bike company</li> </ul>   |
|                     | Maplink  | <ul style="list-style-type: none"> <li>• Mapping service</li> </ul>   |
|                     | Google   | <ul style="list-style-type: none"> <li>• Software company which operates internet search engine</li> </ul>  |
|                     | Oi, TIM, VIVO, Claro                           | <ul style="list-style-type: none"> <li>• Mobile operator, internet service operator</li> </ul>  |

Source: JICA Study Team

### 2.3.2 Current Condition of ITS Facilities

#### (1) Overall Condition

The ITS equipment and facilities are administered on the roads of Rio de Janeiro Metropolitan Area and these are summarized as follows:

##### 1) Traffic light system

This controls the traffic at the junctions/intersections in the Rio de Janeiro Metropolitan Area. In Rio de Janeiro Municipality, there are 2,600 traffic signals. Out of the total number of signals, 1,100 signals are connected to CET-Rio through general packet radio service (GPRS) and fiber optics in order to monitor and control remotely the equipment. The others are to be improved by the end of 2013 and will be remote controlled through GPRS.



Photo: Traffic Light  
Source: JICA Study Team

##### 2) VMS

This provides important road information and traffic conditions to the driver. CET-Rio, DER, and road concessionaires installed VMSs on the roads. Most of the VMSs are controlled from the center of CET-Rio, DER, and road concessionaires through GPRS. There is no intercommunication among CET-Rio, DER, and road concessionaires. Hence, drivers cannot get clear and reliable road information although the road seamlessly connects.



Photo: VMS  
Source: JICA Study Team

##### 3) OCR/Speed Gun

This measures the traffic volume speed and velocity of the vehicle. The measured data is utilized for traffic control and road management. It can also be utilized for calculating travel time and recognizing illegal vehicles.

##### 4) CCTV

CCTV captures images of road and platform conditions and provides a moving image at the center. It is used as a supporting method at the center to visually confirm the road and platform conditions in order to take necessary action.



Photo: OCR and CCTV  
Source: JICA Study Team

5) Electronic Toll Collection (ETC)

The Electronic Toll Collection (ETC) is a method for electronically collecting toll charges without stopping vehicles at the toll gate in order to reduce traffic congestion on toll roads. It is applied to the Dedicated Short-Range Communications (DSRC) and applies to the communication between on-board units and an antenna on the toll gate. ETC service is provided

by two companies in the Rio de Janeiro Metropolitan Area, namely, ViaFacil, which provides services to toll roads such as

CCR-Ponte, CCR-Vialagos, Lamsa, Autopista Fluminense, and Rota116, and the other is Onda Livre, which provides services to CCR-Ponte, CCR-Vialagos, and Lamsa.



Photo: ETC  
Source: JICA Study Team

6) Meteorological and Atmospheric Sensors

These measure the weather conditions and atmospheric data and are used to provide weather forecasts and warning messages. The meteorological and atmospheric sensors are installed by four agencies, as shown below;

-AlertaRio, SMO of the municipality

The SMO introduces a warning information provision system called AlertaRio which collects rain gauge data from 33 monitoring stations.

-MonitorAr-Rio, SMAC of the municipality

The SMAC measures air quality in the municipality on the basis of an agreement made with *Petróleo Brasileiro S.A* or Petrobras. There are eight atmospheric monitoring stations in the municipality.

-Flood warning system, air quality, INEA under SEA of the state government

The INEA introduces a flood warning system and collects data from 46 rain/water level monitoring stations. Also, they have an atmospheric monitoring system in 37 atmospheric monitoring stations.

- Weather System of the State of Rio de Janeiro (*Sistema de Meteorologia do Estado do Rio de Janeiro: SIMERJ*) under SEDEC of the state government

The SIMER(J) has a weather monitoring system which collects meteorological data from 11 monitoring stations and 24 Fire Brigade of the State of Rio de Janeiro (*Corpo de Bombeiros Militar do Estado do Rio de Janeiro: CBMERJ*) rain gauge stations.



Photo: Monitoring Station (Monitora Rio)  
Source: JICA Study Team

**Table 2-51 Meteorological and Atmospheric Sensors**

| System                    | Jurisdiction | Observation Item  | No. of Stations | Object  | Note  |
|---------------------------|--------------|---|-----------------|---|---|
| AlertaRio                 | SMO          | Rainfall  | 31              | Weather forecast<br>Disaster management<br>(heavy rain, landslide)            | <a href="http://www0.rio.rj.gov.br/alertario/">http://www0.rio.rj.gov.br/alertario/</a>   |
|                           |              | Rainfall, wind information, air temperature, humidity and atmospheric pressure  | 2               |   |   |
| MonitorAr Rio             | SMAC         | SO2,CO,PM10,O3,NO2  | 8               | Air quality monitoring  | <a href="http://infofer.homeip.net:8800/smac/institucional/index.html">http://infofer.homeip.net:8800/smac/institucional/index.html</a> |
| Flood Warning System      | INEA-SMA     | Rainfall and water level  | 46              | Weather forecast<br>Disaster management<br>(flood, heavy rain)                | <a href="http://infofer.homeip.net:8800/smac/boletim.jsp">http://infofer.homeip.net:8800/smac/boletim.jsp</a>                           |
| Air Quality               |              | PTS,PM10,SO2,NO2,O3,CO  | 37              |   |   |
| Weather Monitoring System | SIMERJ-SEDEC | Rainfall, wind information, air temperature, humidity, wind speed/direction, atmospheric pressure and solar radiation | 11              | Weather forecast<br>Disaster management<br>(heavy rain, flood, and landslide) | <a href="http://www.simerj.com/">http://www.simerj.com/</a>   |
|                           |              | Rainfall (installed by CBMERJ)  | 24              |   |   |

Source: JICA Study Team

7) DSRC Probe System

The DSRC are one-way or two-way short- to medium-range wireless communication channels specifically designed for automotive use with a corresponding set of protocols and standards. A demonstration project using DSRC wireless communication and a GPS probe system was conducted in Rio de Janeiro from January to February 2012 and was supported by the Japanese Ministry of Internal Affairs and Communications. The DSRC probe system is planned to be operated by SMTR in the near future in Rio de Janeiro. An outline of the DSRC probe system is shown below:

- GPS and driving data accumulation and record of 100 taxis.
- Collection of recorded data through 5.8 GHz DSRC wireless communication from taxi to an antenna.
- Transmission of the data from antenna to server system by cellphone network.
- Process of analyzing system with collected data and provision of transit information.



Source: presentation

**Figure 2-150 Outline of DSRC Probe System**



8) Overall System Diagram

Overall System Diagram is shown in Figure 2-151. It is an overall system diagram which shows the relation of the ITS-related agencies in Rio de Janeiro Metropolitan Area. COR collects information on public transportation in Rio de Janeiro Municipality through CET-Rio.

On the other hand, the Agency Public Services Regulating Granted Waterway Transportation, Rail and Subway and Highways of the State of Rio de Janeiro (*Agência Reguladora dos Serviços Públicos Concedidos de Transportes Aquaviários, Ferroviários e Metroviários e de Rodovias do Estado do Rio de Janeiro: AGETRANSP*) collects CCTV images of road, train, metro, and ferry from each concessionaire through operator networks such as Vivo, Oi or Claro in order to exercise regulatory power, monitoring, controlling, and supervising concessions, and public permissions granted to waterway transportation, railway, subway, and highways.

Information gathered in COR and AGETRANSP is displayed individually and not unified. There is also no intercommunication network line between COR and AGETRANSP, therefore, information on public transportation is unshared.

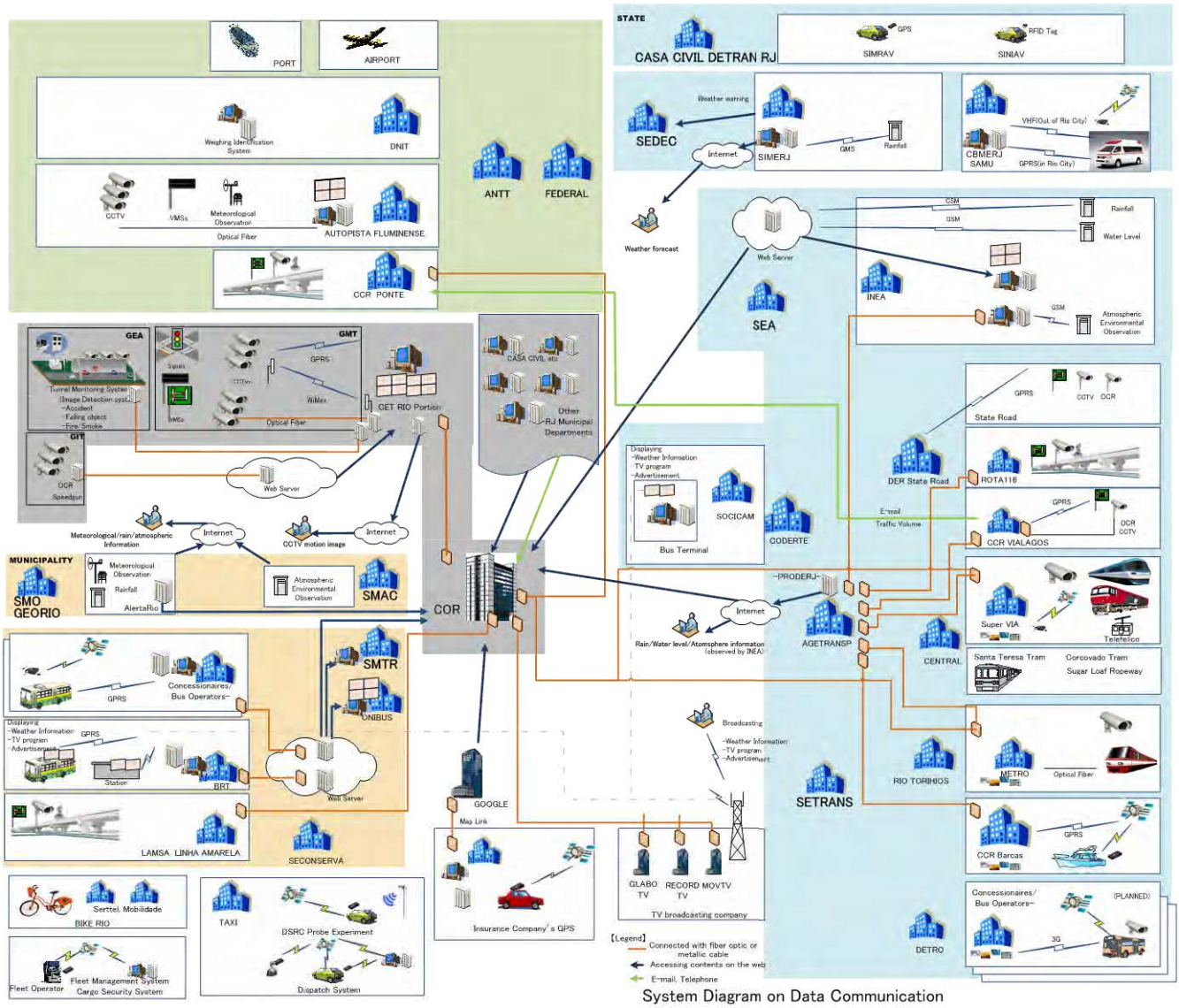


Photo: Control Center (AGETRANSP)



Photo: Control Center (COR)

Source: JICA Study Team



Source: JICA Study Team

**Figure 2-151 Overall System Diagram**

From the above system diagram, information, which is collected and distributed by the ITS-related agencies, is summarized in the following tables:

**Table 2-52 Information to be Collected by Related Agencies**

| Concessionaires/Agencies             | Information to be Collected  | Other Agencies which Information is Distributed | Method                          |
|--------------------------------------|--|---|---------------------------------|
| <b>Federal Government</b>            |  |   |                                 |
| Autopista Fluminense                 | CCTV<br>OCR/Speed gun<br>Metrological information  | -<br>-<br>-                                     |                                 |
| CCR Ponte                            | CCTV<br>OCR/Speed gun<br>Metrological information  | COR<br>-<br>-                                   | Metallic cable                  |
| <b>State Government</b>              |  |   |                                 |
| DER-RJ                               | CCTV<br>OCR/Speed gun  | -<br>-  |                                 |
| Rota116                              | CCTV   | AGETRANSP                                       | Metallic cable                  |
| CCR Vilagos                          | CCTV<br>OCR/Speed gun  | AGETRANSP<br>-                                  | Metallic cable                  |
| SuperVia                             | CCTV<br>Operation information  | AGETRANSP<br>AGETRANSP                          | Metallic cable<br>Telephone     |
| Metro                                | CCTV<br>Operation information  | AGETRANSP<br>AGETRANSP                          | Metallic cable<br>Telephone     |
| CCR Barcas                           | CCTV<br>Operation information  | AGETRANSP<br>AGETRANSP                          | Metallic cable<br>Telephone     |
| SIMERJ-CESTAD-Civil<br>Defense-SEDEC | Meteorological information   | -   |                                 |
| INEA-SEA                             | Meteorological information<br>Atmospheric information  | COR<br>COR                                      | Internet<br>Internet            |
| AGETRANSP                            | CCTV (Rota 116, CCR-Vialagos,<br>SuperVia, Metro, CCR-Barcas)<br>Operation information<br>(Rota 116, CCR-Vialagos,<br>SuperVia, Metro, CCR-Barcas) |   | Metallic cable<br><br>Telephone |
| <b>Municipality</b>                  |  |   |                                 |
| SMAC<br>(MonitorAr Rio)              | Atmospheric information  | COR   | Internet                        |
| CET-Rio-SMTR                         | GMT  | CCTV<br>Signal                                  | COR<br>COR                      |
|                                      | GEA  | Tunnel CCTV                                     | COR                             |
|                                      | GIT  | OCR/Speed gun                                   | COR                             |
| Onibus                               | Bus location   | COR   | Internet                        |
| SMO<br>(AlertaRio)                   | Meteorological information<br>Atmospheric information  | COR<br>COR                                      | Internet<br>Internet            |
| Maplink                              | GPS data in taxi   | COR   | Internet                        |
| COR                                  | Atmospheric information<br>(SMAC, SMO)<br>Meteorological information<br>(INEA, SMO)<br>CCTV<br>(CET-Rio, CCR-Ponte)<br>Signal<br>(CET-Rio)<br>VMS  |   |                                 |

|  |  |  |  |
|--|--|--|--|
|  | (CET-Rio)<br>Tunnel CCTV<br>(CET-Rio)<br>OCR/Speed gun<br>(CET-Rio, LAMSA LINHA) |  |  |
|--|--|--|--|

Source: JICA Study Team

**Table 2-53 Information to be Distributed**

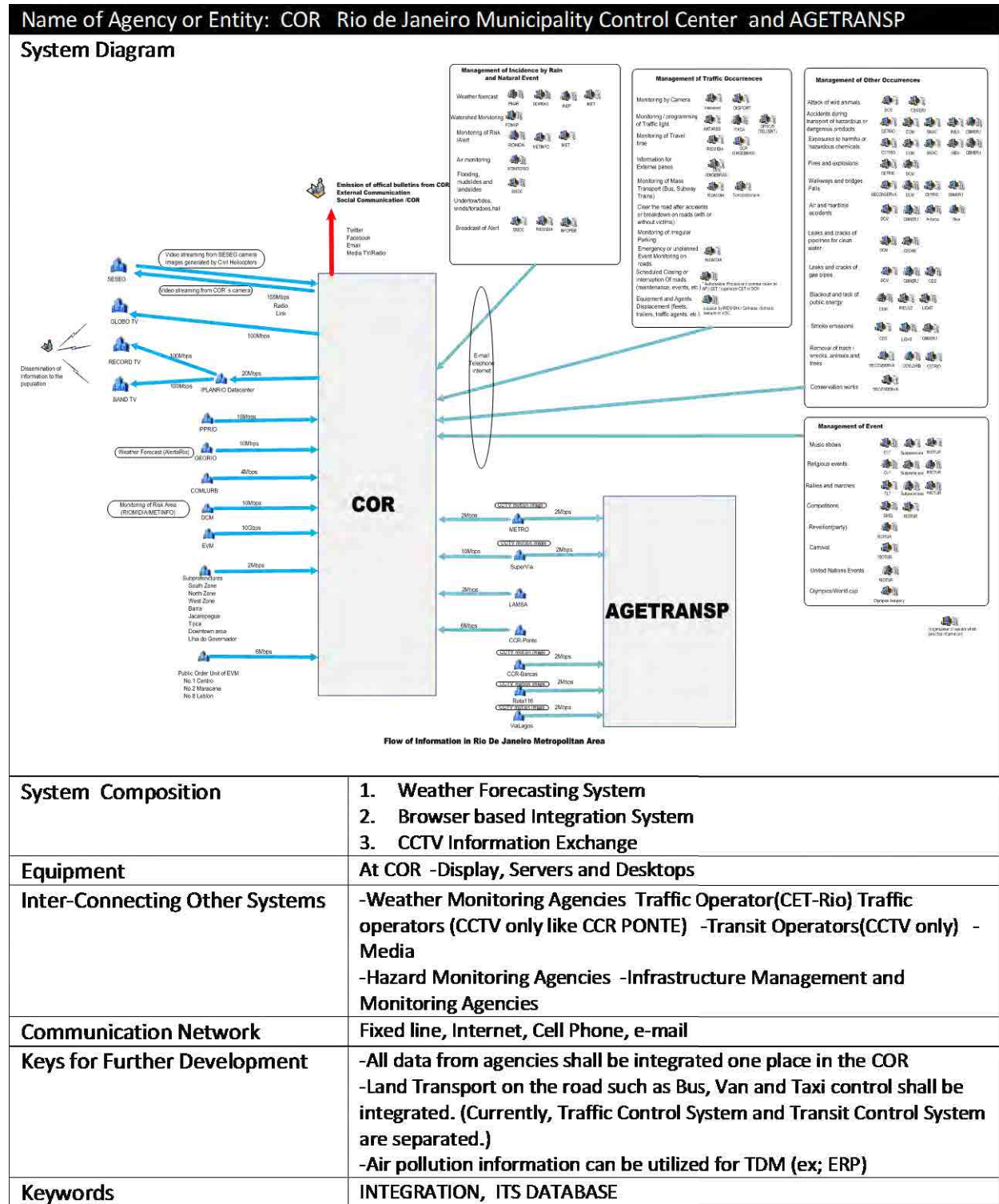
| Concessionaires/Agencies             | Information to be Distributed  | Recipient              | Method               |
|--------------------------------------|--|------------------------|----------------------|
| <b>Federal Government</b>            |  |                        |                      |
| Autopista Fluminense                 | VMS  | Drivers                | Fiber optic          |
| CCR Ponte                            | VMS  | Drivers                | Fiber optic          |
| <b>State Government</b>              |  |                        |                      |
| DER-RJ                               | VMS  | Drivers                | Fiber optic/Internet |
| Rota116                              | To be confirmed  |                        |                      |
| CCR Vialagos                         | VMS  | Drivers                | Fiber optic          |
| SuperVia                             | Operation information  | Residents              | Internet             |
| SIMERJ-CESTAD-Civil<br>Defense-SEDEC | Weather information  | Residents              | Internet             |
| INEA-SEA                             | Meteorological information<br>Atmospheric information  | Residents<br>Residents | Internet<br>Internet |
| <b>Municipality</b>                  |  |                        |                      |
| SMTC<br>(MonitorAr RIO)              | Atmospheric information  | Residents              | Internet             |
| CETRIO-SMTR GMT                      | VMS  | Drivers                | GPRS                 |
| SMO<br>(AlertaRio)                   | Meteorological information<br>Atmospheric information  | Residents<br>Residents | Internet<br>Internet |
| COR                                  | CCTV<br>Transit information<br>Transportation information<br>Weather radar<br>Weather forecast<br>Bulletin | Residents/TV broadcast | Internet             |

Source: JICA Study Team

(2) Existing System Evaluation of Each Agency

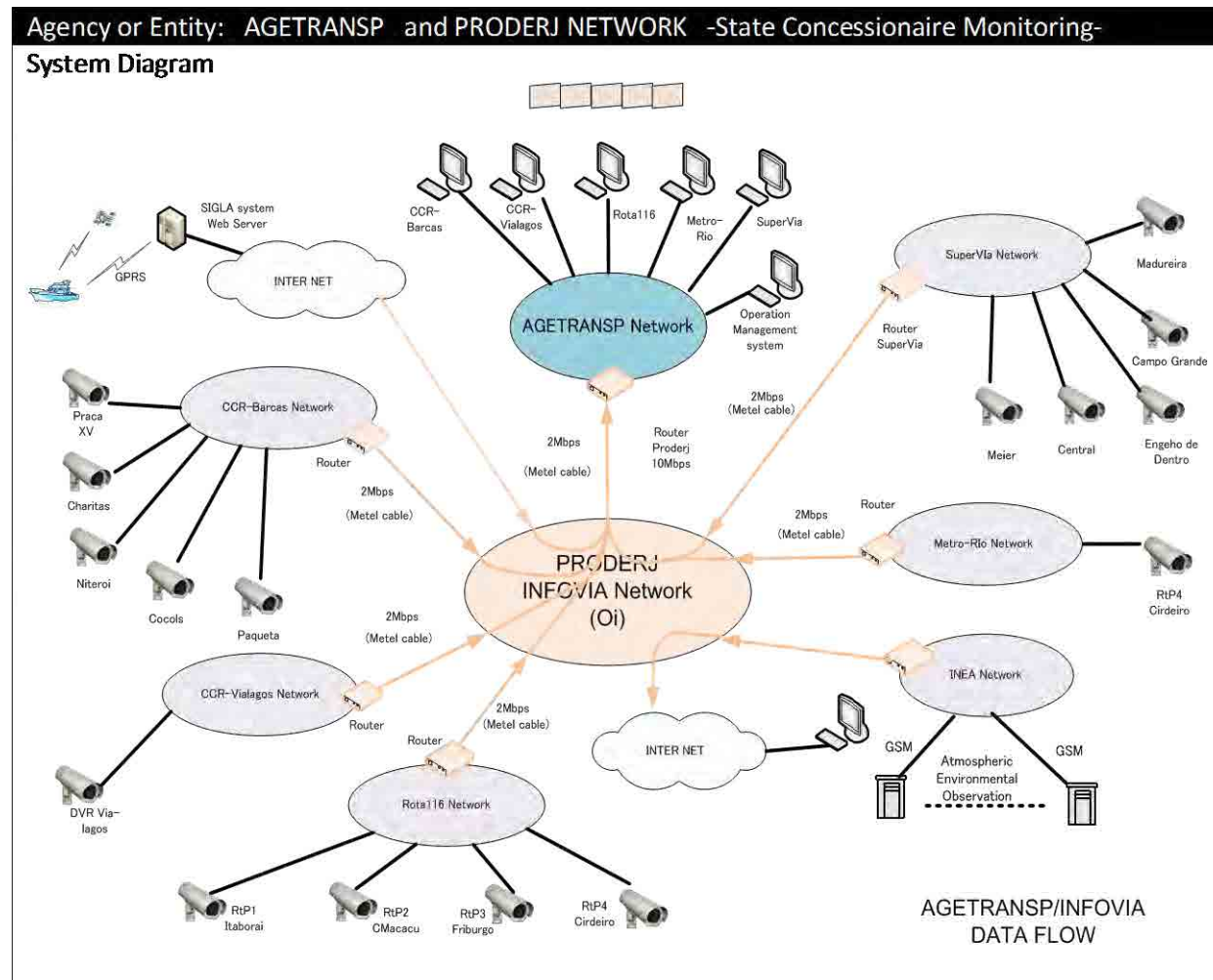
Based on interview with ITS-related agencies, ITS diagrams of each agency are summarized below.

1) Control Center



Source: JICA Study Team

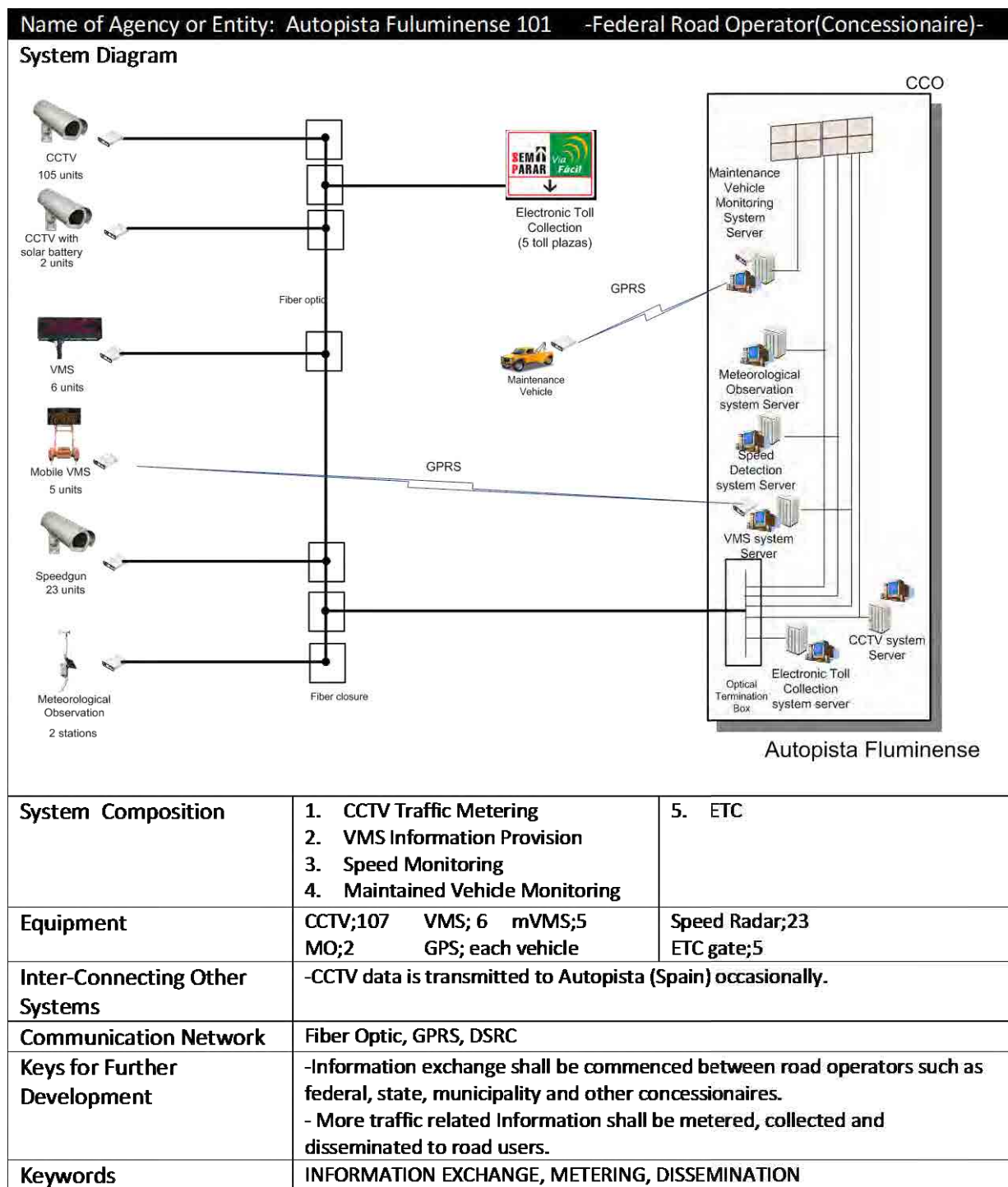




|                                       |   |
|---------------------------------------|---|
| <b>System Composition</b>             | <b>1. Concessionaire Monitoring System</b>  |
| <b>Equipment</b>                      | -Display, Desktop   |
| <b>Inter-Connecting Other Systems</b> | -INFOVIA NETWORK (Oi)   |
| <b>Communication Network</b>          | GPRS/GMS, Fixed Line  |
| <b>Keys for Further Development</b>   | -To monitor and supervise concessionaires effectively, quantitative indicators shall be gathered and checked automatically.<br>*now under planning as SITRANS |
| <b>Keywords</b>                       | <b>AUTOMATED CHECKING INDICATORS, INTEGRATION</b>   |

Source: JICA Study Team

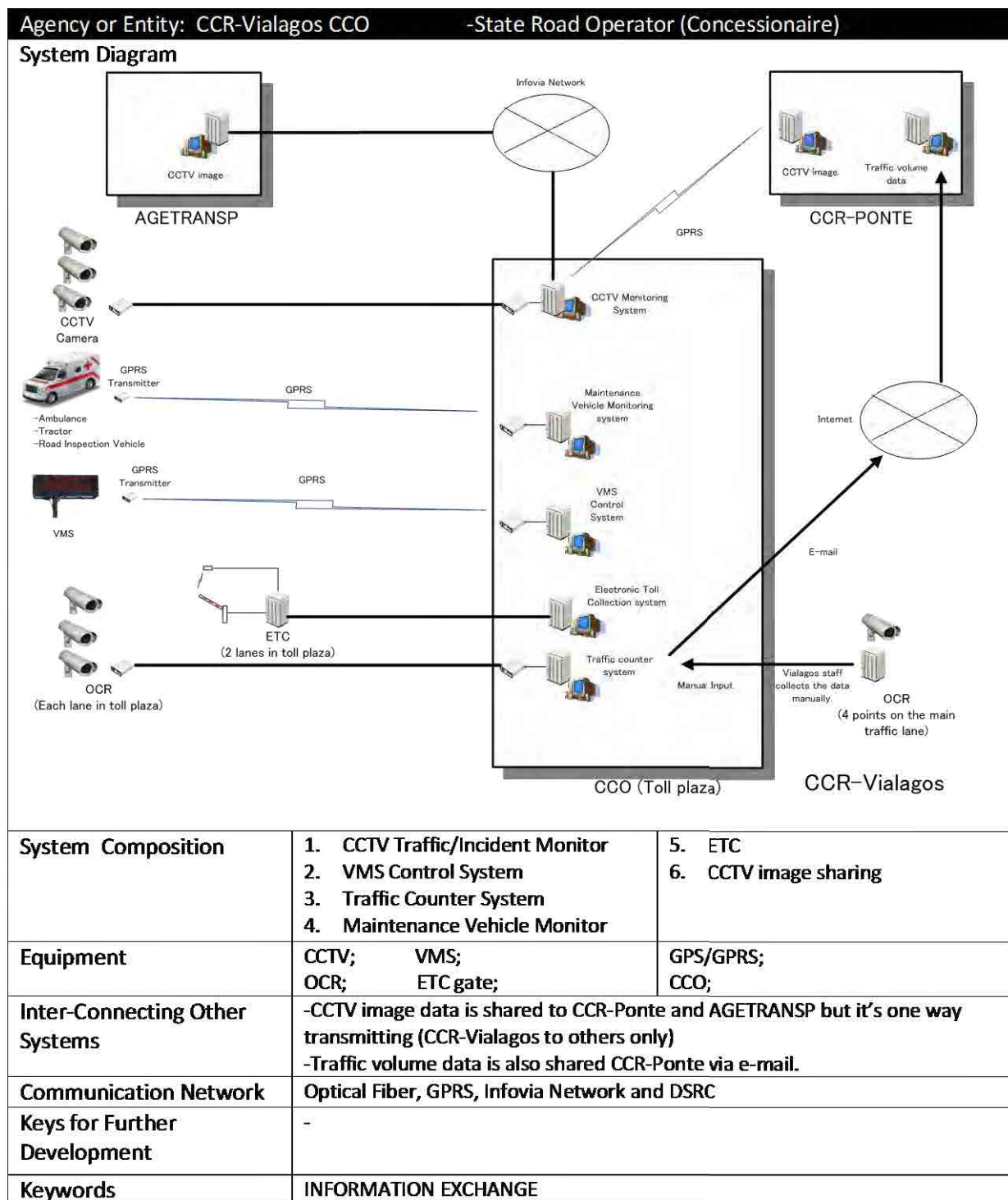
2) Road Operator



Source: JICA Study Team

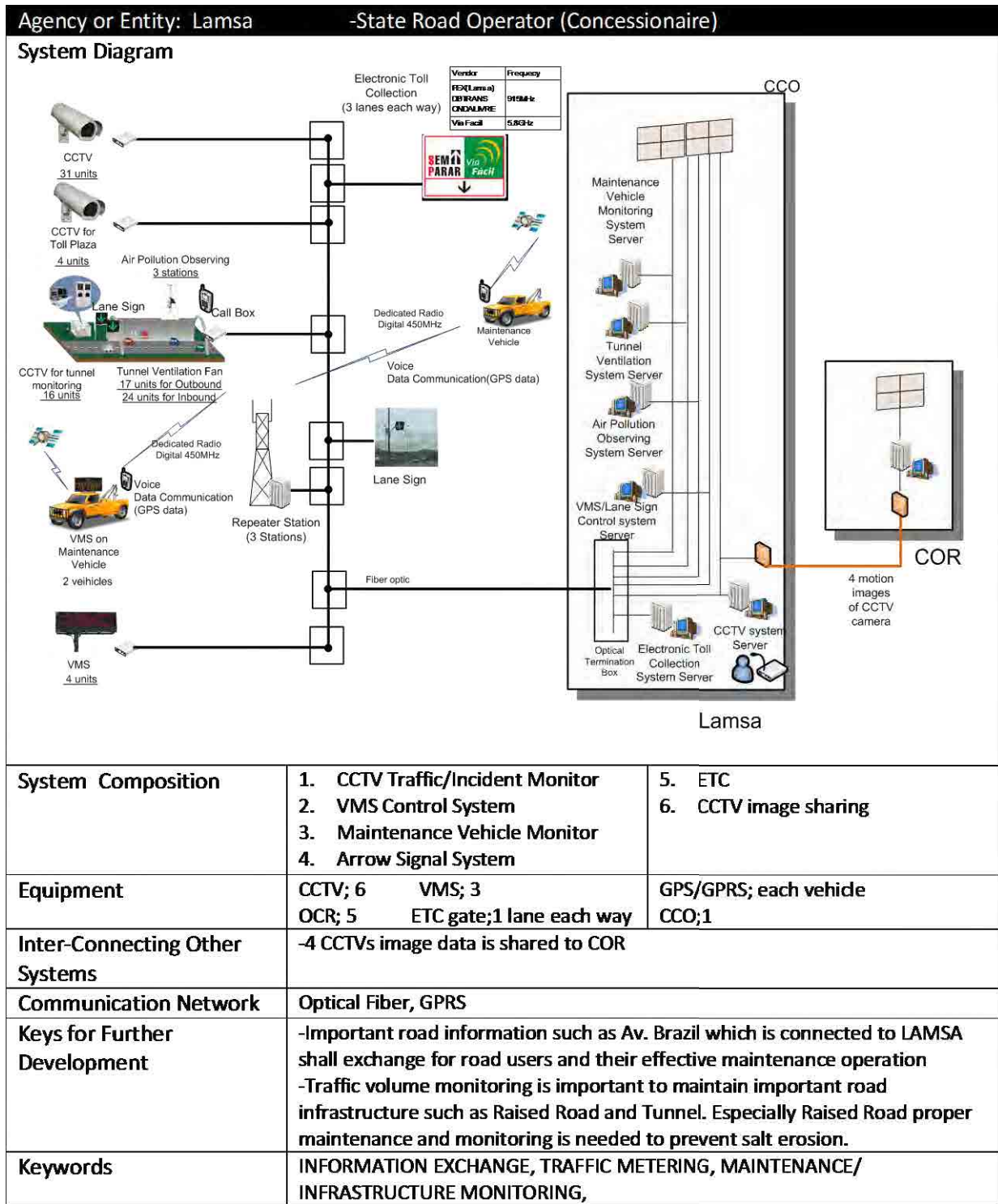
| Name of Agency or Entity: CCR PONTE -Federal Road Operator(Concessionaire)- |   |  |
|---|---|--|
| <p><b>System Diagram</b></p>  |   |  |
| <b>System Composition</b>   | <ol style="list-style-type: none"> <li>1. CCTV Traffic Metering</li> <li>2. VMS Information Provision</li> <li>3. Speed Monitoring</li> <li>4. Maintained Vehicle Monitoring</li> </ol>   | <ol style="list-style-type: none"> <li>5. ETC</li> </ol> |
| <b>Equipment</b>  | CCTV; 28 VMS; 6 mVMS; some MO; several GPS; each vehicle  | Speed Radar; ETC gate;2                                  |
| <b>Inter-Connecting Other Systems</b>                                       | -CCTV data is transmitted to COR.   |  |
| <b>Communication Network</b>  | Fiber Optic, GPRS, DSRC   |  |
| <b>Keys for Further Development</b>   | -Information exchange shall be commenced between road operators such as federal, state, municipality and other concessionaires.<br>- More traffic related Information shall be metered, collected and disseminated to road users. |  |
| <b>Keywords</b>   | INFORMATION EXCHANGE, METERING, DISSEMINATION   |  |

Source: JICA Study Team



Source: JICA Study Team



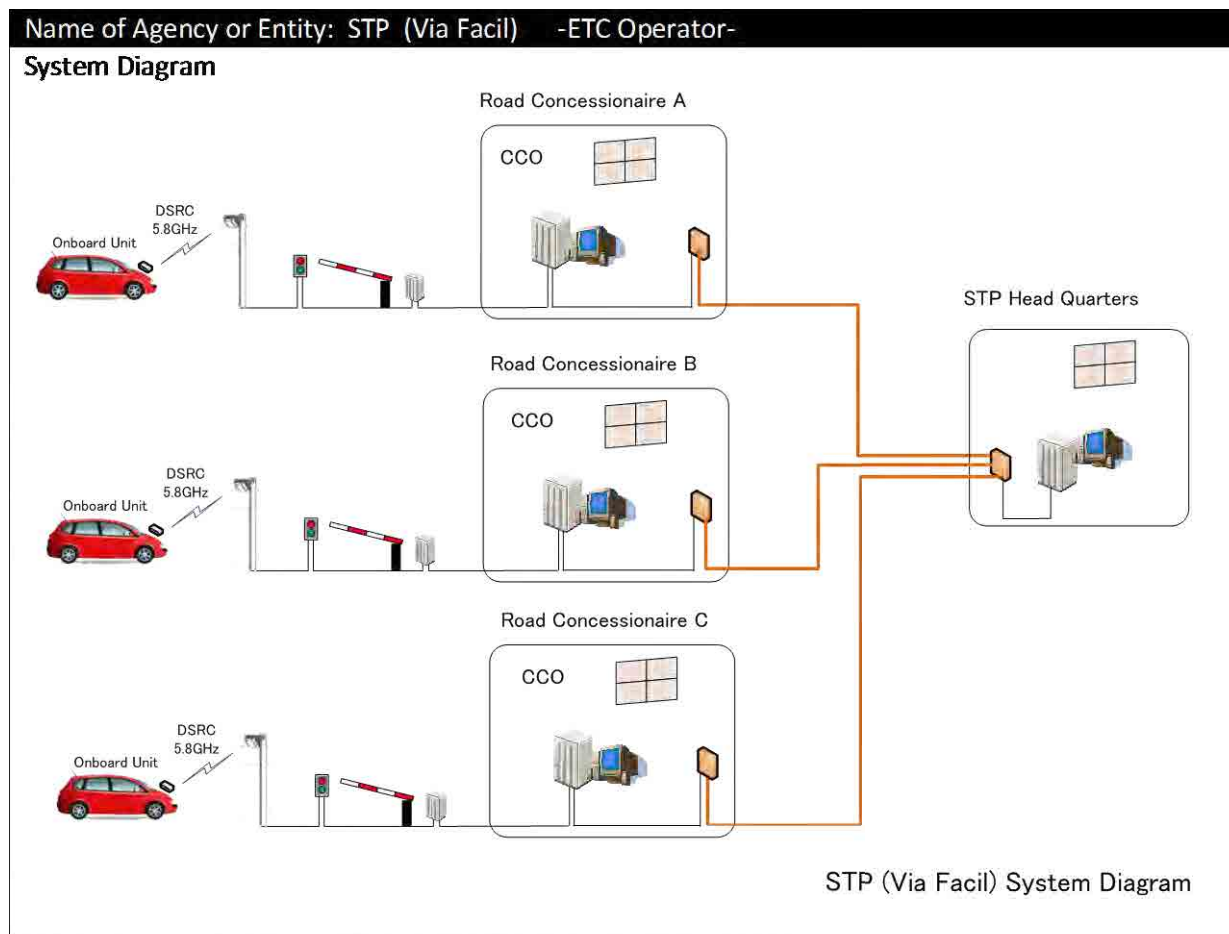


Source: JICA Study Team

| Name of Agency or Entity: CET-Rio CCO -Municipality Road Operator- |  |                                       |                 |
|--|--|---------------------------------------|-----------------|
| <p><b>System Diagram</b></p>                                       |  |                                       |                 |
| System Composition   | <ol style="list-style-type: none"> <li>1. CCTV Traffic Metering</li> <li>2. Signals</li> <li>3. VMS Information Provision</li> <li>4. Speed Radar and OCR</li> <li>5. Tunnel Monitoring(CCTV Incident Detection, Arrow Signals)</li> <li>6. CET-Rio CCO</li> </ol>   |                                       |                 |
| Equipment  | <table border="1"> <tr> <td>CCTV; 705 VMS;34 mVMS;14 Signals;2265</td> <td>Speed Radar;387</td> </tr> </table>   | CCTV; 705 VMS;34 mVMS;14 Signals;2265 | Speed Radar;387 |
| CCTV; 705 VMS;34 mVMS;14 Signals;2265                              | Speed Radar;387  |                                       |                 |
| Inter-Connecting Other Systems                                     | This CCO is Located in COR. Physically gathered but not Integrated. Systems in CCO are respectively developed. Each system is independent.   |                                       |                 |
| Communication Network  | Optical Fiber, Wimax and GPRS  |                                       |                 |
| Keys for Further Development                                       | <ul style="list-style-type: none"> <li>-CCO shall be integrated other road operators (Federal, State and concessionaires), transit operators for cooperating land transport.</li> <li>-Expand a function of traffic/transport and transit information dissemination via broad casting FM or other media.</li> <li>-Dedicated short range communication also shall be utilized for information dissemination, traffic demand management etc.</li> </ul> |                                       |                 |
| Keywords   | INTEGRATION, COOPERATION, DISSEMINATION  |                                       |                 |

Source: JICA Study Team

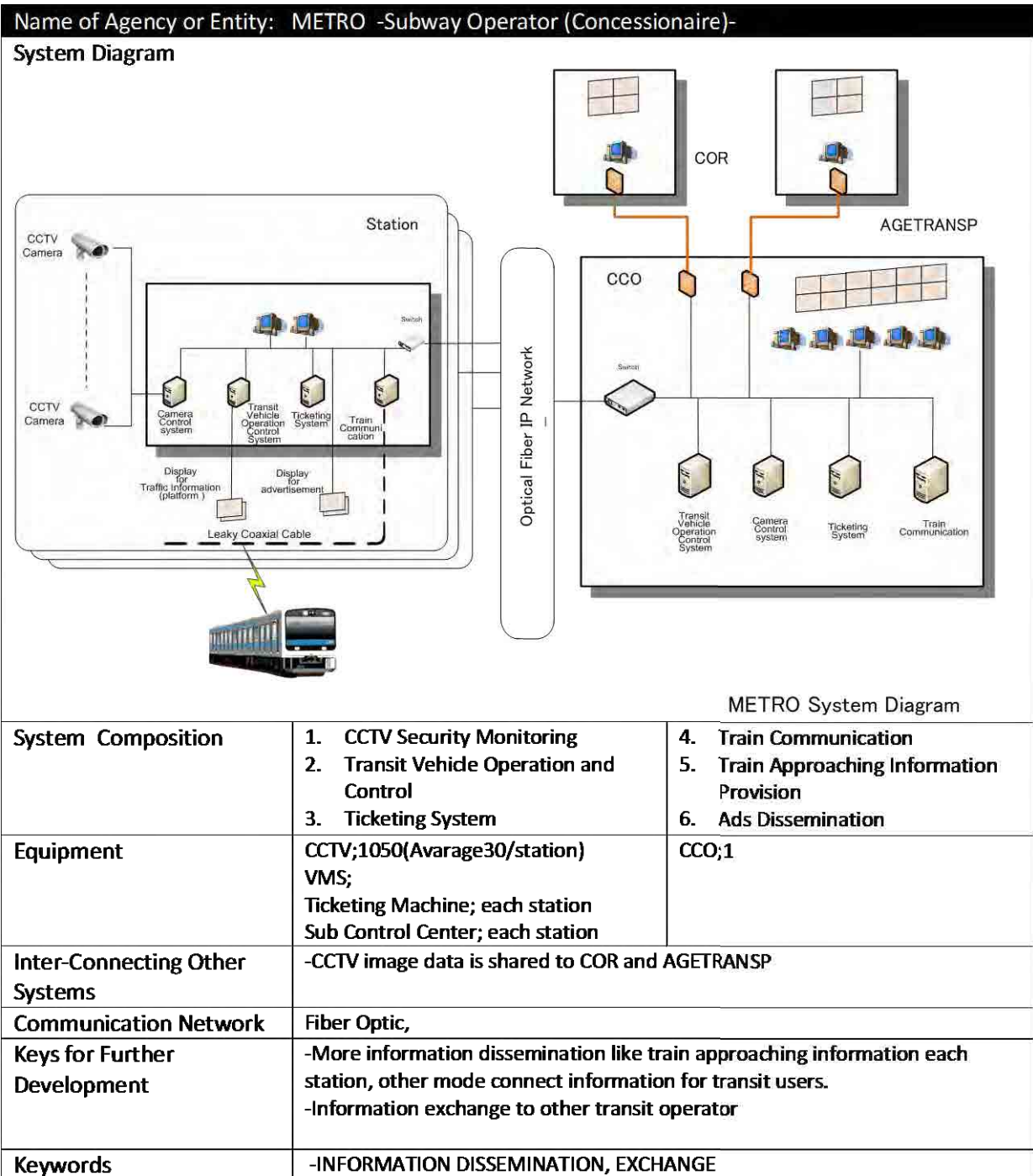




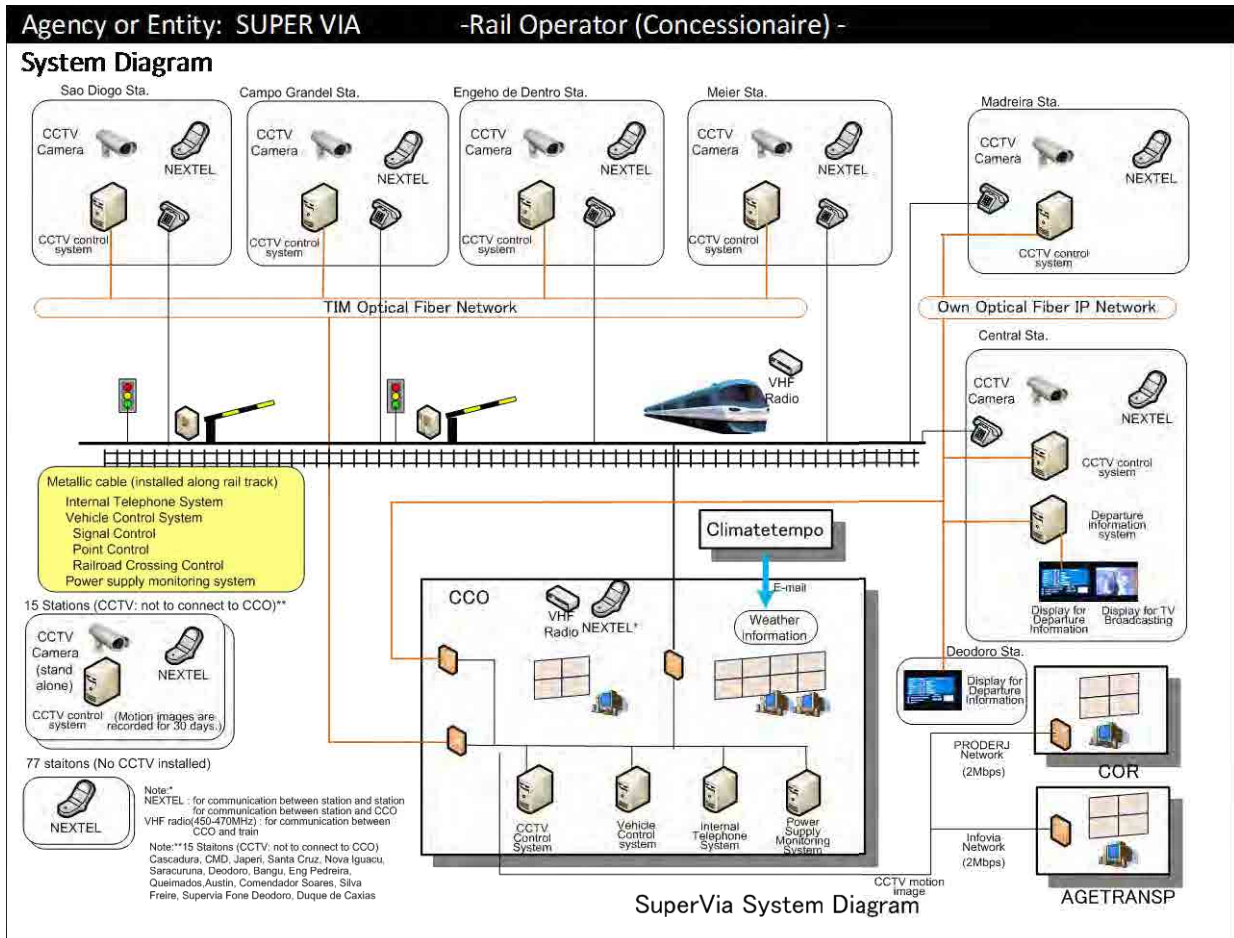
|                                       |   |                            |
|---------------------------------------|---|----------------------------|
| <b>System Composition</b>             | <b>1. Electric Payment System Via DSRC</b>  |                            |
| <b>Equipment</b>                      | -DSRC 5.8 Passive Antenna<br>-OBU(Rental)<br>-Signal  | -Gate Pole<br>-Data Server |
| <b>Inter-Connecting Other Systems</b> | -This system is connected from road concessionaire roadway to STP headquarters to verify electronic payment   |                            |
| <b>Communication Network</b>          | Fiber Optic, DSRC   |                            |
| <b>Keys for Further Development</b>   | -OBU rental system might be obstruction to spread ETC OBU<br>-It is an one piece type of OBU which can be only dedicated for electric payment and has no room for functional expansion<br>-Two piece OBU unit shall disseminate for further development to integrate electric payment system.<br>-Active DSRC shall be installed for security and further development |                            |
| <b>Keywords</b>                       | DISSEMINATION RATE OF OBU/ETC, TWO PIECE ON-BOARD UNIT, FUNCTIONAL EXPANSION , ACTIVE DSRC  |                            |

Source: JICA Study Team

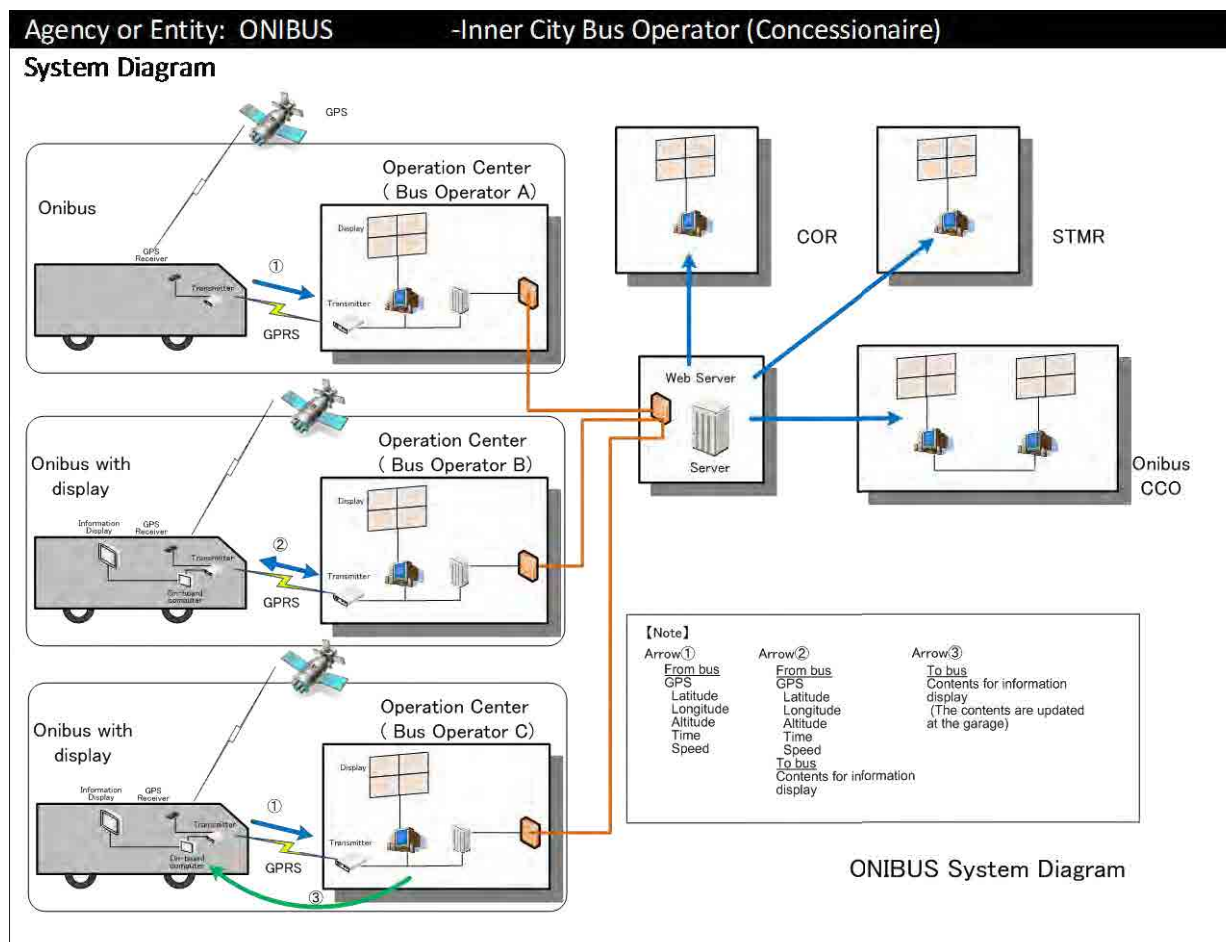
3) Transportation



Source: JICA Study Team



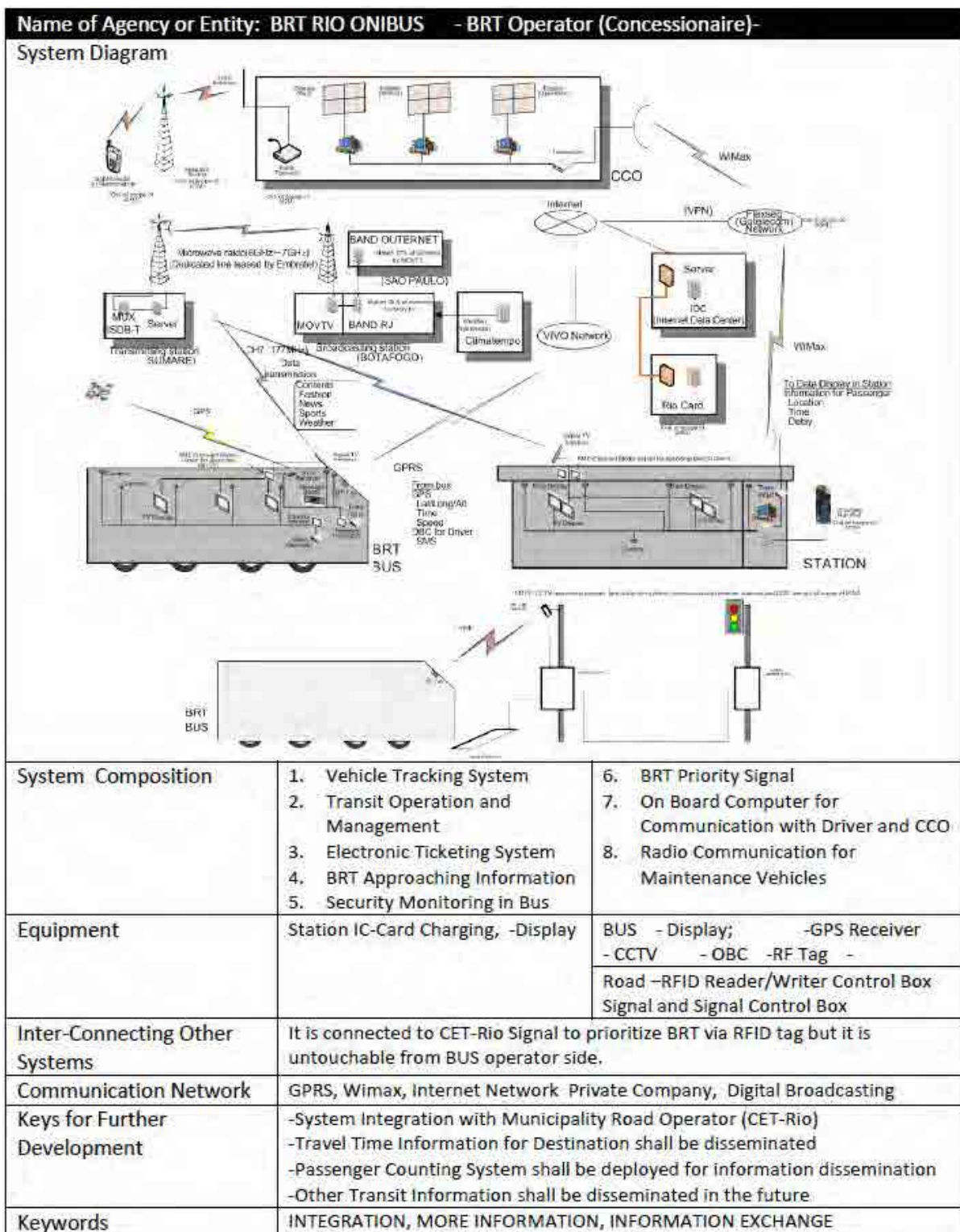
Source: JICA Study Team



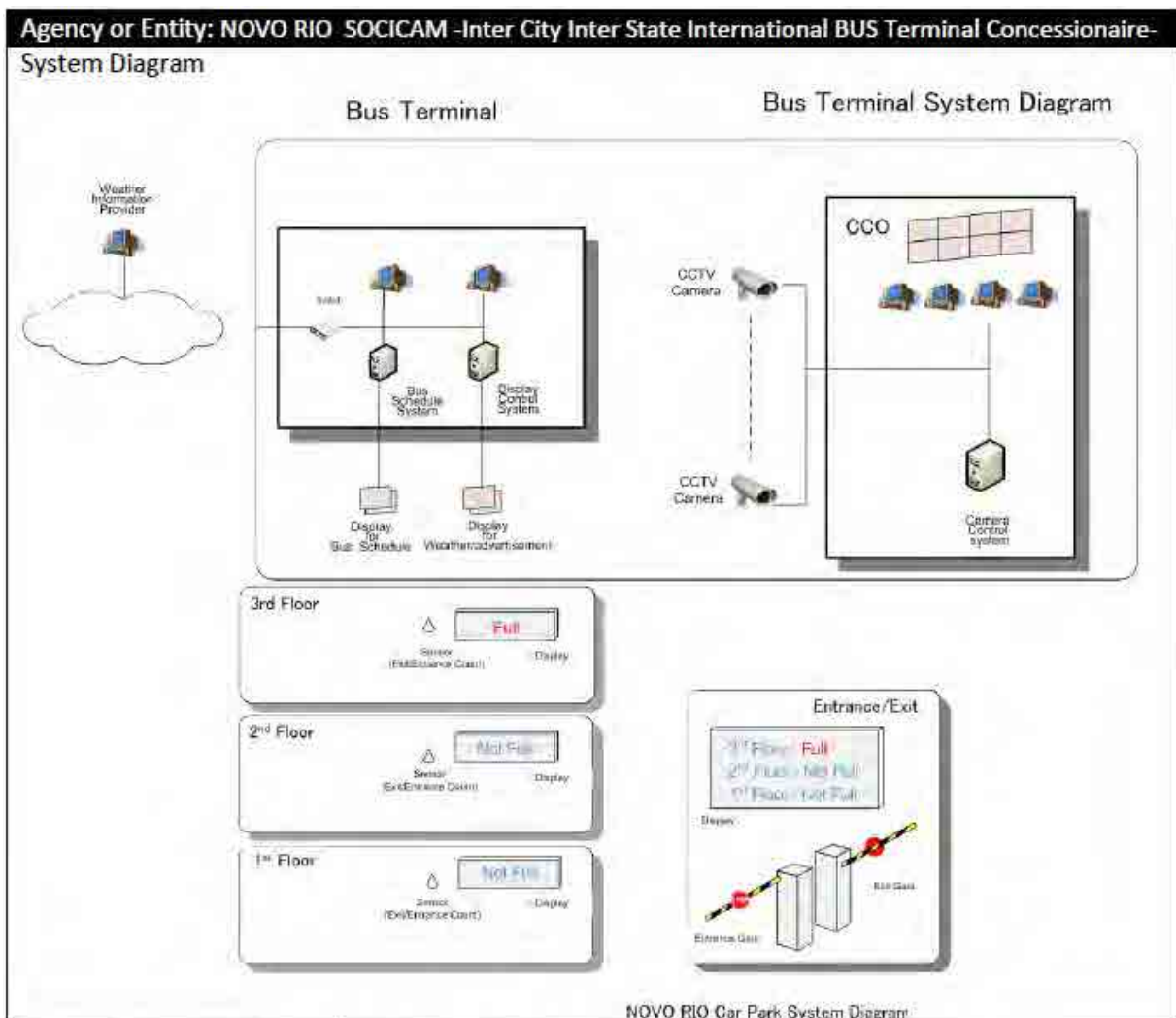
|                                       |  |   |
|---------------------------------------|--|---|
| <b>System Composition</b>             | 1. Transit Vehicle Tracking<br>2. OBU Transit Vehicle Monitoring   | 3. In-Vehicle Display Information Dissemination<br>4. Transit Operation Control |
| <b>Equipment</b>                      | Bus<br>-On-Board Computer<br>-GPS  | -Display<br>-RFID Reader Writer<br>CCO  |
| <b>Inter-Connecting Other Systems</b> | -Bus positioning data is transmitted to SMTR, COR<br>The Data Server is located in U.S. and is supervised by system developer  |   |
| <b>Communication Network</b>          | GPRS, Fixed line   |   |
| <b>Keys for Further Development</b>   | -Next Bus information shall be provisioned at important bus stops<br>-Next Bus stop information and area related information shall be provisioned in Bus<br>-Passenger counting also important for users to avoid congested vehicles<br>-More effective fleet management system shall be deployed to avoid making traffic jam caused buses<br>- V to V communication would be important to achieve more smooth traffic<br>-Information exchange for supporting user travel is needed |   |
| <b>Keywords</b>                       | MORE EFFECTIVE INFORMATION PROVISION, FLEET MANAGEMENT, INFORMATION EXCHANGE   |   |

Source: JICA Study Team





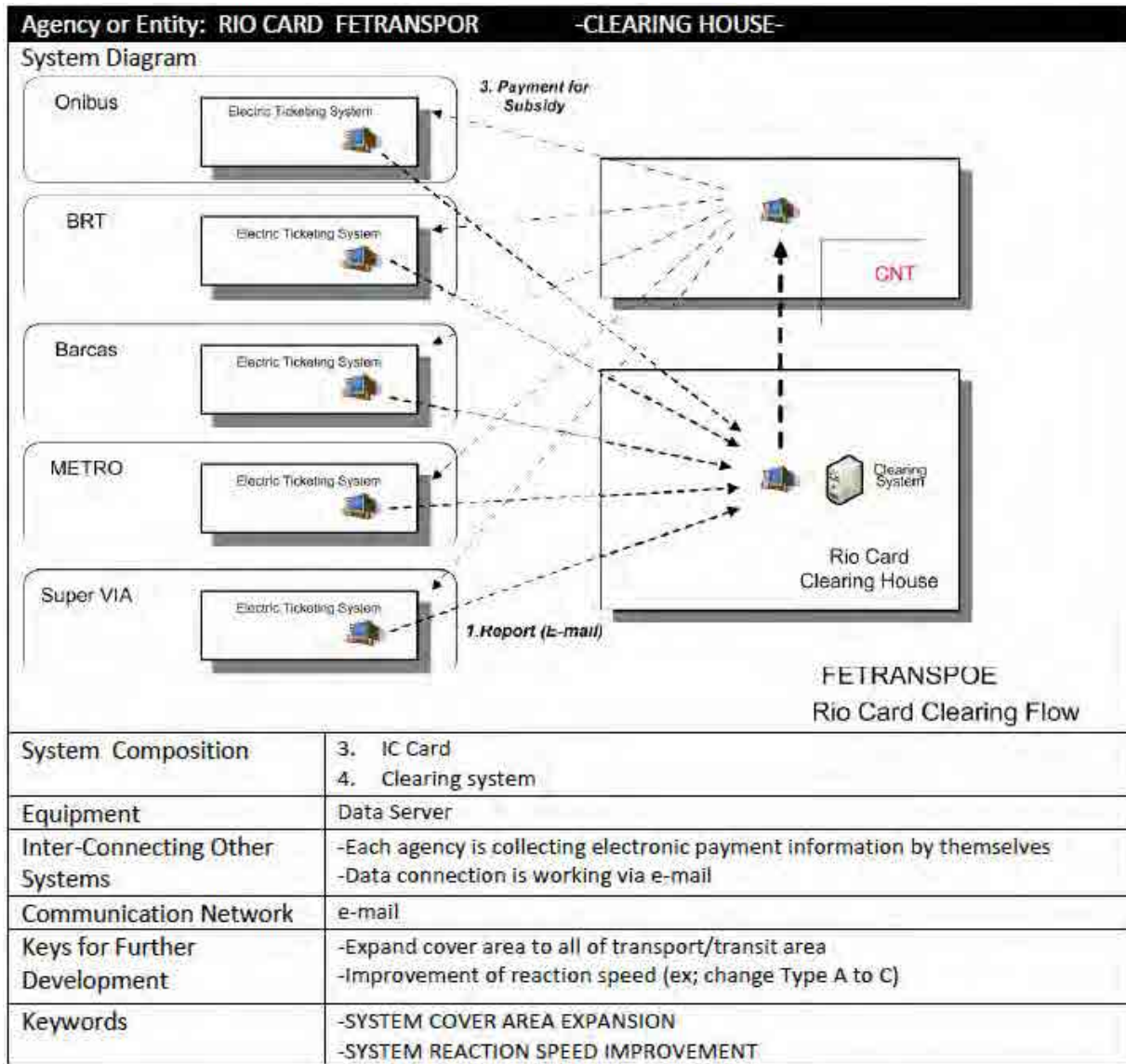
Source: JICA Study Team



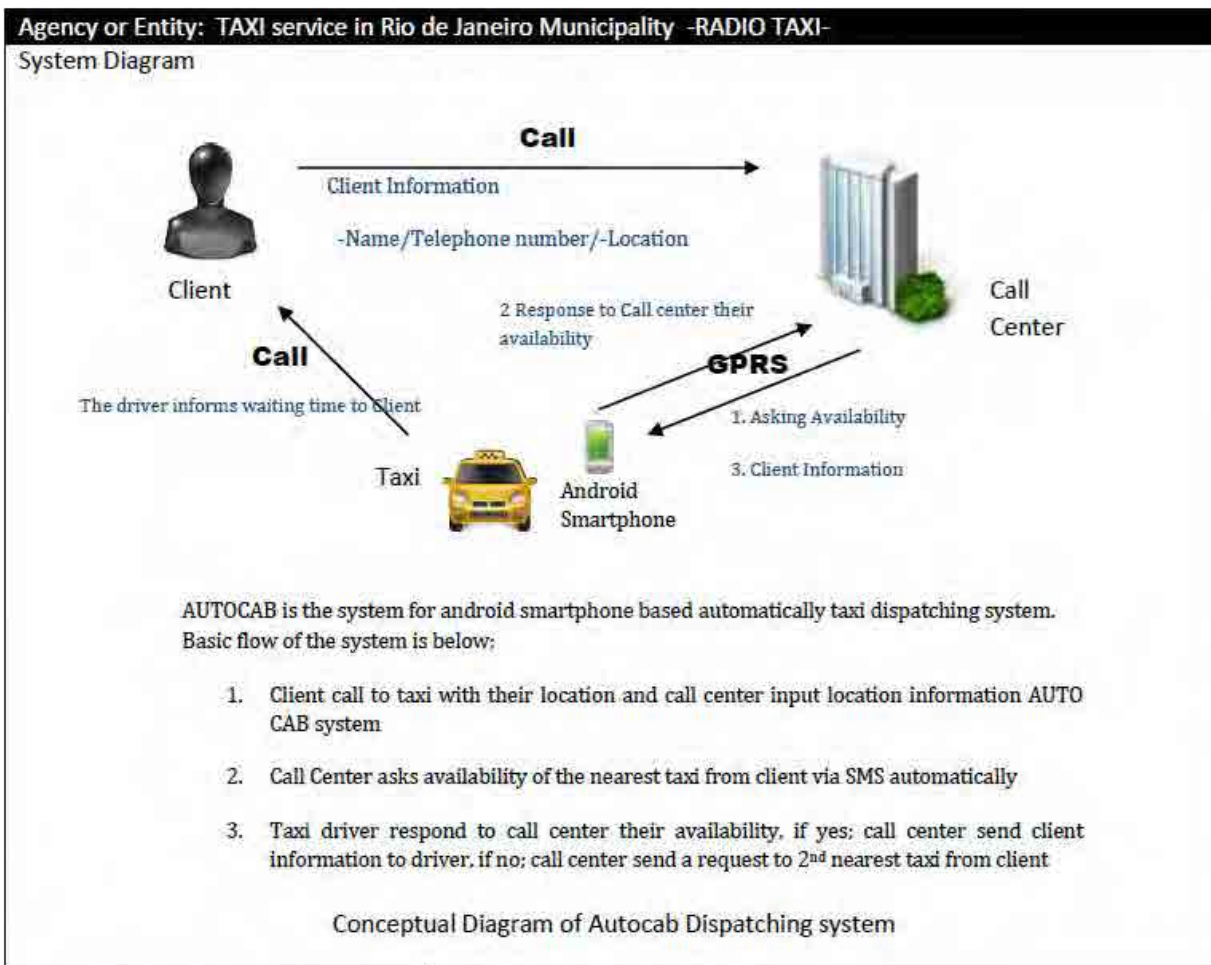
|                                |   |
|--------------------------------|---|
| System Composition             | 1. Bus Terminal Security Monitoring<br>2. Parking System Management   |
| Equipment                      | -CCTV;56 Display; CCO;1<br>-Parking Gate; VMS for Parking;  |
| Inter-Connecting Other Systems | -Stand Alone  |
| Communication Network          | Fixed Line  |
| Keys for Further Development   | -Bus positioning information for provision of bus arrival<br>-Electronic Payment System via DSRC<br>-Information exchange with other transit operator |
| Keywords                       | -VEHICLE TRACKING INFORMATION, ELECTRONIC PAYMENT FOR PARKING, INFORMATION EXCHANGE   |

Source: JICA Study Team



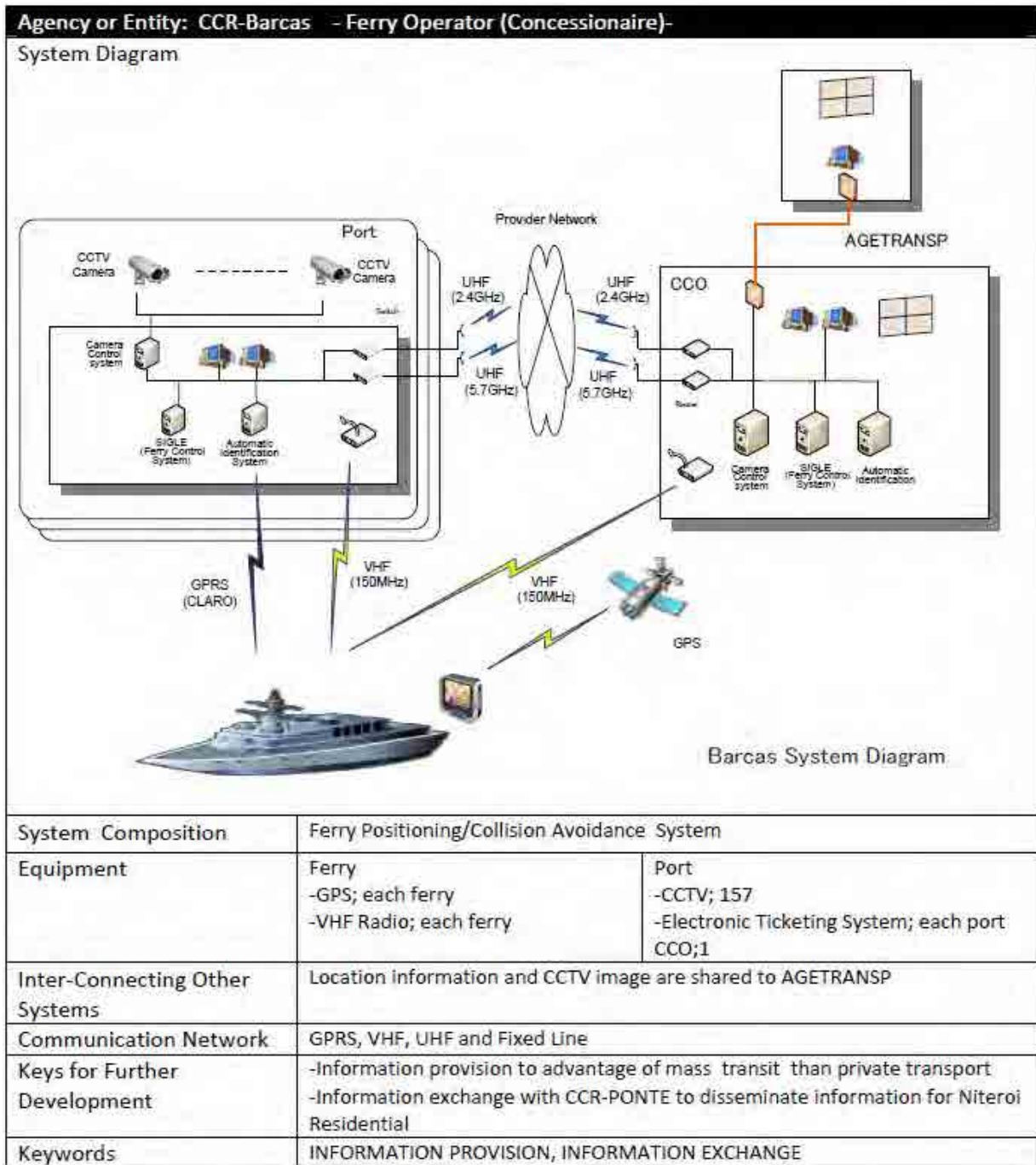


Source: JICA Study Team

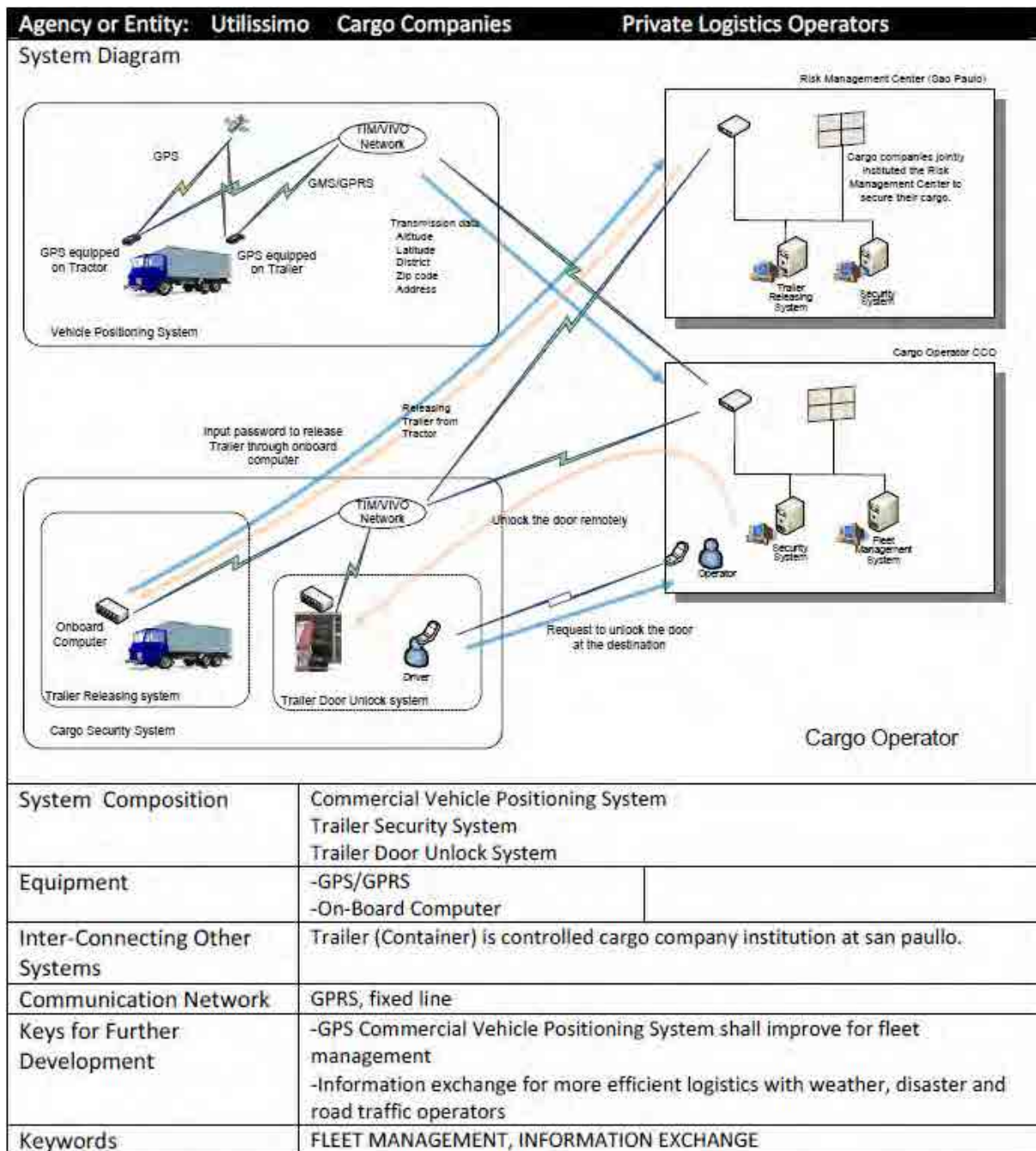


|                                |   |
|--------------------------------|---|
| System Composition             | 1. Taxi Dispatching System                                      |
| Equipment                      | -Android Smartphone;<br>-Call Center<br>-GPS data Server        |
| Inter-Connecting Other Systems | None  |
| Communication Network          | GPRS  |
| Keys for Further Development   | -Data utilization for monitoring current road traffic condition |
| Keywords                       | -UTILIZATION  |

Source: JICA Study Team



Source: JICA Study Team



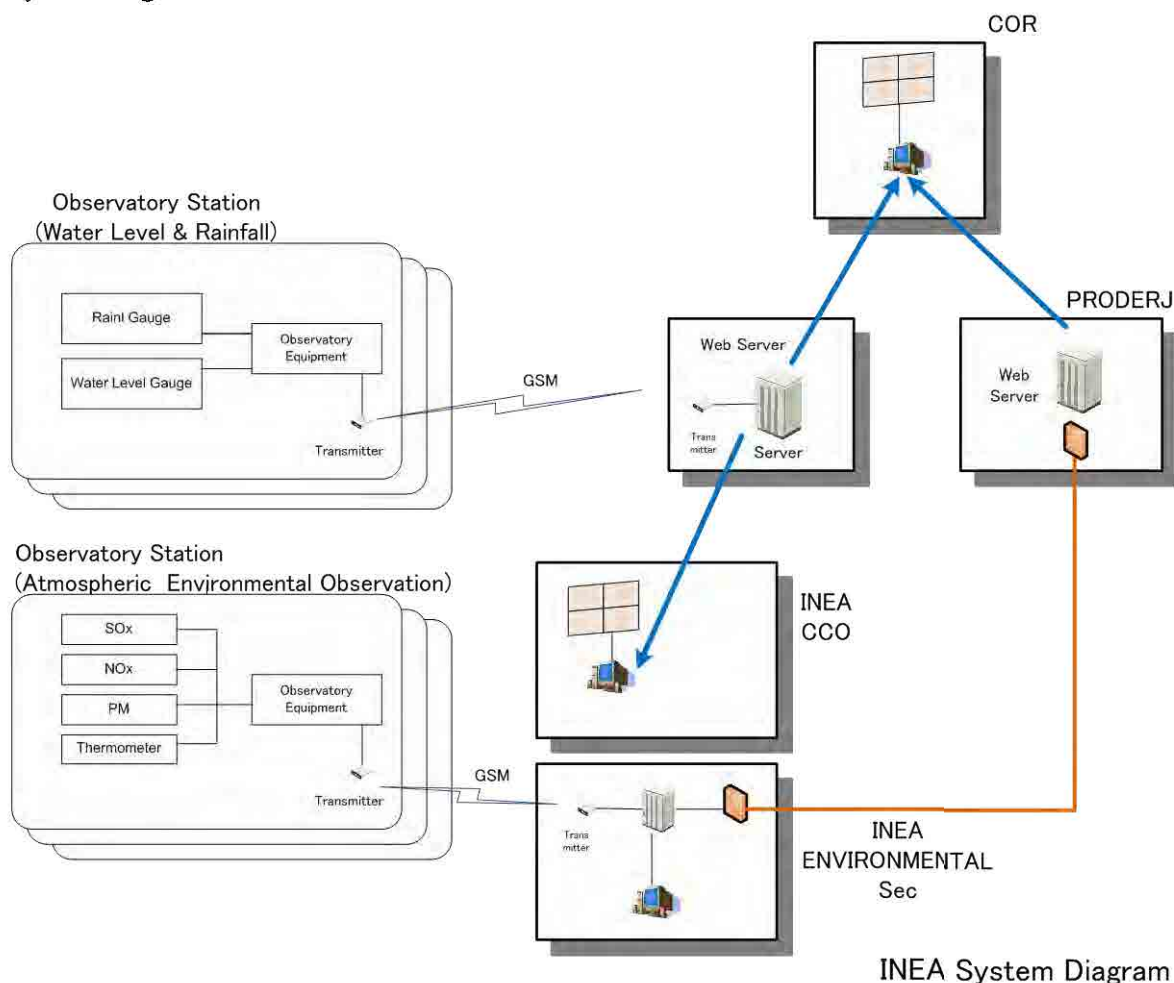
Source: JICA Study Team



4) Other Agencies

**Name of Agency or Entity: INEA State Government River, Environment Agency**

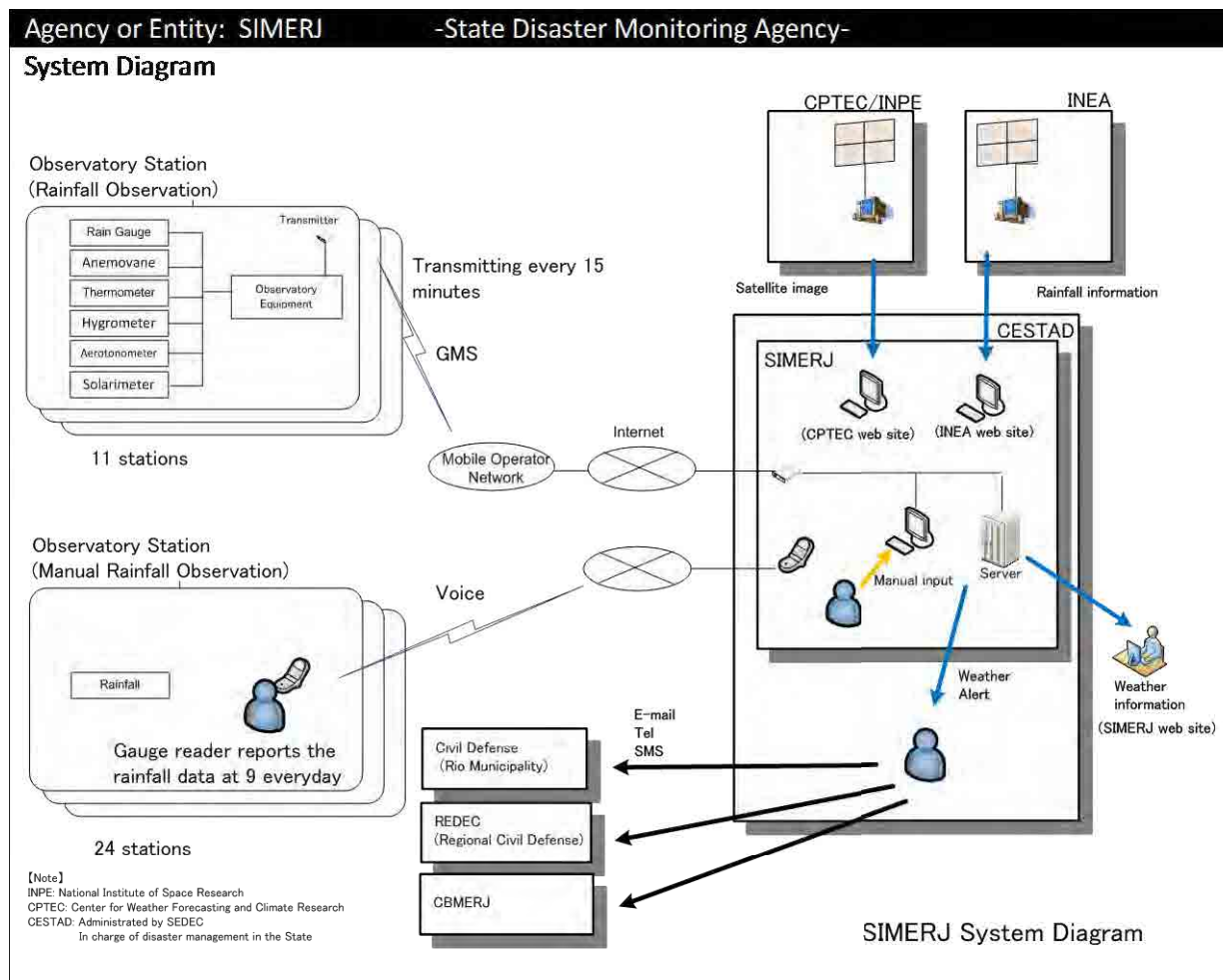
**System Diagram**



INEA System Diagram

|                                       |   |
|---------------------------------------|---|
| <b>System Composition</b>             | 1. Air Monitoring<br>2. River Level Monitoring  |
| <b>Equipment</b>                      | -Air Pollution Monitoring Equipment ; 37      -Thermometer; 37<br>-Rain Gauge ; 11      -Water level Gauge; 11              |
| <b>Inter-Connecting Other Systems</b> | -COR  |
| <b>Communication Network</b>          | GSM, fixed line   |
| <b>Keys for Further Development</b>   | -River Level Monitoring system is developed and administered by Infoper.<br>System Integration is important in same agency. |
| <b>Keywords</b>                       | INTEGRATION   |

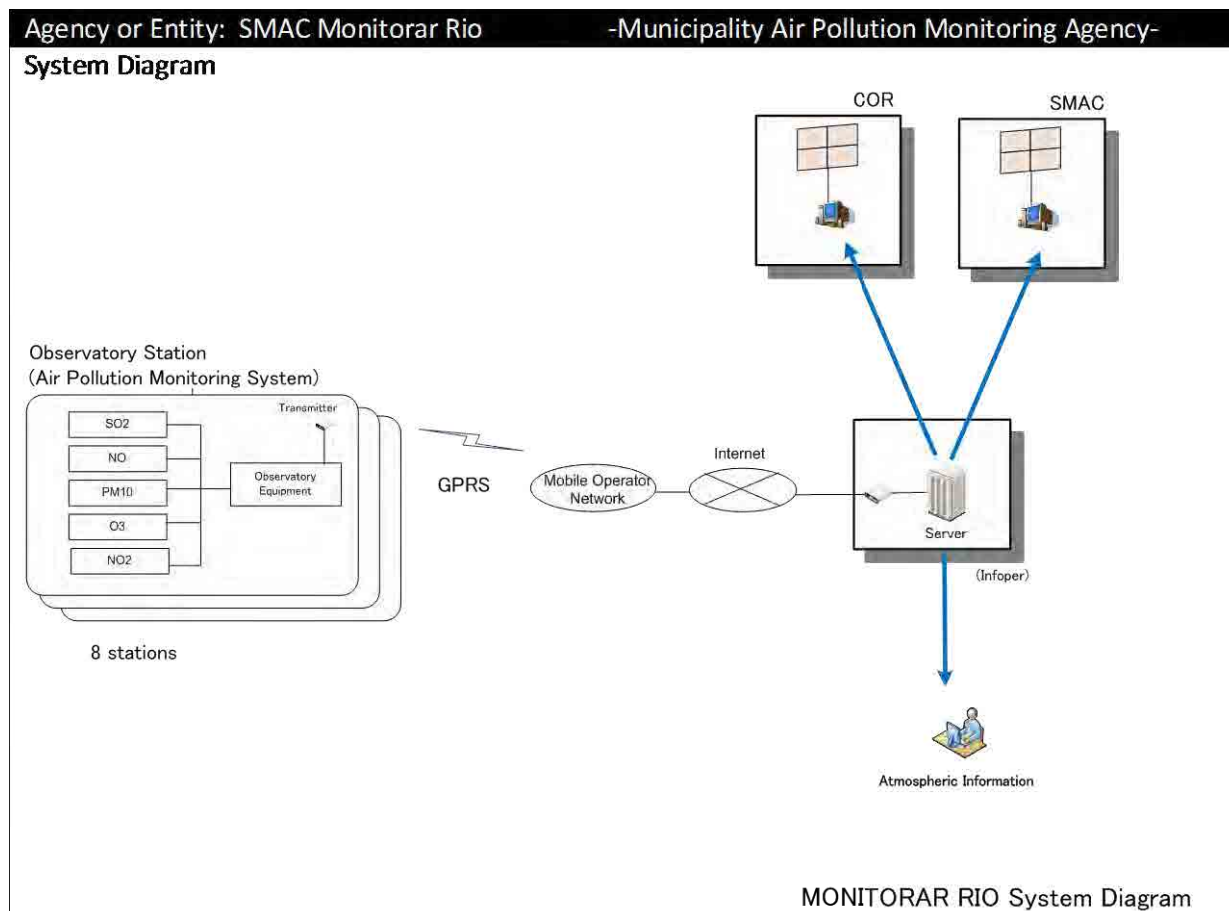
Source: JICA Study Team



|                                       |   |
|---------------------------------------|---|
| <b>System Composition</b>             | 1. Weather Monitoring<br>2. Rain Monitoring(Manual)   |
| <b>Equipment</b>                      | -Rain gauge; 11 - Anemovane; 11 -Thermometer; 11 -Hygrometer; 11 - Aerotonometer; 11 -Solarimeter; 24 |
| <b>Inter-Connecting Other Systems</b> | -SIMERJ stuffs are gathering weather information via INEA and CPTEC web site                          |
| <b>Communication Network</b>          | GPRS/GMS, Fixed Line  |
| <b>Keys for Further Development</b>   | -Rain gauge information shall be integrated one data base and server                                  |
| <b>Keywords</b>                       | INTEGRATION   |

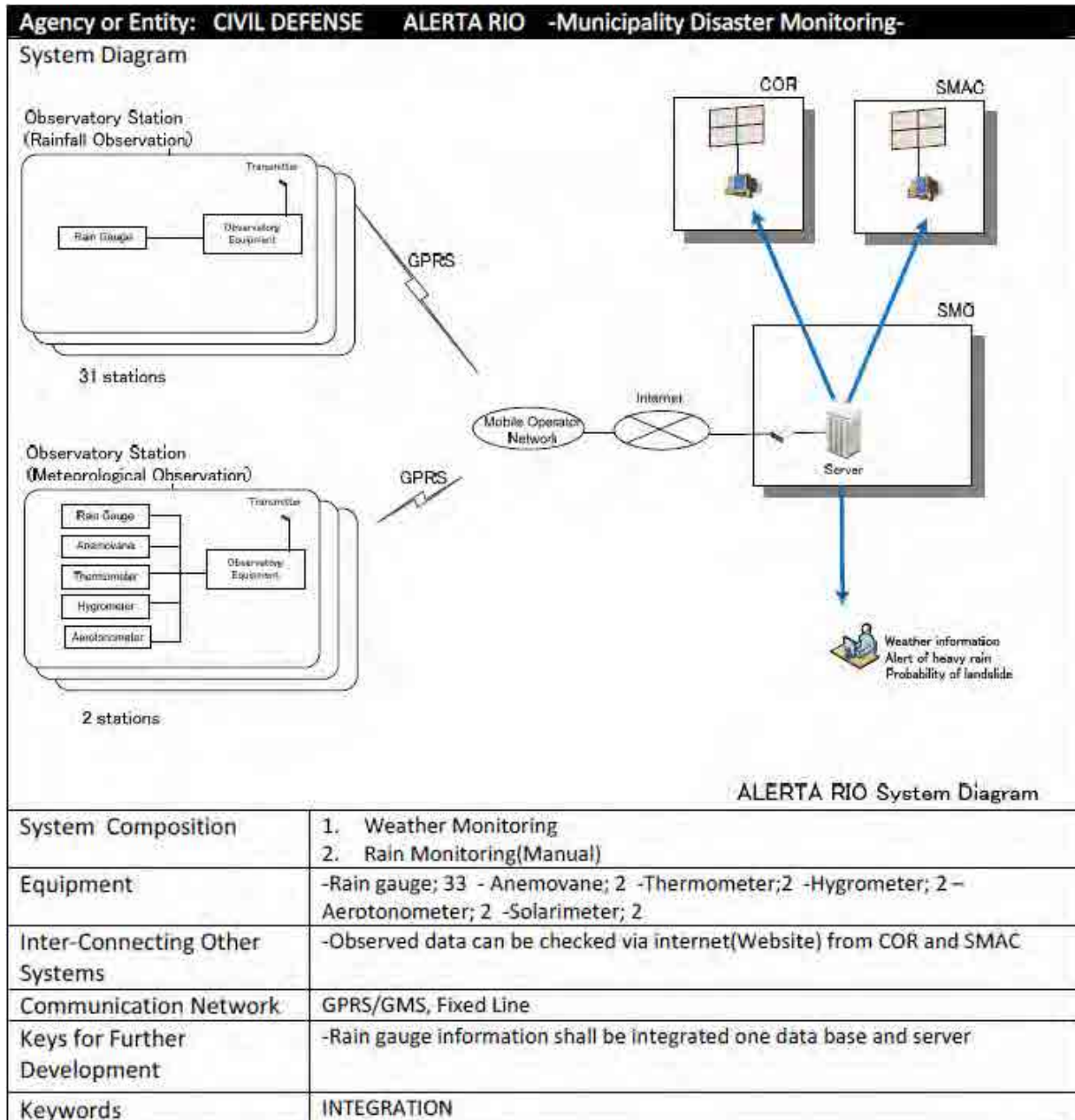
Source: JICA Study Team





|                                       |   |
|---------------------------------------|---|
| <b>System Composition</b>             | <b>1. Air Pollution Monitoring System</b>   |
| <b>Equipment</b>                      | <b>SO2, Nox,O3, PM10 Monitoring Equipment; 8</b>  |
| <b>Inter-Connecting Other Systems</b> | <b>-Observed data can be checked via internet(Website) from COR</b>   |
| <b>Communication Network</b>          | <b>GPRS</b>   |
| <b>Keys for Further Development</b>   | <b>-Traffic Demand Management such as Electric Road Payment shall be conducted based on real air pollution, hence that the system shall be integrated to traffic control center</b> |
| <b>Keywords</b>                       | <b>INFORMATION</b>  |

Source: JICA Study Team



Source: JICA Study Team

(3) Issues of Existing Transportation and Transit in Rio de Janeiro

As a result of the review of ITS-related agencies and concessionaires based on the interviews, the following issues should be resolved for the improvement of public transportation.

1) Insufficiency of information exchange

Among road administration agencies

Drivers should have road network information, such as travel time, congestion, closure of roads, construction work, and so on, to enable them to reach their destination in a timely and safe manner. However, there is no information exchange among road administration agencies and therefore, information is only limited on their respective roads. As a result, the driver is not aware of the road situation or condition to his/her final destination.

Among transportation operators

There is no information connection of public transportation operators. To improve public transportation service and to make it more convenient, public transportation operators should exchange information with each other and provide other operators' information to users. This would make smoother connections at the bus terminals, station terminals, airports, and ports where public transportation congregates and would help to shorten transit time of users.

2) Insufficiency of information provision

In connection with the above issue, provision of insufficient information services is also noted. As per road traffic information, although there are sets of information collection equipment, such as traffic counters, CCTV cameras, and meteorological observation sensors on the road side, the collected information is not utilized effectively due to lack of information provision equipment. It is conceivable that not only VMS, websites, SMS, Twitter, or Facebook, but also smartphone or digital broadcasting could be used as a method of providing information to users. If users had useful information on public transportation and transit, they could decide as to where and when they will leave and how they could get to their destination easier.

3) Subsystem not unified

Each agency has equipment, facilities, and systems to maintain its infrastructure or execute its obligation. Information observed by a sensor in the field is managed on a server at the agency or at the Internet Data Center which the agency outsources. The information is aggregated to COR which has 80 monitors to display current conditions of road traffic, transportation, weather, water levels, and air quality. And all these information are collected by about 30 agencies to take prompt action in cases of emergencies such as heavy rains, landslides, and traffic accidents. However, due to non-integration of the system, the information is displayed at each agency's separately built system. In order to share information with the other agencies, it is necessary to unify the information by putting it on the same map and in a common format.

## 2.4 PLANS IN RIO DE JANEIRO METROPOLITAN AREA

### 2.4.1 Traffic/Transportation Related Plan

- (1) The Master Plan for Urban Transport in the Metropolitan Region of Rio de Janeiro (*O Plano Diretor de Transporte Urbano da Região Metropolitana do Rio de Janeiro: PDTU/RMRJ*)

1) Summary

This is the study for the Master Plan for Urban Transport in the Metropolitan Region of Rio de Janeiro. In this study, some alternatives of road and public transport systems are compared in terms of environmental impact, benefit for travelers, and investment cost. This would be a guide for further development of transport infrastructure in RMRJ. Currently, the update study is ongoing.

The summary of PDTU is shown in the table below.

**Table 2-54 Summary of PDTU/RMRJ**

| Item                     | PDTU/RMRJ                  |   |
|--------------------------|----------------------------|---|
| Year of Formulation      | 2003–2005                  |   |
| Target Year              | 2008–2013                  |   |
| Responsible Organization | SETRANS (State Government) |   |
| Contents                 | Report 1                   | Work Plan   |
|                          | Report 2                   | Analysis of Existing Studies and Plans                          |
|                          | Report 3                   | Elaboration of Questionnaires and Survey Plan                   |
|                          | Report 4                   | Compatibility with Existing Software                            |
|                          | Report 5                   | Progress of Mounting Network, Diagnostic and Survey OD          |
|                          | Report 6                   | (Finalize in Chapter 10)  |
|                          | Report 7                   | Survey for Cordon Line  |
|                          | Report 8                   | Origin Destination Survey                                       |
|                          | Report 9                   | Designing the Matrices  |
|                          | Report 10                  | Mounting of Network, Diagnostic (Final Version)                 |
|                          | Report 11                  | Calibration Models  |
|                          | Report 12                  | System Development  |
|                          | Report 13                  | Plan (Contents: Demand, Forecast, Scenario Setting, Evaluation) |

Source: JICA Study Team

2) Aim

This study was conducted for the following four goals:

1. To clarify the current situation of demand and supply of transport in RMRJ;
2. To formulate alternatives of the transport system in the Metropolitan Region, with special emphasis on political and physical integration intermodal tariff;
3. To formulate a policy of investment in road infrastructure and public transport; and
4. To provide a direction that allows the implementation of ongoing processes of planning.

3) Consideration for ITS Master Plan

The policy of this study is to build the most effective investment plan for the transportation network which can manage the expanding transportation demand in the near future. ITS will be able to support the transportation services. Therefore, current conditions, assumption of demand estimations and policies of alternatives and comparison should be considered in formulating the ITS master plan.

[Cover page]



[Proposed terminals]



[Proposed bus lines]



Source: PDTU Report

Figure 2-152 Example of PDTU Report

(2) Transport Strategic Plan for the Rio 2016 Olympic and Paralympic Games

1) Summary

This document describes the Olympic Transport Strategic Plan to be implemented by Rio 2016, which was formulated in the election as the host city for the Olympic Games. This document sets out a comprehensive view of Rio’s transport plans for the Olympic Games.

According to this plan, Rio 2016, in partnership with the three levels of government, is totally committed in delivering transport services to all Olympic Games clients including spectators and workforce.

**Table 2-55 Summary of Transport Strategic Plan**

| Item                     | Transport Strategic Plan  |   |
|--------------------------|---|---|
| Year of Formulation      | 2008  |   |
| Target Year              | 2016  |   |
| Responsible Organization | Rio 2016 Transport Strategy Team<br>In cooperation with<br>Federal Government, State Government, City Government<br>Public Transport Operators (Metro, Rail, and Bus) and<br>Rio 2016 BID Committee |   |
| Contents                 | Chapter 1<br>Chapter 2<br>Chapter 3<br>Chapter 4<br>Chapter 5<br><br>Chapter 6<br>Chapter 7<br>Chapter 8<br>Chapter 9<br>Chapter 10<br>Chapter 11   | Introduction<br>Transport Strategy<br>Transport Governance<br>Transport Investments and Legacy<br>Games Route Network and Traffic Management Measures<br>Games Family Transport<br>Spectator and Workforce Transport<br>Venue Transport<br>Special Operations<br>Transition from Planning to Delivery<br>Paralympic Games transport |

Source: JICA Study Team

2) Aim

The aim of this plan is to provide vision, major concepts, and key initiatives which will guide the planning and delivery of the Olympic and Paralympic transport services.

The mission is to deliver transport services of the highest level of safety, comfort, quality, reliability, and efficiency to all clients, while minimizing the impact on the citizens of Rio.

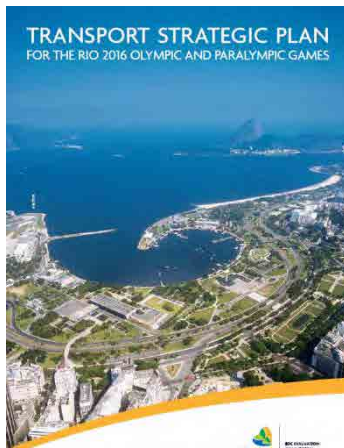
3) Consideration for ITS Master Plan

As far as infrastructure and transportation operation, keywords from the mission of this plan have to be considered in the mission of ITS master plan. The keywords are as follows:

- Safety
- Comfort
- Quality
- Reliability
- Efficiency
- All Clients



[Cover page]



[Responsible authorities]

FIGURE 3.1: AUTHORITIES RESPONSIBLE FOR THE CONSTRUCTION OF KEY TRANSPORT INFRASTRUCTURE

| TYPE OF INFRASTRUCTURE | ACTIVITIES  |                                   |   |
|------------------------|---|-----------------------------------|---|
|                        | PLANNING  | CONSTRUCTION                      | FINANCING   |
| AIRPORTS               | INFRAERO (Federal Government)   |                                   | Federal Government                                    |
| RAIL                   | SETRANS (State Transport Authority)   | State Government and Operators    | State Government and Private Sector                   |
| ROADS AND BRT          | DER (State Roads Authority)<br>City Secretary of Urban Planning<br>City Secretary of Works<br>City Secretary of Transport | State and City Secretary of Works | Federal, State and City Government and Private Sector |
| TRAFFIC MANAGEMENT     | CET - Rio (City Traffic Authority)  |                                   | City Government                                       |

[Responsible authorities]

FIGURE 3.2: AUTHORITIES, SERVICE PROVIDERS AND OPERATORS RESPONSIBLE FOR TRAFFIC AND TRANSPORT OPERATIONS

| OPERATIONS    | ACTIVITIES   |                   |
|---------------|--|-------------------|
|               | PLANNING   | DELIVERY          |
| AIR TRANSPORT | ANAC (Federal Government)                                |                   |
| AIRPORT       | INFRAERO (Federal Government)                            |                   |
| PORT          | Port Authority (Federal Government)                      |                   |
| RAIL          | SETRANS (State Transport Authority)<br>Private Operators | Private Operators |
| BRT           | SMTR (City Transport Authority)<br>Private Operators     | Private Operators |
| BUS - CITY    | SMTR (City Transport Authority)<br>Private Operators     | Private Operators |
| BUS - STATE   | SETRANS (State Transport Authority)<br>Private Operators | Private Operators |
| TRAFFIC       | CET - Rio (City Traffic Authority)                       |                   |

Figure 2-153 Example of Transport Strategic Plan 1/4

[Investment schedule]

FIGURE 4.1: PLANNED TRANSPORT INVESTMENTS

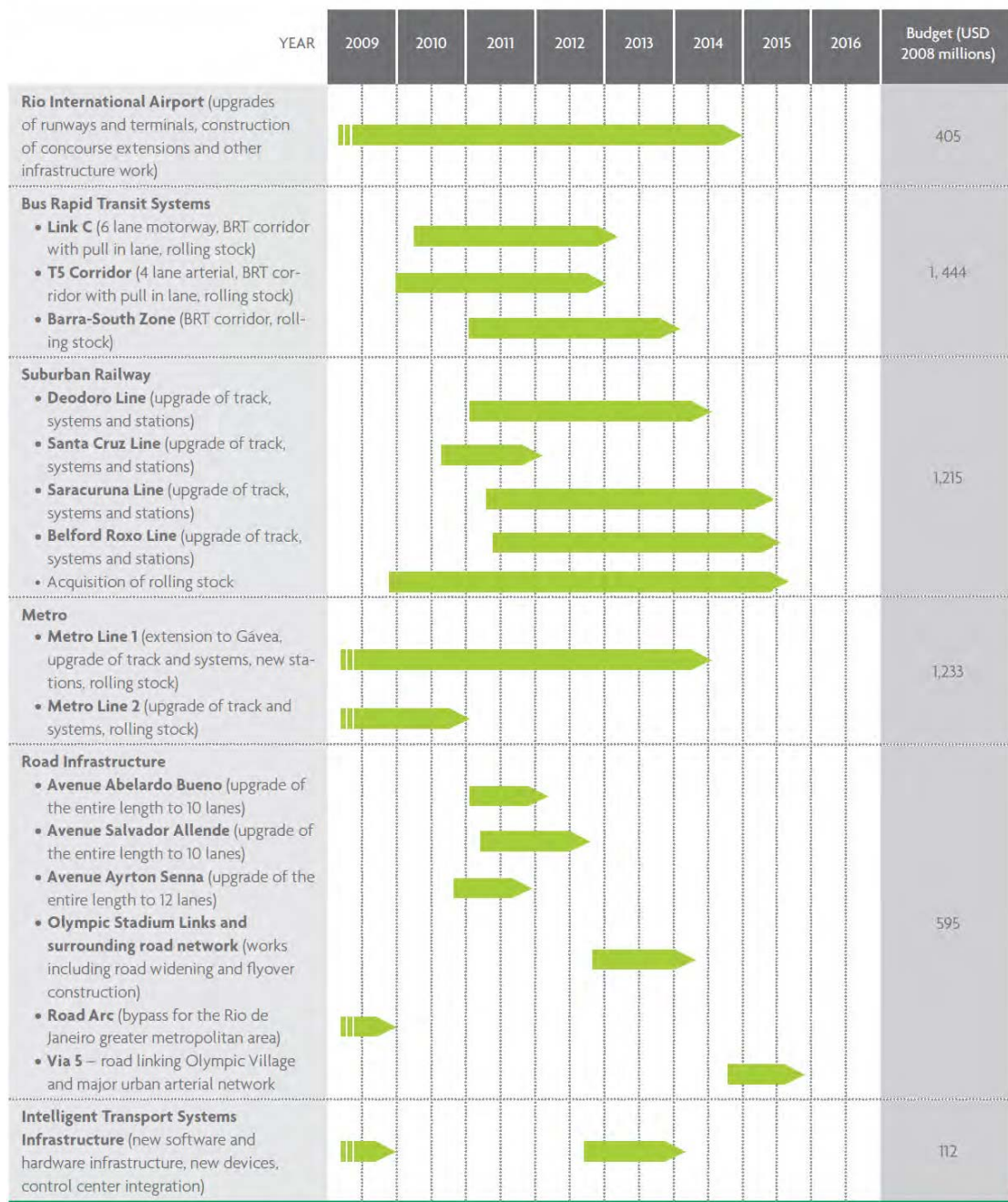
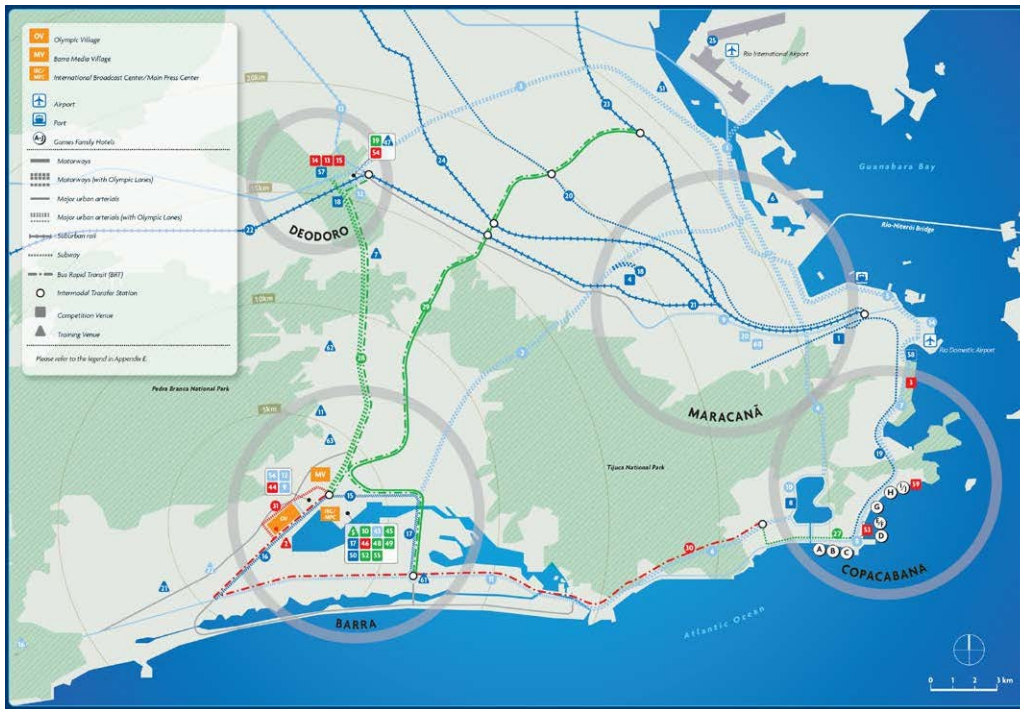


Figure 2-154 Example of Transport Strategic Plan 2/4

[Map for the Olympic Games]



[Olympic lanes]

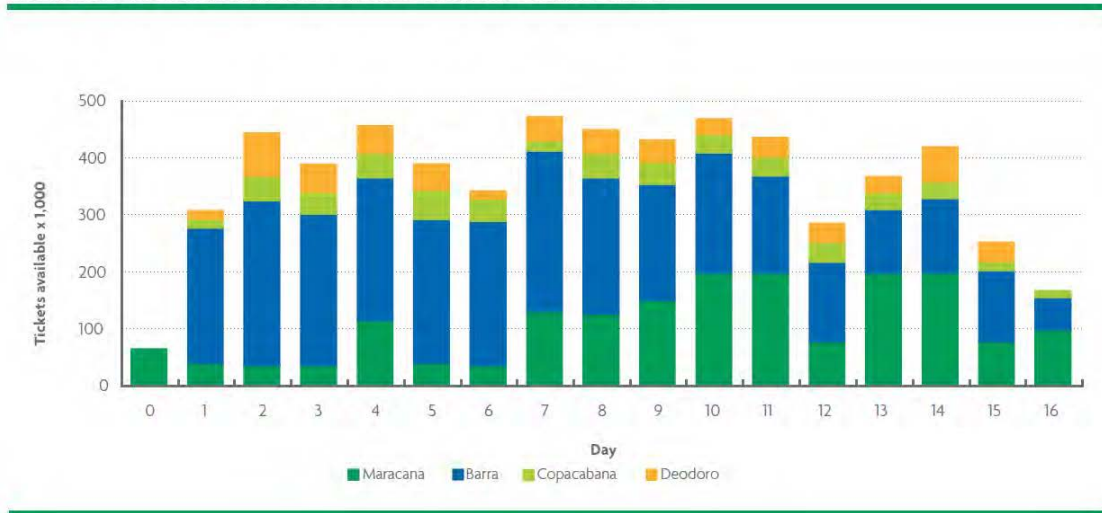


Figure 2-155 Example of Transport Strategic Plan 3/4



[Maximum spectators demand]

FIGURE 71: TOTAL TICKETS AVAILABLE PER DAY FOR THE RIO OLYMPIC EVENTS



[Map of the venue]

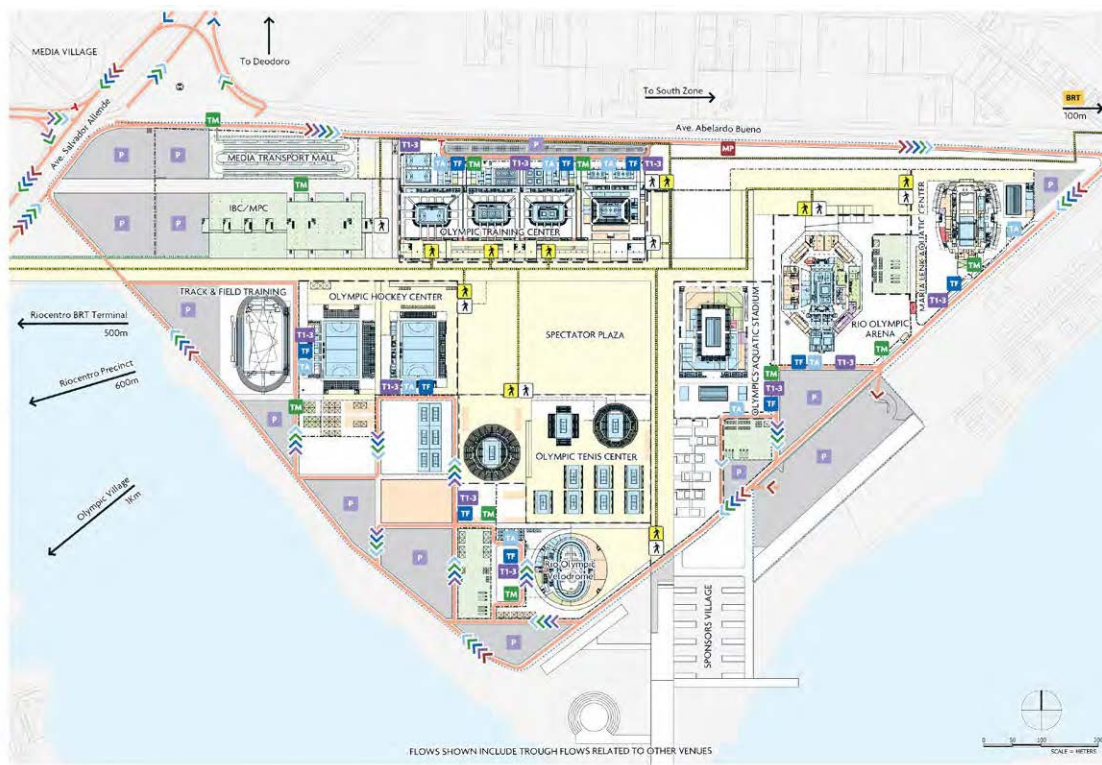


Figure 2-156 Example of Transport Strategic Plan 4/4

Source: Transport Strategic Plan (Figure 2-153 to Figure 2-156)

## 2.4.2 Urban Development Plan

### (1) Growth Acceleration Program (*Programa de Aceleração do Crescimento*:PAC)

#### 1) Summary

This is the four-year investment plan authorized by the federal government. The plan consists of nationwide projects, such as energy systems, logistics and international transportation infrastructure, and a high-speed traffic network, which will be expected to accelerate economics in Brazil.

Two programs have been formulated previously. One is the program from 2007 to 2010 and the other is from 2011 to 2014.

**Table 2-56 Summary of PAC**

| Item                     | PAC   |
|--------------------------|---|
| Year of Formulation      | 2007  |
| Target Year              | 2010  |
| Responsible Organization | Federal Government  |
| Contents                 | Projects for:<br>Energy<br>Transportation (Expressway, Road, Seaport, Airport, Urban Transport)<br>Residential Development/Housing<br>Public Health |

Source: JICA Study Team

**Table 2-57 Summary of PAC2**

| Item                     | PAC  |
|--------------------------|--|
| Year of Formulation      | 2011   |
| Target Year              | 2014   |
| Responsible Organization | Federal Government   |
| Contents                 | Remaining Projects in PAC<br>New Projects in order to Prepare for<br>2014 FIFA World Cup<br>2016 Olympic Games |

Source: JICA Study Team

#### 2) Aim

This program aims to accelerate the national economy in Brazil, especially, investment in PAC2 which is planned for 2014 FIFA World Cup and 2016 Olympic Games.

#### 3) Consideration for ITS Master Plan

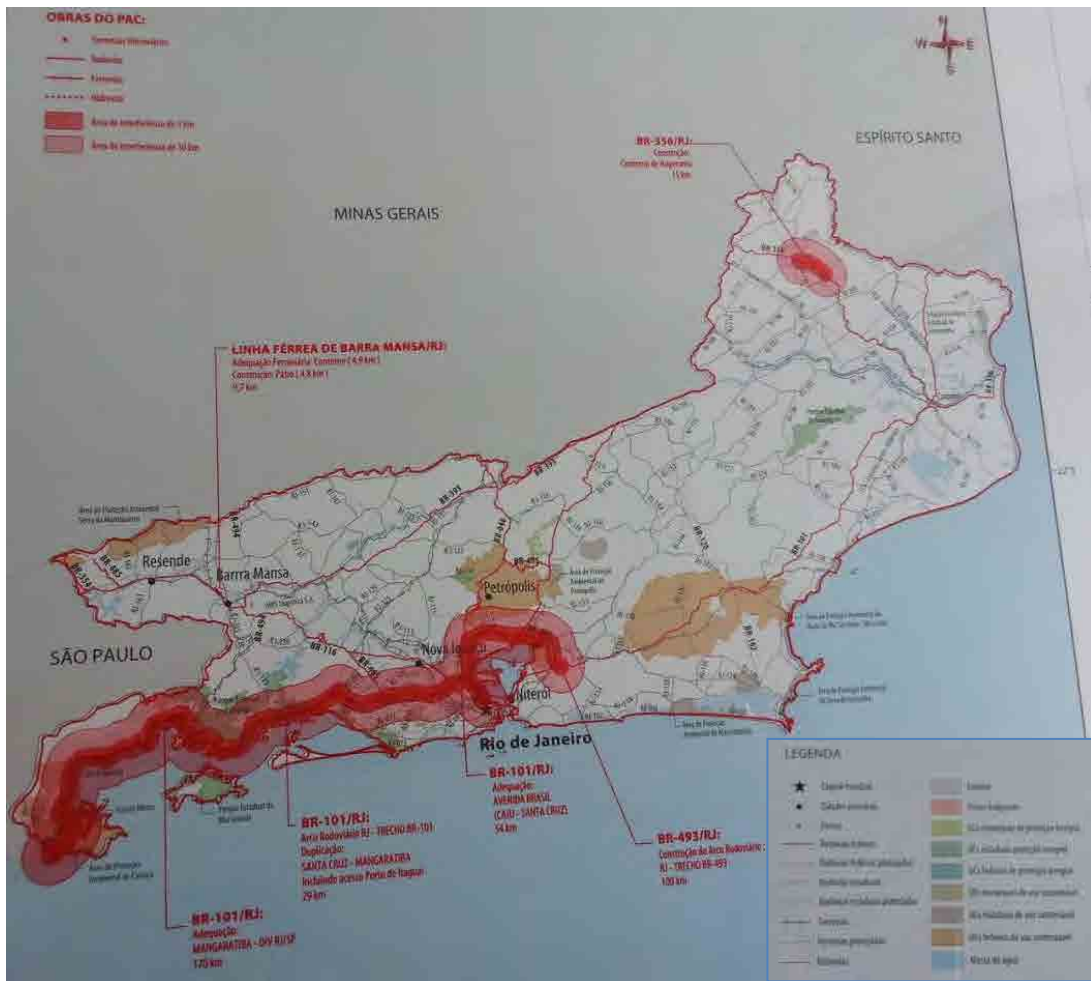
Projects authorized in PAC program will be implemented during the period of the ITS program. Therefore, projects in PAC and PAC2 should be considered as future developments.



[PAC2 structure]



[PAC2 road projects in the state of Rio de Janeiro]



Source: PAC2 Project

Figure 2-157 PAC2 Projects

(2) Multi-Year Plan (*Plano Plurianual*: PPA)

1) Summary

This is the Multi-Year Plan of the state of Rio de Janeiro for four years prepared by the state government. The plan consists of state-wide projects such as metropolitan strategy, development for large events, and modernization management. The Federal Constitution is the legal framework for the establishment of the PPA.

The PPA plays a central role in the planning process of the state and its programming is regionalized as the guidelines and goals of the state government. All programs are developed from data that demonstrates a set of issues that must be resolved in the short, medium, and long term.

**Table 2-58 Summary of PPA**

| Item                     | PPA   |
|--------------------------|---|
| Year of Formulation      | 2012  |
| Target Year              | 2012–2015   |
| Responsible Organization | Secretaria de Planejamento e Gestao (State Government)  |
| Contents                 | PPA consists of <ul style="list-style-type: none"> <li>&gt; Presentation of macro-sectoral goals and objectives;</li> <li>&gt; Analysis of the macroeconomic and investment strategies;</li> <li>&gt; Analysis of the state of public finances;</li> <li>&gt; Identification of opportunities and partnerships; and</li> <li>&gt; Presentation of the territorial dimension of planning.</li> </ul> Program contains <ul style="list-style-type: none"> <li>· Construction of Citizenship;</li> <li>· Megaeventos International;</li> <li>· Metropolitan Strategies;</li> <li>· Large Investment Projects;</li> <li>· Management Modernization;</li> <li>· Preventing and Combating Effects of Disasters; and</li> <li>· Health and Education.</li> </ul> |

Source: JICA Study Team

2) Aim

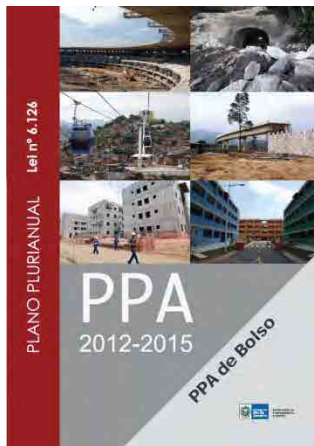
The challenges of this program are as follows:

1. To strategically develop and transform economic growth;
2. To aid the ongoing process of modernization;
3. To invest in the 2014 World Cup and 2016 Olympics; and
4. To generate employment and income, technological innovation and management, competitiveness, reduction of inequalities, and improve the general well-being of the public.

3) Consideration for ITS Master Plan

Projects authorized in this program will be implemented during the program period. Therefore, projects in PPA should be considered as future developments.

[Cover page]



[Projects for SETRANS]

#### System Reform

- > Reforming the 89 railway stations in Rio.
- > Renovation and expansion of the waterway terminals from Praça XV in Rio de Janeiro, and Square Araribóia in Niterói.
- > Reforming the airports in Resende, Angra dos Reis, Paraty, Marica, and Itaperuna.
- > Deployments of Vale do Aço Airport in Volta Redonda/Pirai, and deployment of heliports inside.

#### System Modernization

- > Potential of using Airport Galeão as international hub for passenger and cargo airlines.
- > Transformation of the standard operating system for suburban trains that will operate as a metro on the ground.

#### Magnification System

- > Opening of Uruguay Station of Line 1 of the subway;
- > Construction of lines 3 and 4 of the subway;
- > Purchase of 11 new vessels to the waterway system;
- > Purchase of 120 new trains, of which 30 have already been acquired;
- > Reform of 94 trains;
- > Consolidation of improvements in road, rail, and sea access to the Port do Rio;
- > Completion of the State Plan for Freight Logistics - PELC/RJ;
- > Deployment of logistics corridor to access Açu;
- > Implementation of broad gauge railway connection between Rio de Janeiro, the Petrochemical Complex of Rio de Janeiro (COMPERJ), and the Port of Açu; and
- > Deployment of complex logistic of Barra do Furado.

(3) Strategic Plan 2012–2031 (State Government of Rio de Janeiro)

1) Summary

This is the Strategic Plan for the period between 2012 and 2031, which mirrors the concern of the state government with the consolidation of the process to restructure the state. In this plan, the paths that enable the public administration to drive its management towards ensuring its legacy are identified.

**Table 2-59 Summary of Strategic Plan 2012 -2031**

| Item                     | Strategic Plan  |                                   |
|--------------------------|---|-----------------------------------|
| Year of Formulation      | 2012  |                                   |
| Target Year              | 2012–2031   |                                   |
| Responsible Organization | Secretariat of Planning and Management – SEPLAG (The State of Rio de Janeiro) |                                   |
| Contents                 | Chapter 1   | Context and Trends                |
|                          | Chapter 2   | Vision of Rio de Janeiro for 2031 |
|                          | Chapter 3   | Scenarios and Forecasts           |
|                          | Chapter 4   | Long Term Sectorial Challenges    |
|                          | Chapter 5   | Sectorial Strategies              |
|                          | Chapter 6   | Programmed Sectorial Investments  |

Source: JICA Study Team

2) Aim

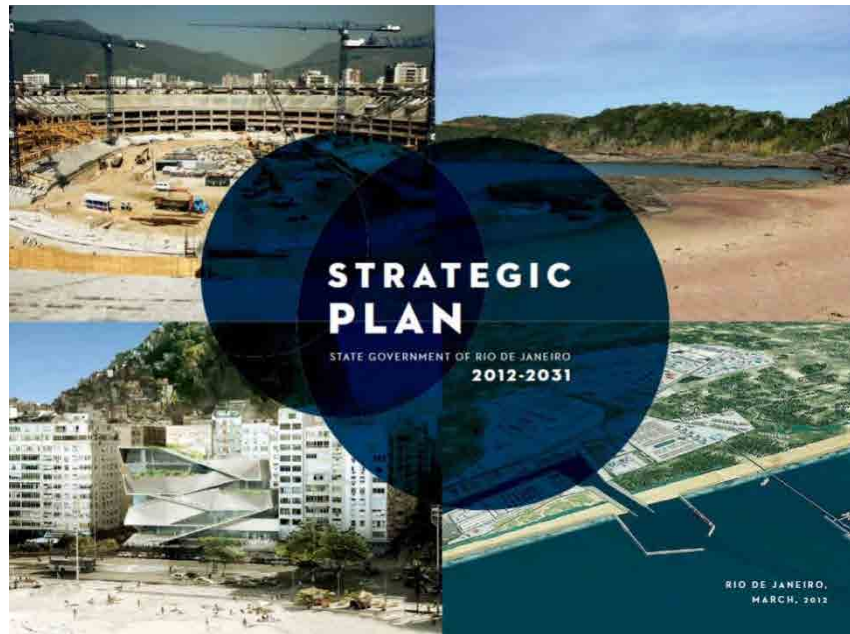
This plan has ten goals as listed below.

- Health: quality of life for the population.
- Prosperity: economy will be boosted by a mix of international and national favorable environments.
- Efficiency: continuous conscious effort to combat all sources of waste.
- Sustainability: efficient use of material and human resources and intensive application of renewable resources, methods, and technologies.
- Education: children attending schools longer and better access to higher level of education.
- Innovation: ideas for advancement and a sincere belief in public administration of research that will achieve scientific progress and creativity.
- Plural diversity: diversity and freedom feed themselves mutually.
- Solidarity: the value of social integration will be realized by productive inclusion of citizens who strive to actively participate in economic life.
- Equity: public policies inspired by the most democratic principles of justice, with effective social control by public and private agencies.
- Safety: continued democracy and protection of the rights to life and freedom.

3) Consideration for ITS Master Plan

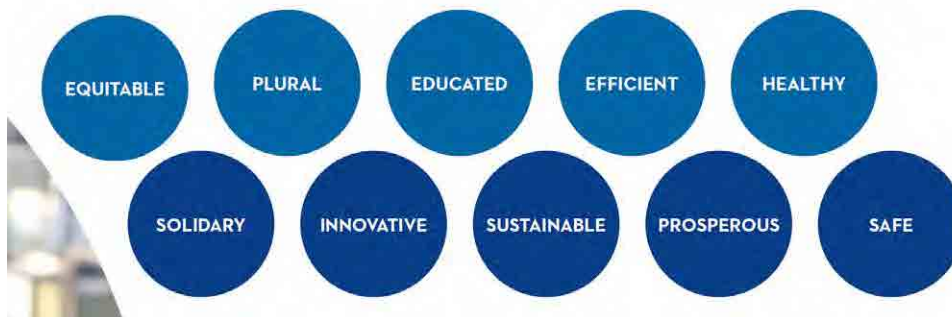
The ITS master plan needs to follow the abovementioned goals.

[Cover page]



[Goals]

THE FUTURE GLIMMERED BY RIO DE JANEIRO IN THE MOST OPTIMISTIC OF THE SCENARIOS FOR THE YEAR 2031 UNVEILS A PICTURE DEFINED BY TEN ESSENTIAL ASPECTS, THROUGH WHICH A NEW STATE WILL BE REVEALED.

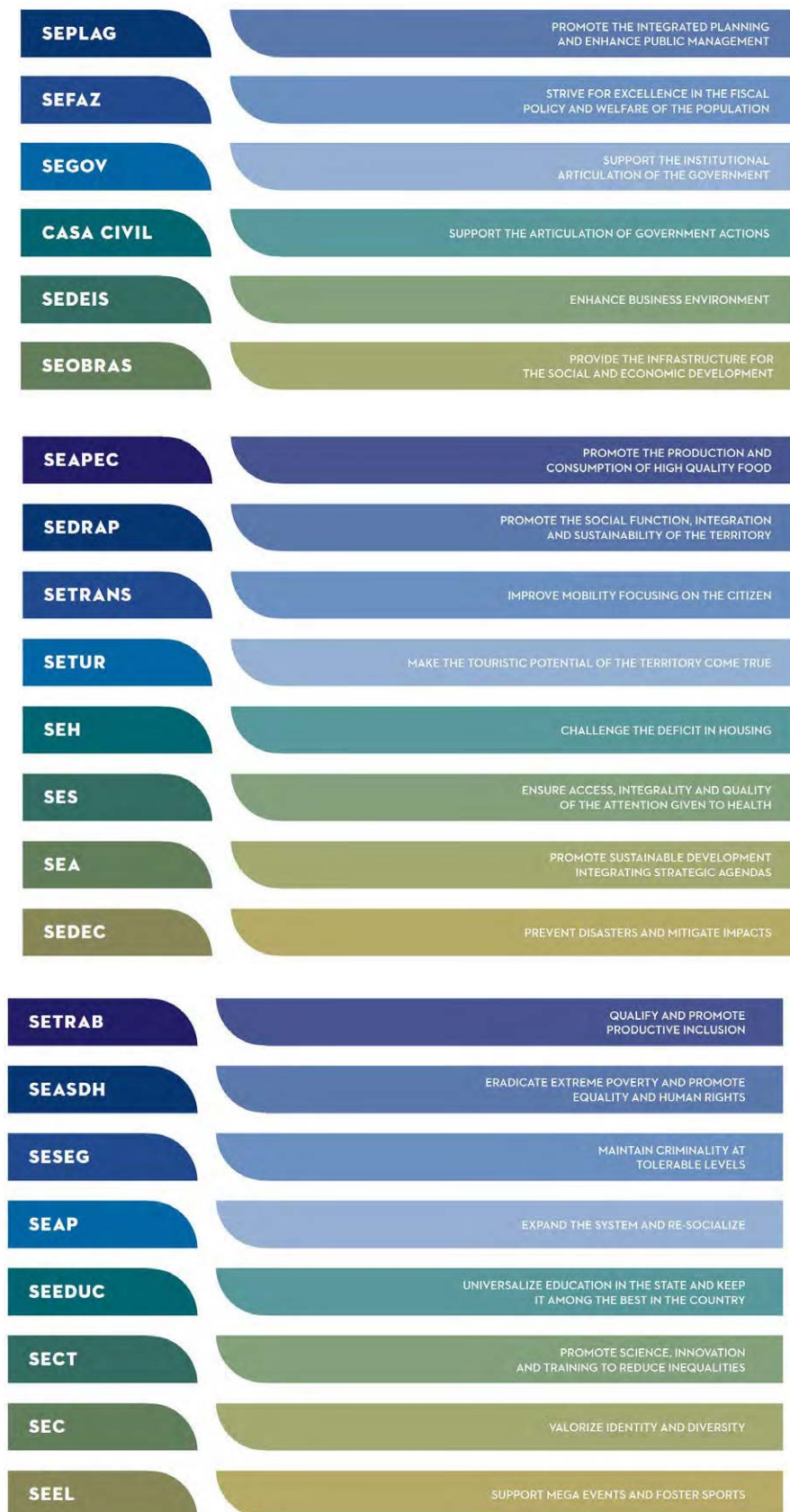


Source: Strategic Plan 2012-2031

Figure 2-158 Example of Strategic Plan 2012–2031 1/2



[Long-term challenges for each secretary]



Source: Strategic Plan 2012-2031

Figure 2-159 Example of Strategic Plan 2012–2031 2/2

(4) Strategic Plan 2009–2012 (City Government of Rio de Janeiro)

1) Summary

This is the Strategic Plan for the period between 2009 and 2012, which will make Rio more integrated and competitive leading up to the 2014 FIFA World Cup and 2016 Olympic Games, formulated by the City Government of Rio de Janeiro.

This plan has short-term projects, but could lead to long-term projects over the next decades and especially after the Olympic Games.

**Table 2-60 Summary of Strategic Plan 2009-2012**

| Item                     | Strategic Plan                 |  |
|--------------------------|--------------------------------|--|
| Year of Formulation      | 2009                           |  |
| Target Year              | 2009–2012                      |  |
| Responsible Organization | Municipality of Rio de Janeiro |  |
| Contents                 | Chapter 1                      | Premise  |
|                          | Chapter 2                      | Future Vision for Rio                          |
|                          | Chapter 3                      | Introduction                                   |
|                          | Chapter 4                      | Objectives and Principles of Government Action |
|                          | Chapter 5                      | Plan for Each Section                          |
|                          | Chapter 6                      | Olympic Goal                                   |
|                          | Chapter 7                      | Institutionalization of the Strategic Plan     |

Source: JICA Study Team

2) Aim

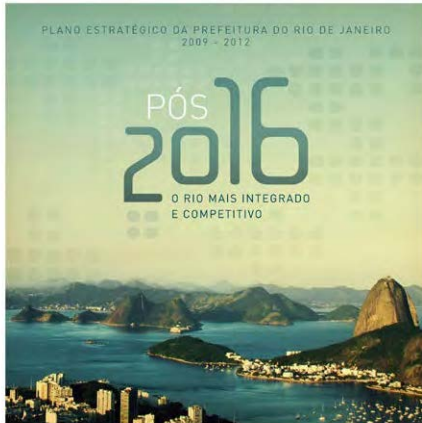
The objectives of the government are as follows:

1. Improve the quality of public services;
2. Protect and recover public space and natural assets of the city;
3. Ensure greater equality of opportunities for young people and children in Rio;
4. Establish the necessary conditions for sustainable economic growth;
5. Promote the development of the economy;
6. Make Rio a city promoting such integrated view of urban and cultural;
7. Reduce current levels of poverty, especially extreme poverty in the city; and
8. Focus on the river as an important political and cultural center on the international stage.

3) Considerations for ITS Master Plan

The ITS master plan needs to follow the abovementioned objectives.

[Cover page]



[Plan for each section]

AS 37 INICIATIVAS ESTRATÉGICAS DO GOVERNO POR ÁREA DE RESULTADO

|  |   |  |  |   |
|--|---|--|--|---|
| <p><b>SAÚDE</b></p> <ul style="list-style-type: none"> <li>• Saúde Preventiva (TEAS)</li> <li>• Restauração do Atendimento de Emergência</li> <li>• Programa de Atendimento Domiciliar ao Idoso (PADDI)</li> <li>• Criação de UPAs</li> </ul> <p><b>EDUCAÇÃO</b></p> <ul style="list-style-type: none"> <li>• Escolas do Amanhã</li> <li>• Espaço de Desenvolvimento Infantil</li> <li>• Reforço Escolar</li> <li>• Saúde nas Escolas</li> </ul> | <p><b>ORDEM PÚBLICA</b></p> <ul style="list-style-type: none"> <li>• Choque de Ordem - Ações de Ordenamento</li> <li>• Choque de Ordem - Modernização da Guarda Municipal</li> <li>• Choque de Ordem - Câmeras de Vigilância</li> </ul> <p><b>EMPREGO E RENDA</b></p> <ul style="list-style-type: none"> <li>• Rio Ambiente de Negócios</li> <li>• Rio Capital de Energia</li> <li>• Rio Capital da Indústria</li> <li>• Criative, Make &amp; Design</li> <li>• Rio Capital da Indústria Criativa, Audiovisual</li> <li>• Rio Capital de Turismo</li> </ul> | <p><b>INFRAESTRUTURA URBANA</b></p> <ul style="list-style-type: none"> <li>• Choque de Ordem - Conservação da Cidade</li> <li>• Porto Maravilha</li> <li>• Barra Maravilha</li> <li>• Morar Maravilha</li> </ul> <p><b>MEIO AMBIENTE</b></p> <ul style="list-style-type: none"> <li>• Expansão do Saneamento de Zona Oeste</li> <li>• Micro-drenagem de Jacarepaguá</li> <li>• Novo Alvaro Saldanha</li> <li>• Política de Mudanças Climáticas</li> <li>• Rio Capital de Bioeconomia</li> <li>• Rio Capital Verde</li> </ul> | <p><b>TRANSPORTE</b></p> <ul style="list-style-type: none"> <li>• Racionalização e Integração Rodoviarfária, BRTs e Ônibus</li> <li>• Transportes</li> <li>• Ligação C</li> <li>• Tarifários - Tabela de Grupos Faltas</li> </ul> <p><b>CULTURA, ESPORTE E LAZER</b></p> <ul style="list-style-type: none"> <li>• Espaço das Letras Culturais</li> <li>• Cultura na Rua</li> <li>• Expansão de Quadras e Vãos Olímpicos</li> </ul> | <p><b>ASSISTÊNCIA SOCIAL</b></p> <ul style="list-style-type: none"> <li>• Bolsa Família Cartão</li> </ul> <p><b>GESTÃO E FINANÇAS PÚBLICAS</b></p> <ul style="list-style-type: none"> <li>• Choque de Resultados - Prefeitura Presente - Rio Cidadão</li> <li>• Nota Fiscal Eletrônica</li> </ul> |
|--|---|--|--|---|

Source: Strategic Plan 2009-2012

Figure 2-160 Example of Strategic Plan 2009-2012

(5) Development Map in the State of Rio de Janeiro

1) Summary

From November 2005 to June 2006, the Federation of Industries of the State of Rio de Janeiro (*Federação das Indústrias do Estado do Rio de Janeiro: FIRJAN*) mobilized over a thousand entrepreneurs and representatives of public and private organizations in developing a shared strategy. This strategic vision has been built and validated in meetings and workshops to consolidate the elements of the Map Development: Objective Indicators, Goals, and Strategic Actions.

According to the study, sustainable infrastructure development coupled with favorable conditions of logistics (ports, rail and road grids), nuclear energy, telecommunications (network and satellite control), and human resources could make Rio de Janeiro an economic hub.

**Table 2-61 Summary of Development Map in the State of Rio de Janeiro**

| Item                     | Transport Strategic Plan   |
|--------------------------|--|
| Year of Formulation      | 2006   |
| Target Year              | 2015   |
| Responsible Organization | FIRJAN   |
| Contents                 | <p>Basis of Development<br/>                     Focus of Practice<br/>                     Positioning in 2015<br/>                     Results</p> |

Source: JICA Study Team

2) Aim

This is a reference to envisage a better place to live, work, and invest in by 2015 in the state of Rio de Janeiro in Brazil by achieving sustainable development.

3) Consideration for ITS Master Plan

Sustainable infrastructure development, which is the policy of this plan should be considered in the ITS master plan.

[Cover page]



[Indicators for components related to transportation]

> Infrastructure of transport and logistics in the state indicators are as follows:

- Percentage of international flights at the International Airport of Rio de Janeiro to all international flights leaving or arriving in Brazil;
- Amount of cargo handled at the ports (General cargo, containerized and bulk);
- Number of vessels arriving at the ports (Cargo, passengers, maritime support);
- Participation of cargo handled at the international airports (Galleon) to the whole of Brazil (Import/export);
- Amount of freight moved by rail;
- Traffic conditions on highways and road quality (Proportion of great, good, deficient, bad, and terrible); and
- Amount of cargo handled on federal roads.



### 2.4.3 ITS-Related Plan

#### (1) Agency for Regulation for Telecommunication

##### 1) Ministry of Telecommunication (MOC)

The MOC has broadcasting, postal, and telecommunications services, as its areas of competence. Also, it is responsible for formulating and proposing national policies for these areas, as well as, the national policy for digital inclusion. MOC is also responsible, among other functions, for granting and monitoring broadcasting services and supervising its related entities, i.e., the National Telecommunications Agency (ANATEL); Brazilian Post and Telegraph Company (CORREIOS); and Telecomunicações Brasileiras S.A. (TELEBRAS). ETC(*Electronic Toll Collection System*) and TELEBRAS are the Brazil based holding companies.

##### 2) ANATEL

The National Telecommunication Agency (*Agência Nacional de Telecomunicações*:ANATEL) is a special agency created by the General Telecommunications Law (LGT)- Law 9, 472 of 16 July 1997, administratively independent and financially autonomous with no hierarchical subordination to any government agency. ANATEL's mission is to promote the development of telecommunications in the country so as to give it a modern and efficient telecommunications infrastructure, capable of providing adequate services to society, diverse and fairly priced, throughout the national territory. The agency inherited, for the Ministry of Communications, the powers of licensing, regulation, and supervision, plus a large technical assets and equity for adopting the measures necessary to meet the public interest and for the development of Brazilian telecommunications, acting with independence, legality, impartiality, and publicity.

##### 3) Frequency management by ANATEL

The ANATEL has the duty to manage the radio frequency spectrum in Brazil. ANATEL is responsible for maintaining an allocating plan that designates radio frequencies according to International Telecommunication Union (ITU) recommendation, exclusively for military purposes, but for telecommunications services under the public and private regimes, broadcasting services, emergency and public security services, and other telecommunications activities.

ANATEL is responsible for updating the frequency assignment book that includes all uses of spectrum throughout Brazil. A new regulation on spectrum usage in Brazil was issued by ANATEL on 17 April 2001.

(2) Related Telecommunication Plan in Brazil

1) Fourth generation mobile technology

In telecommunications, 4G is the fourth generation of cellphone mobile communications standards. It is a successor of the third generation (3G) standards. A 4G system provides mobile ultra-broadband internet access, for example to laptops with USB wireless modems, to smartphones, and to other mobile devices. Conceivable applications include amended mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing, and 3D television. Recently, Android and Windows-enabled cellular devices have fallen in the 4G category. One basic advantage of 4G is that it can at any point of travelling time provide an internet data transfer rate higher than any existing cellular services (excluding broadband and Wi-Fi connections)

New mobile generations have appeared about every ten years since the first move from 1981 analog (1G) to digital (2G) transmission in 1992. This was followed in 2001, by 3G multi-media support, spread spectrum transmission and at least 200 kbit/s peak bitrate, in 2011/2012 expected to be followed by "real" 4G, which refers to all-Internet Protocol (IP) packet-switched networks giving Ultra Mobile Broadband (gigabit speed) access.

In the mid 1990s, the International Telecommunication Union Radiocommunication Sector (ITU-R) standardization organization released the IMT-2000 requirements as a framework for what standards should be considered for 3G systems, requiring 200 kbit/s peak bit rate. In 2008, ITU-R specified the International Mobile Telecommunications Advanced (IMT-Advanced) requirements for 4G systems.

This article uses 4G to refer to IMT-Advanced, as defined by ITU-R. An IMT-Advanced cellular system must fulfill the following requirements:

- Be based on an all-IP packet switched network.
- Have peak data rates of up to approximately 100 Mbit/s for high mobility, such as mobile access and up to approximately 1 Gbit/s for low mobility, such as nomadic/local wireless access.
- Be able to dynamically share and use the network resources to support more simultaneous users per cell.
- Use scalable channel bandwidths of 5–20 MHz, optionally up to 40 MHz.
- Have peak link spectral efficiency of 15 bit/s/Hz in the downlink, and 6.75 bit/s/Hz in the uplink (meaning that 1 Gbit/s in the downlink should be possible over less than 67 MHz bandwidth).
- System spectral efficiency of up to 3 bit/s/Hz/cell in the downlink and 2.25 bit/s/Hz/cell for indoor usage.
- Smooth handovers across heterogeneous networks.
- The ability to offer high quality of service for next generation multimedia support.

The following technologies are developing for compliance with IMT-Advanced:

***-LTE Advanced***

The Long-term Evolution Advanced (LTE Advanced) is a candidate for IMT-Advanced standard, formally submitted by the 3GPP organization to ITU-T in the autumn of 2009, and expected to be released in 2012. The target of 3GPP LTE Advanced is to reach and surpass the ITU requirements.

***-IEEE 802.16m (WirelessMAN-Advanced)***

The IEEE 802.16m or WirelessMAN-Advanced evolution of 802.16e is under development, with the objective to fulfill the IMT-Advanced criteria of 1 Gbit/s for stationary reception and 100 Mbit/s for mobile reception.

The following technologies are the pre-4G technologies that can be used:

***-3GPP Long Term Evolution (LTE)***

The LTE has a theoretical net bit rate capacity of up to 100 Mbit/s in the downlink and 50 Mbit/s in the uplink if a 20 MHz channel is used, and more if multiple-input multiple-output (MIMO), i.e., antenna arrays, are used.

***-Mobile WiMAX (IEEE 802.16e)***

The Mobile WiMAX (IEEE 802.16e-2005) mobile wireless broadband access (MWBA) standard offers peak data rates of 128 Mbit/s downlink and 56 Mbit/s uplink over 20 MHz wide channels.

2) Super WiFi

There are many TV broadcasting channels that are unused in nearly every location in the world – these empty channels (blocks of spectrum) are known as “white spaces”. New Wi-Fi technology named 'Super Wi-Fi' started the service at some places in the United States after getting approval from the United States Federal Communications Commission (FCC) to describe a wireless networking to use for the creation of longer-distance wireless internet.

Instead of using the 2.4 GHz radio frequency of Wi-Fi, the 'Super Wi-Fi' uses the lower-frequency white spaces between television channel frequencies. These lower frequencies allow the signal to travel further and penetrate walls better than the higher frequencies previously used. In typical applications, a strong Wi-Fi signal can cover 100 meters while a Super Wi-Fi signal at the same power level can easily travel 400 meters and with higher power can cover many kilometers.

Some of the immediate beneficiaries are the people currently living in areas that cannot be affordably reached with existing technologies. It is said that for rural residents living far from advanced markets such as in India, Brazil, and across Africa, a new technology, such as 'Super Wi-Fi' will be effective.

(3) Related Plan in Rio de Janeiro

1) CICC

The Department of State Security (*Secretaria de Estado de Segurança*: SESEG) has been planning to establish the Center for Integrated Command and Control (*Centro Integrado de Comando e Controle*: CICC) in order to centralize comprehensive information related to police and fire/disaster management and to organize a system to cope with emergencies. In addition to the SESEG, the federal, states, and cities will be incorporated into CICC. The size of the building is 13,000 m<sup>2</sup> and has been designed considering the space needed for each organization.

Areas to cover are Rio City (40% of all state population) and Rio Metropolitan Area (80% of all state population). Because 90% of problems have occurred in the Rio Metropolitan Area, the other cities with relatively lower problems are to be covered by the National Police. Services provided by Military Police (supervisory in all states) to the other cities are being discussed separately.

It is currently under discussion whether the traffic monitoring system can be properly utilized for security control systems and can collaborate with and support security systems. In terms of security systems, CCTV and OCR data is considered to be important. Use of daily traffic data will be examined.

CICC will have the following main functions and roles:

**-Functions**

- 24-hour operation
- Centralize functions of all organizations concerned, including civil, military, and disaster management organizations.
- Collaborate with other organizations that provide emergency responses to local residents. (e.g., CET-Rio)

**-Roles:**

- Is equipped with an emergency service office for residents and a call center (state police, emergency, and federal police).
- Has crisis management and control center at the 3<sup>rd</sup> floor, which covers 92 cities.
- Provides necessary response to large-scale events (such as Olympics and New Year's Eve)



Source: SESEG

**Figure 2-161 Plan of CICC and Image of Emergency Center**

2) INFORVIA.RJ

The INFOVIA.RJ project consisted of the implementation of a communication infrastructure for high-performance data, covering all locations of secretaries and other public agencies of Rio de Janeiro State Government. The INFOVIA.RJ project had, as one of its basic premises, to provide the conditions for increased integration and productivity of public agencies to perform their duties. This was done by allowing citizens to obtain information and have easier access to government services and thereby, facilitating interaction between government agencies and society.

Currently, data communication with this infrastructure supports the Multi-Protocol Label Switching (MPLS) protocol and has deployed services running on the Transmission Control Protocol (TCP)/Internet protocol (IP) platform with guaranteed quality, capable of delivering in a coordinated and non-competitive way, to all kinds of traffic, including voice-over IP (VOIP).

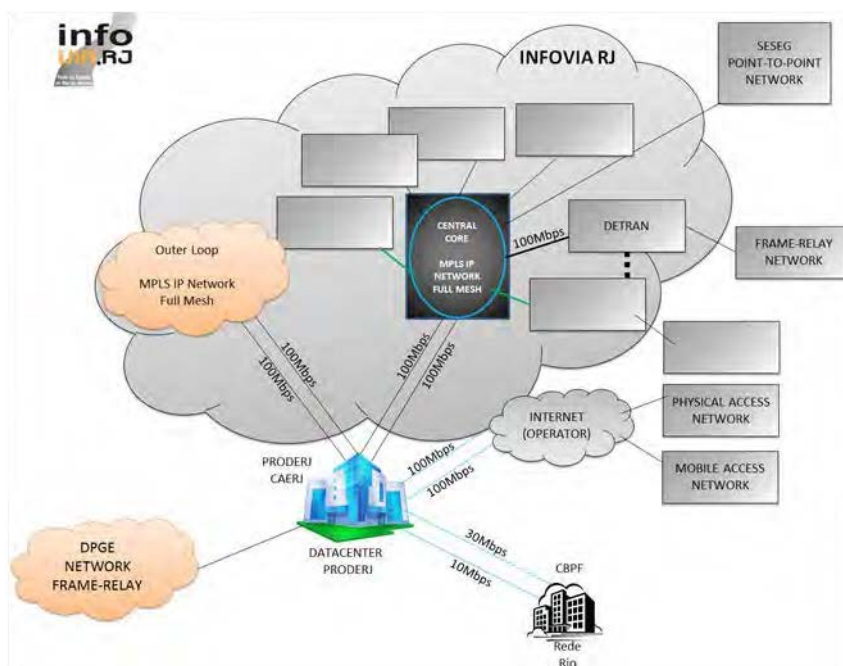
Beyond MPLS technology, alternative technologies are also used, such as the frame-relay technology and dedicated point-to-point circuits for connectivity of some organizations of the State Government of Rio de Janeiro to the Backbone INFORVIA.RJ.

Specifically, with respect to Internet access, main connection is made through the Oi operator and point-to-point circuit with Rio Network, which serves as a contingency.

It also provides Internet access via a dedicated circuit, asymmetric digital subscriber line (ADSL) access, and satellite technology with reliability, security, and ease of deployment and flexibility through VPN's, when required.

The State Government of Rio de Janeiro through the Center for Information Technology and Communication of the State of Rio de Janeiro (*Centro de Tecnologia da Informação e Comunicação do Estado do Rio de Janeiro: PRODERTJ*), has an improvement plan for the services related to both the continuity of the current INFORVIA.RJ, State Government of Rio de Janeiro Network, and the expansion of access points from current INFORVIA.RJ and incorporation of new services, featuring the new Government Network: INFORVIA.RJ 2.0 - IP Network Multi Services. INFORVIA.RJ 2.0 is designed to withstand even the new demands of applications such as distance learning (EAD), video conferencing and tele-medicine, and requirements of transmission of voice, data, and video seamlessly and in real time. INFORVIA.RJ 2.0 also has an important feature with respect to the current Government Network, to include the possibility of access to wireless networks and mobile networks, with the last mile technologies such as Wi-Fi and Wi-Max 4G , which are starting to become available on the market. INFORVIA.RJ 2.0 should be flexible enough to support other innovative technologies that will be made available to meet specific situations and meet the minimum requirements of the applications.





Source: PRODERJ HP

**Figure 2-162 Outline of Existing INFOVIA.RJ**

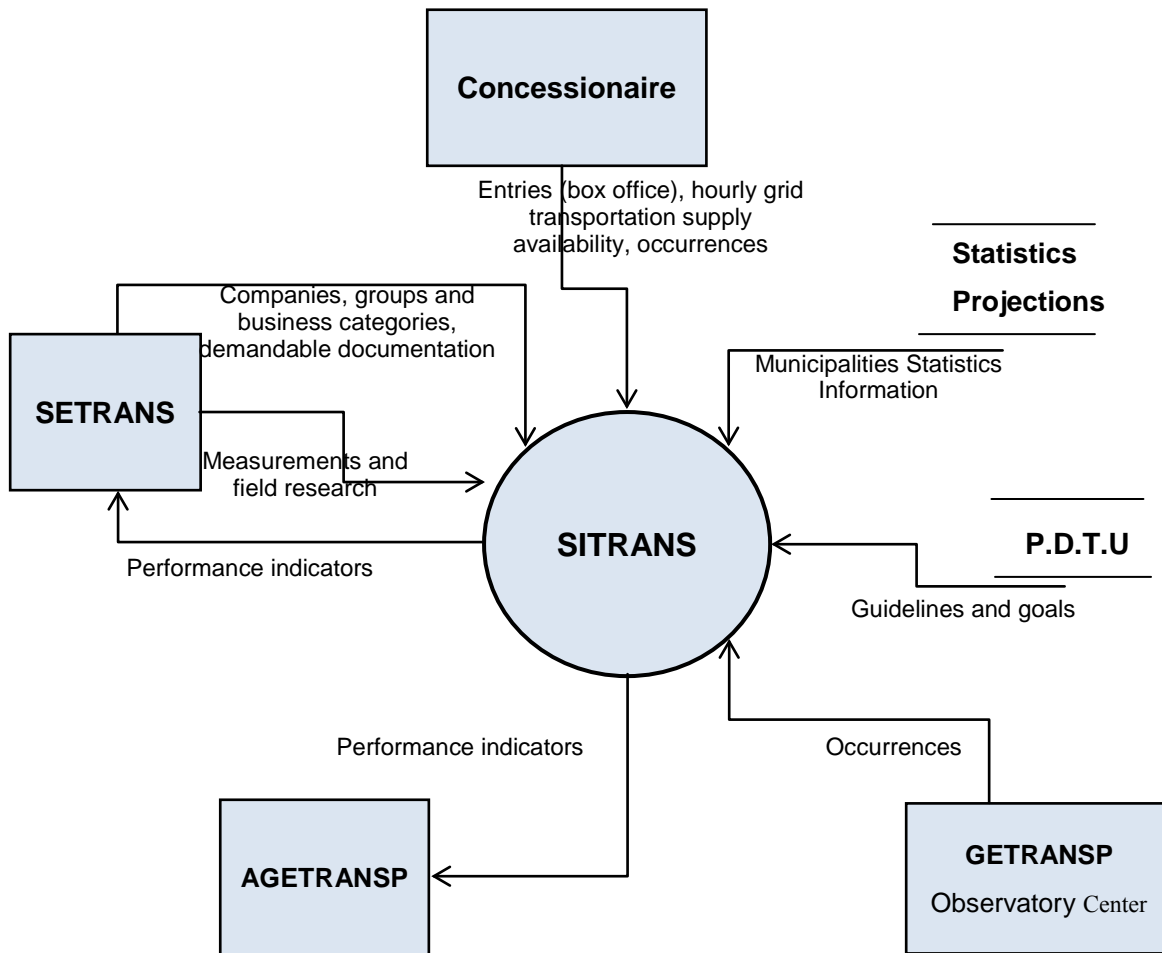
### 3) SITRANS

The AGETRANS has a main objective to monitor operational activities of the concessionaires such as Metro Rio, SuperVia, Barcas, Rota 116, and Via Lagos.

Monitoring is done through the use of private communication data lines that interconnect AGETRANS to concessionaires. These lines are metallic pair cables connected point to point and which transmit the information via Multiprotocol Label Switching (MPLS) system in encrypted form, scaled and contracted according to the amount of information at the moment, which capacity may increase when needed. Each concessionaire has a specific system of capturing images. The monitoring room relies on viewing and monitoring capabilities, both of the images captured in real time as much of the concessionaires as of stored analysis, enabling the application of concepts surveillance based intelligent indicators. These indicators are obtained through observation and analysis of the images, telemetry data, and information gathered by the inspection team of AGETRANS and/or systems provided by the concessionaires.

In order to improve the management from images received, the new Transport Information System (SITRANS) is in the implementation phase that will centralize all information received from each concessionaire on a single database. The system aims to create a computerized solution that provides a set of indicators of operational performance from a multi-dimensional database, to support the planning process of multi-modal transport, through a decision support tool and defining strategies, enabling SETRANS performance monitoring and quality of service provided by the concessionaires of transport.

The SITRANS is allowed to capture operational data of the concessionaires of public transport services for modalities such as metro-rail and waterways, operating in the state of Rio de Janeiro. With that verification, related indicators can be made as to the movement, timetable, and operational performance indicators not being utilized for passengers and events/incidents not systematized, as well as integration with specific seasons, such as input control (ticketing).



Source: SITRANS Presentation

**Figure 2-163 Context Diagram for SITRANS**

The application has a managerial module for decision support, generating reports, graphs, and performance indicators (see the following) and business, with an interface that allows its users a dynamic modeling and availability of information. The traceability of operations movements, and control changes are recorded in real time by data collection devices, including operator identification and date. The processes of data extraction by concessionaires/licensees should be automated so as not to allow tampering actions. All generated interfaces must be authenticated by a component to be provided by PRODERJ.

**Table 2-62 Example of Indicators**

| Indicators                           | Contents   |
|--------------------------------------|--|
| Regularity                           | Metering the percentage regarding scheduled trips and those taking place.<br>Represents the degree of fulfillment of the programming.  |
| Punctuality                          | Qualified measurement regarding the determination of time intervals corresponding to a delay. Denotes the degree of severity relevant to a given delay, observed between the actual and scheduled times of arrival at destination. E.g., delays 10' and 20' may be classified in distinct degrees of severity. |
| Suppression                          | Quantitative measurement involving compositions (trains) that were canceled in the places of origin.<br>Represent trains that stopped circulating as contained in the schedule.  |
| Cancellation                         | Quantitative measurement involving compositions (trains) that were canceled between places of departure and destination. Represents trains circulated without reaching their destinations.   |
| Interval between Trains on Rush Hour | Measurement of the time (minutes) between two corresponding consecutive starts of compositions of the source location.   |
| Operational Performance by Line      | Displays the values related to the amount of trips made in the period and the percentage of accomplishment versus targets set for each of them.  |
| IRIT                                 | Constancy of interval between trains<br>Measure the amount of intervals (in minutes) between successive trips of the same business line that occurred inside/outside the standard time range.  |
| ICPO                                 | Content of achieving the schedule from the offering.<br>Measurement percentage regarding scheduled trips that were made.   |

Source: JICA Study Team

(4) Related organization and standard in Brazil

1) ABNT

The ABNT was established in 1940, as a non-profit organization engaged in the preparation of national standards and to attend the International Organization for Standardization (ISO) as a representative for Brazil. ABNT launched an ITS committee and published the ITS architecture for Brazil as NBR ISO 1483-1 (Part 1) aligned with ISO 14813 in 2011 and is also under the preparation of ITS standards for Brazil refer to ISO ITS standards which authorized by ISO TC204.

2) CONTRAN

The National Traffic Council (*Conselho Nacional de Trânsito*: CONTRAN) was created in 1997, as the Brazilian Traffic Code, and has the responsibility of establishing regulations and guidelines of the National Traffic System. The body is chaired by DENATRAN and is also composed of representatives of the ministries of defense, environment, transport, cities, science and technology, education, health, and justice.

3) DENATRAN

The DENATRAN is the highest executive organization of administrative and technical autonomy, and has jurisdiction over the entire territory of the national traffic system in Brazil. The main objective is to monitor and enforce traffic laws and enforcement of standards and guidelines established by the National Traffic Council (CONTRAN). Moreover, the Department has the authority to oversee and coordinate the agencies responsible for controlling and monitoring the implementation of the National Policy on Traffic System.

The following two systems are regulated under DENATRAN.

**-SINIAV**

The SINIAV requires all vehicles (cars, motor cycles, trucks, etc.) to put Radio Frequency Identification (RFID: authentication technology using radio wave) on the license plate or window shield. Its purpose is to enable police to easily chase/locate stolen cars and cars used for burglary or theft. Under the system, it is said that data transmission is possible even when moving at 160 km/h, and traffic conjunction information can also be obtained. It is used for parking payment and ETC is also being discussed. However, use for ETC is considered difficult because another system has already incorporated in the ETC system. It requires all vehicles to be equipped with RFID by 2014. Any cars without RFID shall be fined R\$127. The system is under the jurisdiction of DENATRAN, the same as SIMRAV. The data transmission method used in SINIAV is 915MHz.

**-SIMRAV**

The SIMRAV was regulated by Law 121/2006 in 2006. It requires all vehicles to be equipped with a GPS chip when shipped from the factory after January 2012. The regulation was established as an anti-auto theft measure in response to arguments within Brazil in 2005 and 2006.

#### 4) NTCIP

The ANTT decided to adopt the Protocol National Transportation Communications for ITS Protocol (NTCIP), developed by the National Electronics Manufacturers Association (NEMA), in conjunction with the American Association of State Highway and Transportation Officials (AASHTO) and with the Institute of Transportation Engineers (ITE), which will regulate the use of equipment, systems, and ITS applications on federal highways granted in Brazil.

The NTCIP family of standards defines protocols and profiles that are open, consensus-based data communications standards. When used for the remote control of roadside and other transportation management devices, the NTCIP-based devices and software can help achieve interoperability and interchangeability. The transportation industry has a history of unique data definitions and proprietary communications protocols. Devices and systems from one manufacturer or developer tend not to interoperate with those of other manufacturers or developers. All too often, agencies were faced with having to deploy separate systems and communications for each manufacturer and each device type. Now, the NTCIP makes the interoperability of transportation systems and interchangeability of devices possible using standardized feature sets. NTCIP defines a family of general-purpose communications protocols and transportation specific data dictionaries/message sets that support most types of computer systems and field devices used in transportation management. Applications for NTCIP are generally divided into two categories, i.e., Center-to-Field (C2F) and Center-to-Center (C2C). Types of systems and devices supported by NTCIP are as follows:

##### **-Center-to-Field (C2F)**

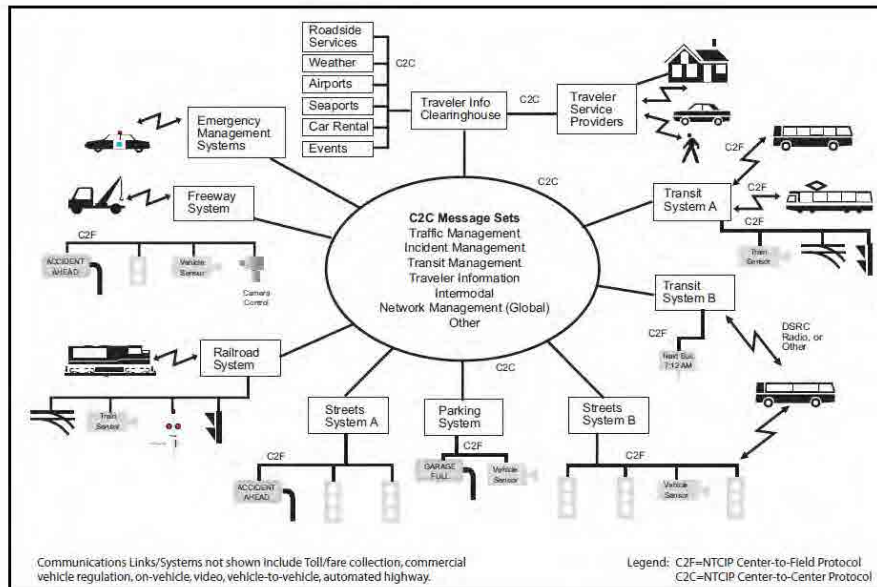
- Dynamic message signs
- Traffic signals
- Field masters (closed loop systems)
- Data collection and monitoring devices such as traffic counter, traffic classifiers, and weigh-in-motion stations
- On-board sensors and controllers
- Environmental sensors
- Ramp meters
- Vehicle detectors
- Closed circuit television cameras (camera control only)
- Video switches
- Highway lighting control

##### **-Center-to-Center (C2C)**

- Traffic management (freeway/surface street, urban/rural)
- Transit management (bus/rail/other)
- Incident management
- Emergency management
- Parking management
- Traveler information (all modes)



- Commercial vehicle operations regulation
- Any combination of the above



Source: NTCIP Guide

Figure 2-164 Examples of ITS Integration Using NTCIP

(5) ITS-Related Standard

There are hundreds of standards used in ITS crossing over all different types of equipment, system and transportation. To achieve the effective and full potential of ITS, the ability of different devices and components to exchange and interpret data directly through a common communications interface, is very important. And for the purpose of such ability, international ITS standards are discussed and developed with the ITS committee within the ISO.

But there are also regional standards to take into account, such as those of the European Committee for Standardization (CEN) for Europe and American National Standards Institute (ANSI), American Society for Testing and Material (ASTM), Society of Automotive Engineers (SAE) and others for the United States. The work group (TC204) was established to develop ITS standards in ISO and also work group (TC278) was established to develop ITS standards in CEN. And both work groups have been coordinating to work together to develop international ITS standard efficiently. The following chart shows the alignment of work groups between TC278 (CEN) and TC204 (ISO).

| CEN/TC 278   |  | ISO/TC 204   |  |
|--|--|--|--|
| - WG1 (Electronic Fee Collection)                                | - WG5 (Fee and Toll Collection)                                  | - WG7 (General Fleet Management and Com./Freight Operations) | - WG8 (Public Transport)   |
| - WG2 (Freight, Logistics and Commercial Vehicle Operations)     | - WG7 (General Fleet Management and Com./Freight Operations)     | - WG10 (Traveller Inform. Systems)                           | - WG9 (Integrated Transport Information, Management and Control) |
| - WG3 (Public Transport)   | - WG8 (Public Transport)   | - WG4 (Automatic Vehicle & Equipment Identification)         | - WG1 (Architecture)   |
| - WG4 (Traffic and Traveller Information)                        | - WG10 (Traveller Inform. Systems)                               | - WG3 (Database Technology)                                  | - WG14 (Vehicle/Roadway Warning and Control Systems)             |
| - WG8 (Road Traffic Data)  | - WG9 (Integrated Transport Information, Management and Control) | - WG16 (CALM)  | - WG17 (Nomadic Devices)   |
| - WG12 (Automatic Vehicle & Equipment Identification)            | - WG4 (Automatic Vehicle & Equipment Identification)             | - WG18 (Co-operative Systems)                                |  |
| - WG13 (Architecture)  | - WG1 (Architecture)   |  |  |
|  | - WG3 (Database Technology)                                      |  |  |
|  | - WG14 (Vehicle/Roadway Warning and Control Systems)             |  |  |
|  | - WG16 (CALM)  |  |  |
|  | - WG17 (Nomadic Devices)   |  |  |
| - WG14 (After Theft Systems for the Recovery of Stolen Vehicles) |  |  |  |
| - WG15 (eSafety / eCall)   |  |  |  |
| - WG16 (Co-operative Systems)                                    |  |  |  |
|  | - WG18 (Co-operative Systems)                                    |  |  |

Source: CEN Presentation September 2011

**Figure 2-165 Alignment of Work Groups**

Although the ITS standardization in the United States has been progressed by themselves, some of their activity and output is used as a reference to CEN and ISO. The following comparison table shows how each standard can cope with each application area. ISO (TC204) and CEN (TC278) cover almost all areas, but some standards cover areas partially and totally in the United States.

In Brazil, the federal government is adopting the NTCIP standard for their ITS system. NTCIP is specially standardized for Center-to-Field devices and Center-to-Center. There are no other areas to adopt the standard in Brazil and different types of communication protocol, which is contractor oriented and maker original, has been adopted for each project in Brazil so far.

**Table 2-63 Comparison of Standard and Application Area**

| Application Area             | ISO<br>(TC204) | CEN<br>(TC278) | US                | Brazil |
|------------------------------|----------------|----------------|-------------------|--------|
| Center to Center             | ○              | ○              | NTCIP, TCIP       | NTCIP  |
| Center to Field Devices      | ○              | ○              | NTCIP             | NTCIP  |
| Center to Vehicle            | ○              | ○              | TCIP              |        |
| Vehicle to Vehicle           | ○              | ○              | IEEE,ASTM,<br>SAE | -      |
| Vehicle to Field Devices     | ○              | ○              | IEEE,ASTM,<br>SAE | -      |
| Traveler Information         | ○              | ○              | SAE               | -      |
| Commercial Vehicle Operation | ○              | ○              | ANSI              | -      |
| Archived Data Management     | ○              | ○              | ASTM              | -      |
| Emergency Management         | ○              | ○              | IEEE              | -      |
| (Total Number of Standards)  | 137            | 115            | 86                | 33     |

○: Covered by ISO or CEN

ISO (TC 204): TC204 committee in ISO

CEN (TC278): TC278 committee in CEN

ANSI: American National Standards Institute

ASTM: American Society for Testing and Material

IEEE: Institute of Electrical and Electronics Engineers

TCIP: Transit Communications Interface Profiles

NTCIP: National Transportation Communications for ITS Protocol

SAE: Society of Automotive Engineers

The total number of standards is counted according to homepage as of November 2012.

Source: JICA Study Team