10.3 CURRENT CONDITION OF ITS IN THE DF

10.3.1 ITS-Related Agencies of the DF

(1) Outline of Government Organization and Hierarchy in the DF

1) Federal Government

The 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 interstate/international bus services and railway operation, and administer the federal roadways and railway concessionaires. The other federal roadways (no concession) are administered by DNIT which is also in charge of development of roadway, train, and port infrastructure.

The Instituto Nacional de Meteorologia (INMET) is the national meteorological agency in Brazil. The role of INMET is to collect and analyze weather information in South America and Brazil, and to provide weather forecasts based on those data to relevant agencies such as Civil Defense, SSP, Army, and Navy. The weather forecast information is available for the public on INMET's homepage.

Table 10-16 Federal Government Organization on ITS-Related Agencies

Federal Government Organization	Concessionaire/Private Company
ANTT	-
DNIT(Road)	-
INMET	-
Note: ITS-related organization/concessionaire/private companies which have information to be aggregated to the ITS Center are described in bold.	

Source: JICA Study Team

2) DF

Public transportation services in the DF are mainly handled by DFTRANS and METRO-DF. The DFTRANS is responsible for bus operations inside the DF. Interstate/international buses are managed by ANTT. The METRO-DF administers metro operation and management and issues the IC cards for the metro.

The DER manages state roads and its traffic flow with CCTV and OCR equipment. The DETRAN-DF manages local roads and regulates the traffic flow with OCR as well. It is also responsible for vehicle registration and licensing. Traffic signals are controlled by the private contractor SITRAN for state and local roads. Meanwhile, SETRANS-DF manages the maintenance of bus terminals.

The SETRANSP is the bus companies' syndicate which helps bus operators with bidding, support, and negotiation on their behalf. The SEPLAN collects and manages information storage from transportation-related agencies such as SETRANS-DF, METRO-DF, and DFTRANS.

The CIADE is an emergency dispatch center where emergency response notification is coordinated. The civil and military police, and firemen operate the center in cooperation with

DETRAN-DF. However, information and statistics collected by CIADE are not shared with other agencies on a regular basis. The CIADE is under the Public Safety Secretary (SSP).

Table 10-17 shows the DF government organizations and concessionaires/private companies related to the ITS sector.

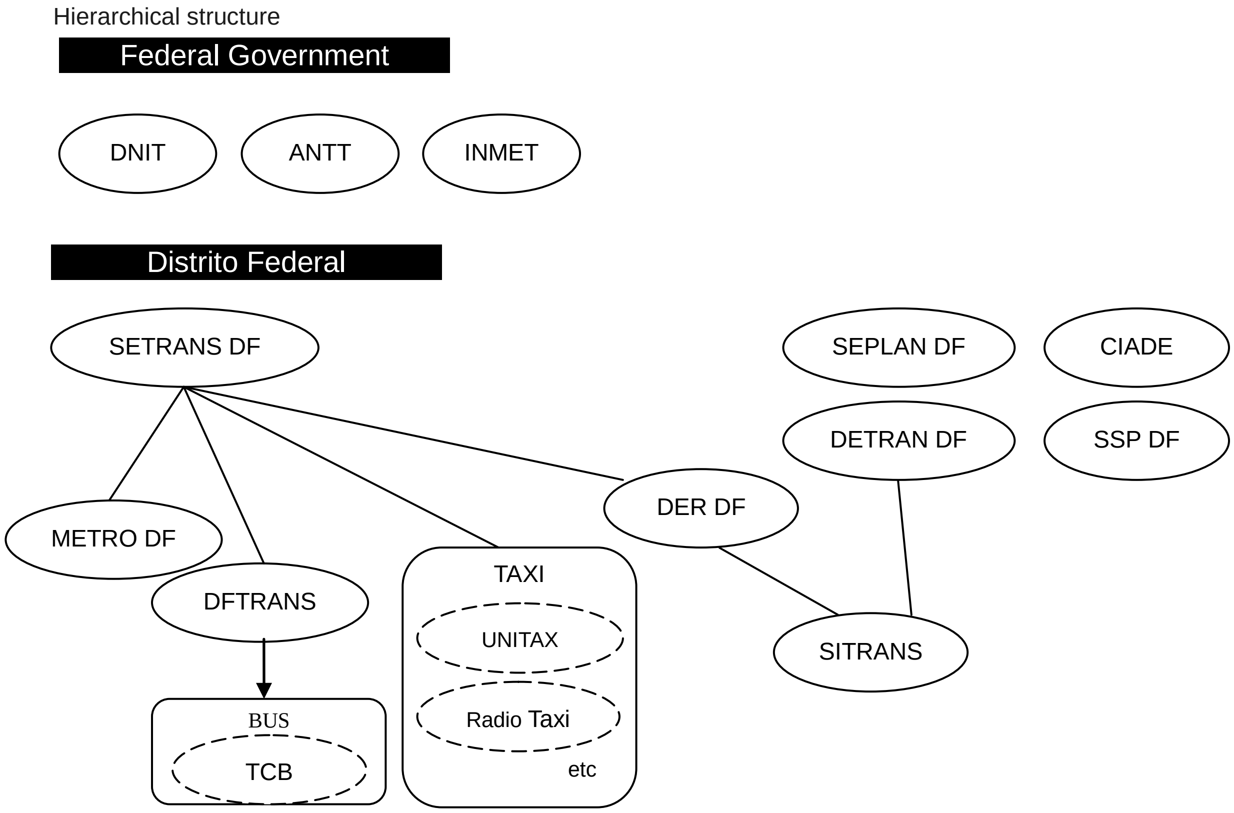
Table 10-17 DF Organization on ITS-Related Agencies

DF Government Organization	Concessionaire/Private Company
DFTRANS	**TCB, Private Bus Companies**
METRO-DF	
DETRAN-DF	**SITRAN-DF (Road)**
DER-DF	**SITRAN-DF (Road)**
SETRANS-DF	**Taxi Company**
SETRANSP	
SEPLAN-DF	
CIADE	
SSP-DF	
Note: ITS-related organization/concessionaire/private companies which have information to be aggregated to the ITS Center are described in bold.	

Source: JICA Study Team

3) Hierarchy of the ITS-related Agencies and Private Companies

The ITS-related agencies and private organizations are organized in the diagram shown below.



(2) Clarification of ITS-related Agencies and Responsibilities in the DF

The role of each agency is listed in Table 10-18.

Table 10-18 Role of ITS-Related Agencies

Category	Agencies	Role
Federal Government		
Transportation	ANTT	・ Institution of criteria for services of interstate/international bus operation concessionaires ・ Administration of interstate/international bus and rail way concessionaires ・ Monitoring performance of concessionaire companies of national highway and public transport operators
	DNIT	・ Administration of federal roads ・ Development of train and port infrastructure such as dredging and lockage
	INMET	・ Metrological observation ・ Metrological analysis ・ Weather forecast ・ Preparation of weather alert message
State Government		
Transportation	DFTRANS	・ Monitoring performance of bus system concessionaire companies ・ Planning and maintenance of bus stops ・ Operation of IC card charge
	METRO-DF	・ Operation and management of metro
	DER-DF	・ Administration of state roads ・ Road maintenance ・ Planning and implementing of project ・ Traffic regulation and fine collection
	SETRANS-DF	・ Policy making and permission for public transport service ・ Preparation of specification for concession contract ・ Operation and maintenance of bus terminals
	SETRANSP	・ Guide, support and advise in the bidding of bus concession for bus companies
	SEPLAN-DF	・ Data collection and data storage of several agencies ・ Maintenance of the DF Government Data Center
	SITRANS	・ Controlling traffic signal
Public safety	CIADE	・ Incoming information and taking action in emergency
	SSP-DF	・ Coordinating public security
Transportation Public safety	DETRAN-DF	・ Registration and licensing of vehicles and drivers ・ Traffic control and monitoring for local road

10.3.2 Current Condition of ITS Facilities

(1) Overall Condition

The ITS equipment and facilities deployed on the roads of the DF are summarized as follows:

1) Traffic Light System

This system controls traffic at the junctions/intersections in the DF. There are about 500 signalized intersections in the DF. About 200 signals are connected to SITRANS through metallic cable and modem for remote control. The remaining lights are manually controlled in-loco.

Photo: Traffic Light
Source: JICA Study Team

2) OCR Equipment

The OCR equipment measures and regulates traffic volume and speed. The measured data is utilized for traffic control and road management. It can also be utilized for calculating travel time and recognizing illegal vehicles.

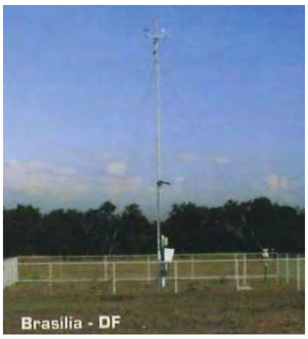
3) CCTV

Deployed CCTV systems capture images of state road conditions (DER-DF system) and metro station platform conditions (METRO-DF system) in real time. It is used for surveillance, traffic monitoring, and dispatch of agents when necessary.

Photos: OCR and Speed Radar
Source: JICA Study Team

4) Meteorological and Atmospheric Sensors

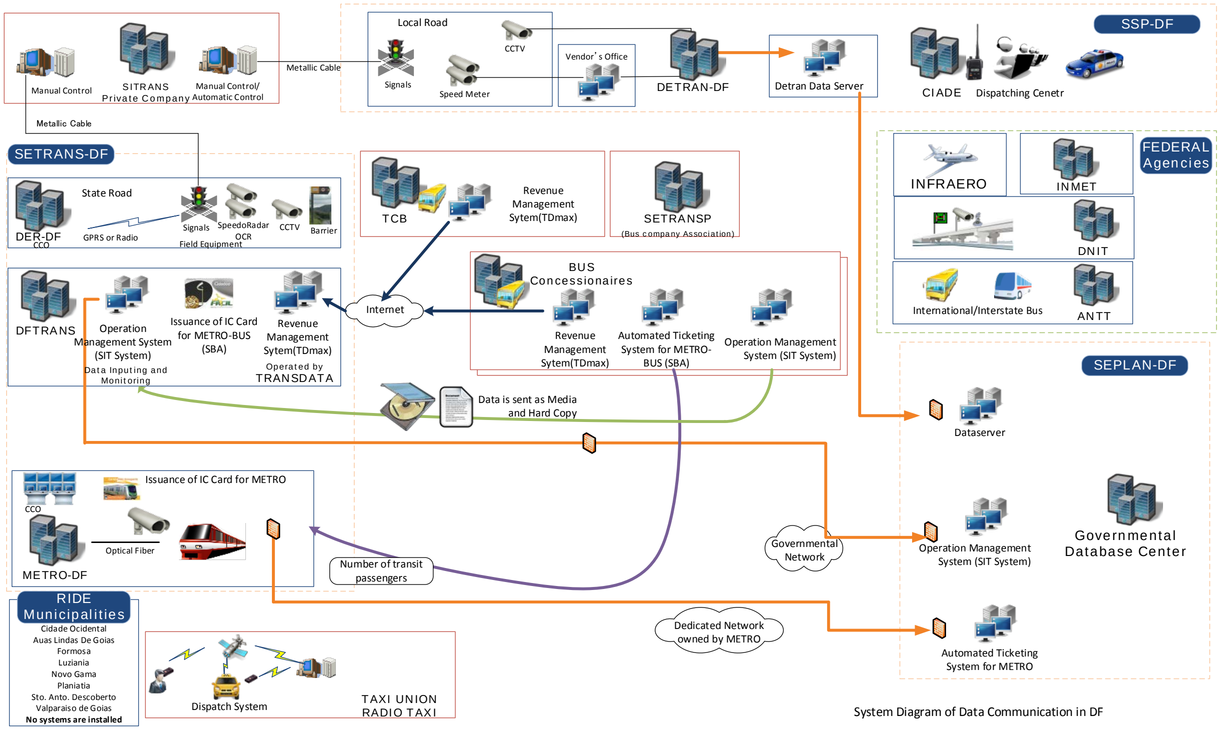
These equipmenst measure the weather conditions and atmospheric data and are used to provide weather forecasts and warning messages. The meteorological and atmospheric sensors are installed by INMET.



Picture: Station
Source: INMET Pamphlet

5) Overall System Diagram

Figure 10-62 is an overall system diagram, which shows the relation of the ITS-related agencies in the DF. Most agencies collect information traffic data such as volume, speed, and CCTV image, but do not integrate/share the information. It note that the traffic signal control in DF is done by a service provider (Sitran-DF) and provides the same data for the DETRAN-DF and DF-DER.



Source: JICA Study Team

Figure 10-62 Overall System Diagram

From the above system diagram, the information collected and distributed by ITS-related agencies are summarized in Table 10-19.

Table 10-19 Information Collected by ITS-related Agencies

Concessionaires/Agencies	Collected Information	Other Agencies to which Information is Distributed	Method
Federal Government			
DNIT	OCR/Speed meter	-	
ANTT	Operation information	-	
INMET	Meteorological information	Civil Defense, SSP, Public, etc	Telephone, E-mail, Internet
DF			
DFTRANS	Operation information	-	Internet
METRO-DF	CCTV Operation information	- -	Fiber optic
DETRAN-DF	OCR/Speed meter Signal	Police, Judicial System SITRAN	Hard copy (CD-R) Metallic cable
DER-DF	CCTV OCR/Speed meter Signal	- - SITRAN	Fiber optic Telephone Metallic cable
SEPLAN	Data collection	-	Fiber optic
CIADE	Emergency information	Civil Police, Fireman. Others	Telephone/Radio
SSP-DF	Basic security information		

Source: JICA Study Team

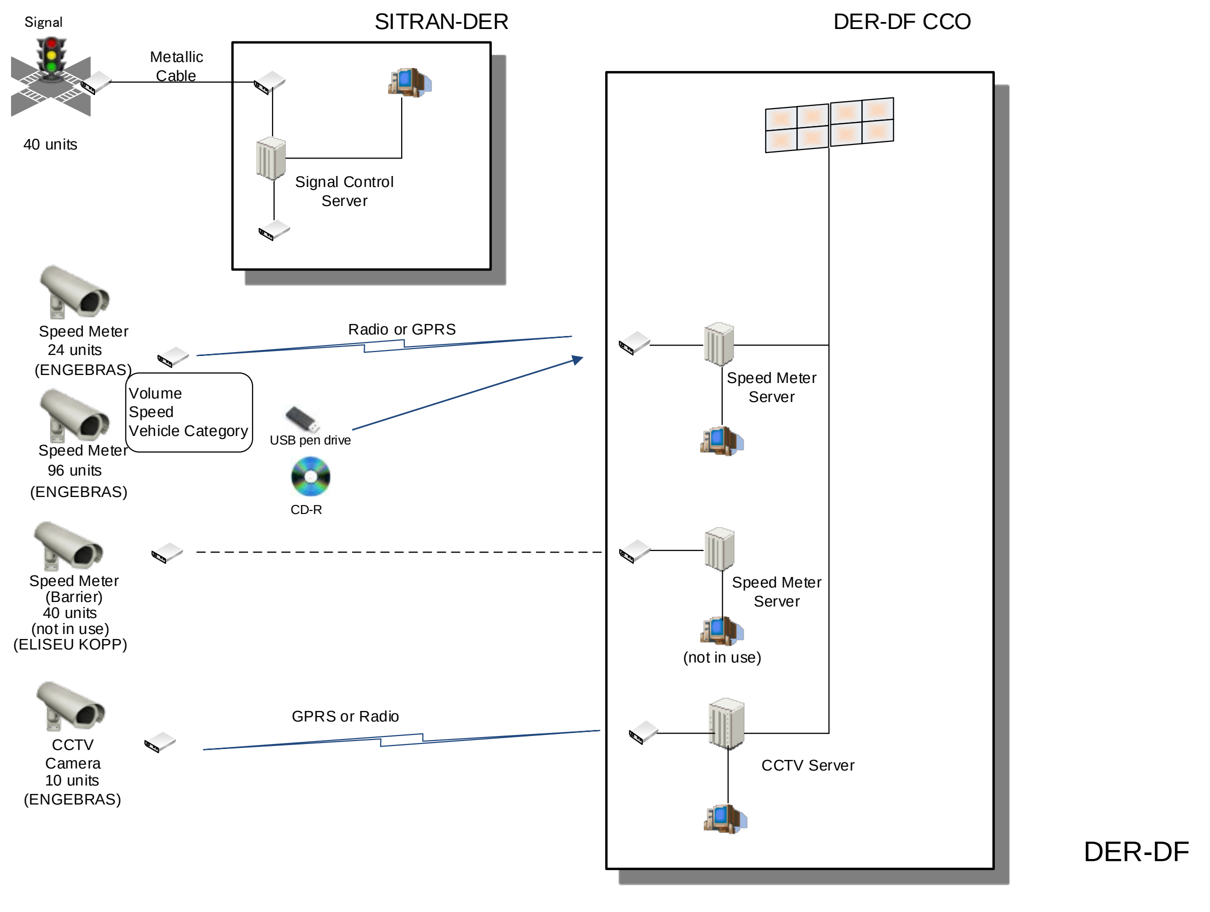
(2) ITS Diagram of Each Agency

Based on the interview with ITS-related agencies and data collected, the ITS diagrams of each agency were developed and summarized below.

1) Road Operator

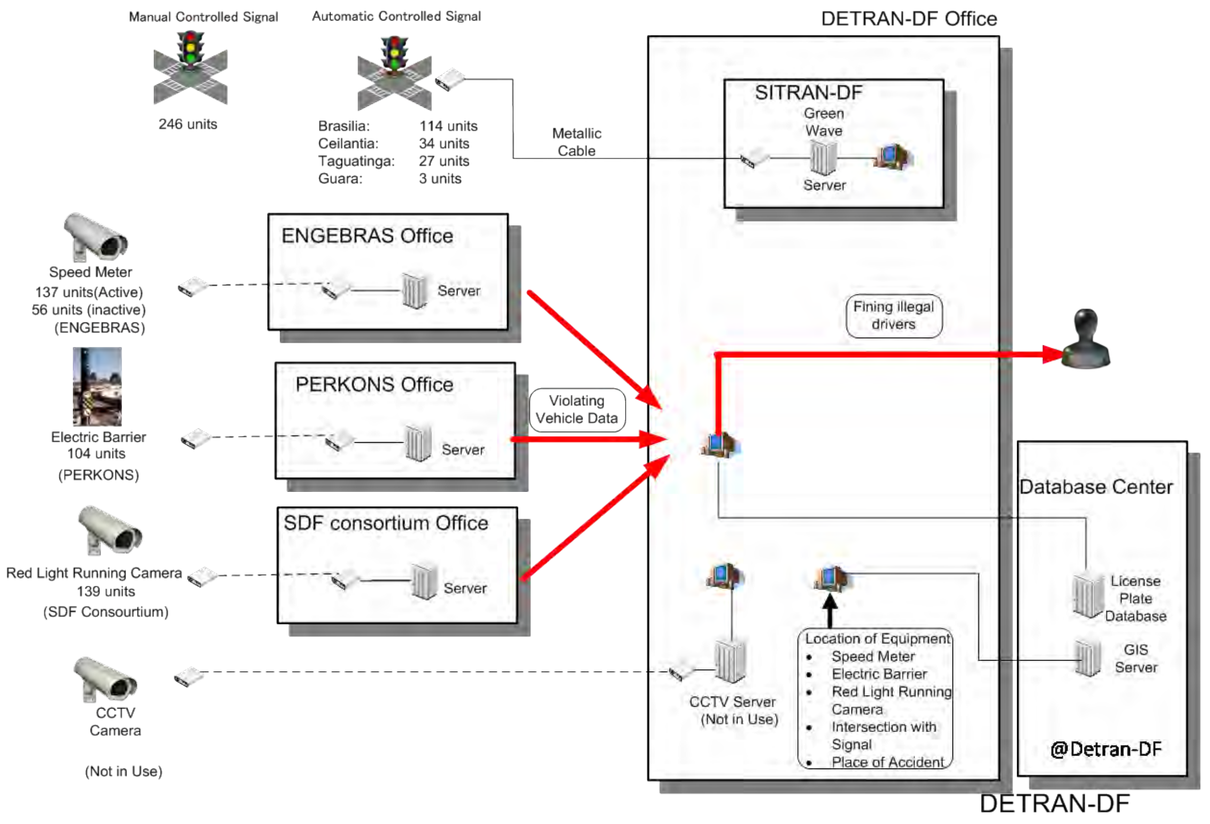
Name of Agency or Entity: DER-DF -State Road Operator -

Diagram



System Composition	1. Traffic Signal(maintained by SITRAN) 2. Speed Meter 3. Electronic Barrier	4. CCTV Traffic/Incident Monitor
Equipment	-Signal;40 -Speed Meter;120 -Electronic Barrier;40	-CCTV;10 -CCO;1
Inter-Connecting Other Systems	-Signals and OCR system are operated by private companies.	
Communication Network	Radio, GPRS, Metallic Cable	
Keys for Further Development	-Information exchange with other road operators is necessary to disseminate road network information to road users. -More traffic-related information shall be metered, collected, and disseminated to road users. -Meteorological observation equipment shall be installed at a certain interval.	
Keywords	**Information Exchange, Metering, Dissemination**	

Name of Agency or Entity: DETRAN-DF -Local Road Operator -		
Diagram		

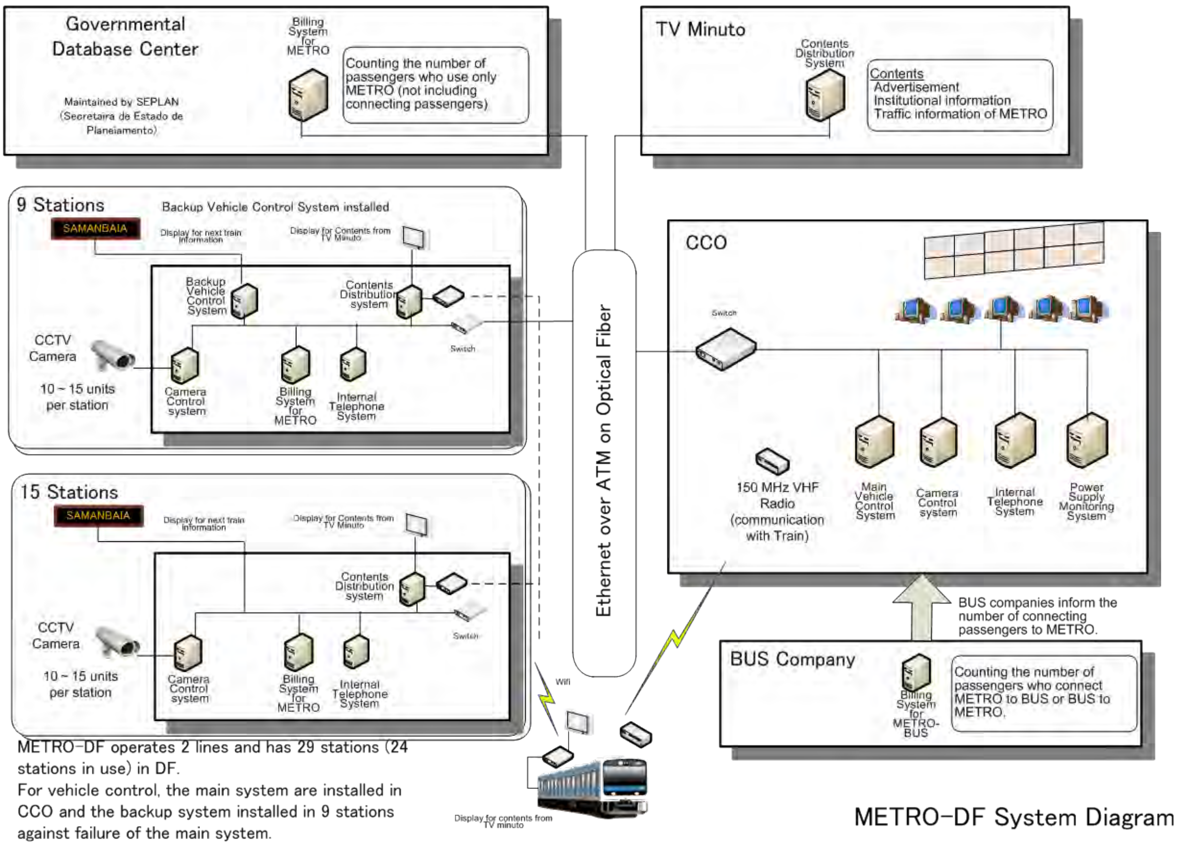


System Composition	1. Traffic Signal (maintained by SITRAN) 2. Speed Meter 3. Electronic Barrier	4. Red Light Running Camera 5. CCTV Traffic/Incident Monitor (Not in Use)
Equipment	-Signal; 246 (Manual), 178 (Automatic) -Speed Meter;137(Active), 56 (Inactive) -Electronic Barriers; 104	-Red Light Running Camera ;139 -CCTV; Not in Use -CCO; (Future Plan)
Inter-Connecting Other Systems	-Signal and OCR system operated by private companies. -Data of DETRAN-DF provides the police and the legal system	
Communication Network	Metallic Cable and Modem	
Keys for Further Development	-Information exchange with other road operators is necessary to disseminate road network information to road users. -More traffic-related information shall be metered, collected and disseminated to road users. -Meteorological observation equipment shall be installed at a certain interval. -CCO shall be developed for monitoring the road effectively.	
Keywords	**Information Exchange, Metering, Dissemination**	

2) Transportation

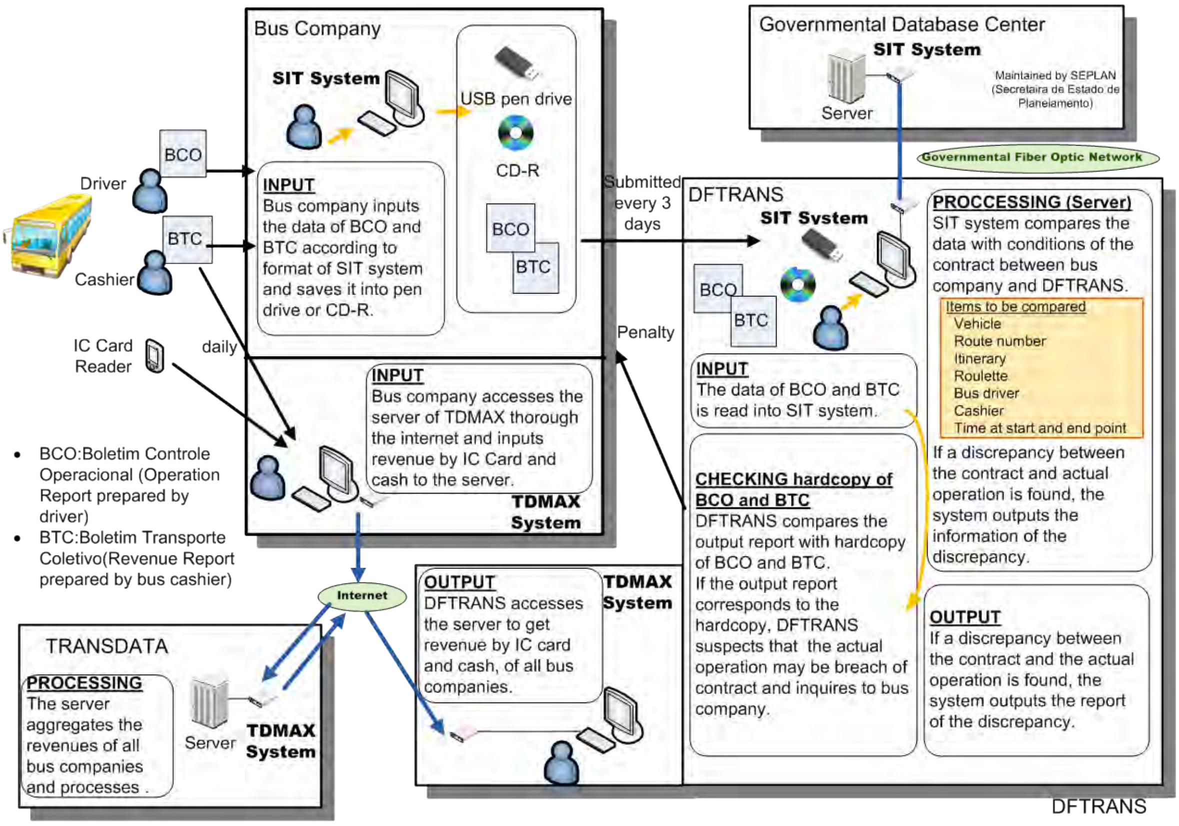
Name of Agency or Entity: METRO-DF -Subway Operator -

Diagram



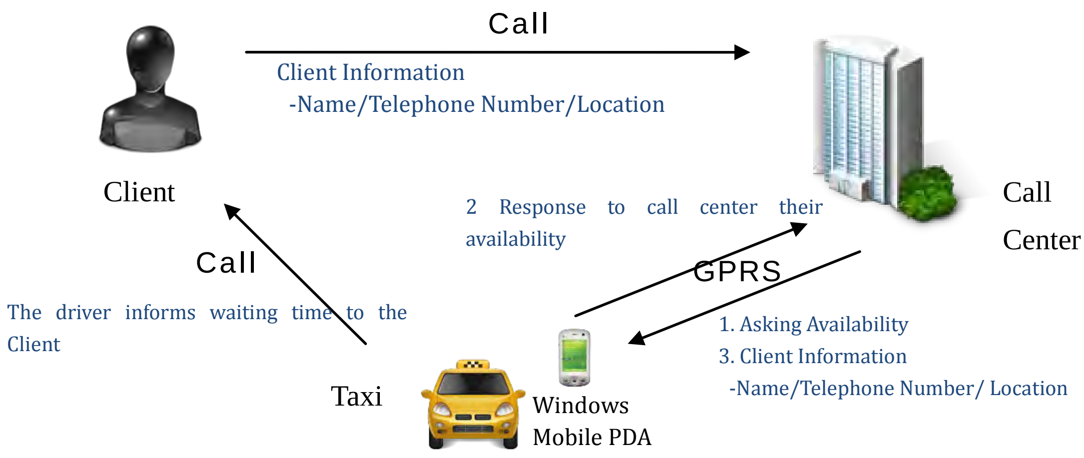
System Composition	1. CCTV security monitoring 2. Transit vehicle operation and control 3. Billing system	4. Electric power supply monitoring 5. Departure information 6. Dissemination of advertisements, institutional and traffic information
Equipment	-CCTV; 360 -Signals; -VHF Radio;-	-CCO; 1
Inter-Connecting Other Systems	-None.	
Communication Network	Fiber Optic, 150MHz Radio	
Keys for Further Development	-Installation of Train Approaching Information - Information exchange with other transit operators	
Keywords	**Information Exchange, Metering, Dissemination**	

Name of Agency or Entity: DFTRANS - Administrator of Bus and Taxi		
Diagram		



System Composition	1. Operation Management System(SIT System) 2. Revenue Management System (TDMAX System)	
Equipment	Display, Desktop	
Inter-Connecting Other Systems	-None	
Communication Network	Fiber Optic, Internet	
Keys for Further Development	- Improving input of operation data from driver. - Setting up on-line between DFTRANS and bus companies. - Integrating the operation management and revenue management systems.	
Keywords	**Automation, Integration**	

Agency or Entity: TAXI Services in the DF (Empresa Alvorada)	
Diagram	



AUTOCAB is a system for android smartphone/windows mobile based for automatic taxi dispatching system. The basic flow of the system is shown below.

1. Client calls for a taxi with their location and call center agent inputs location information in the AUTOCAB system.

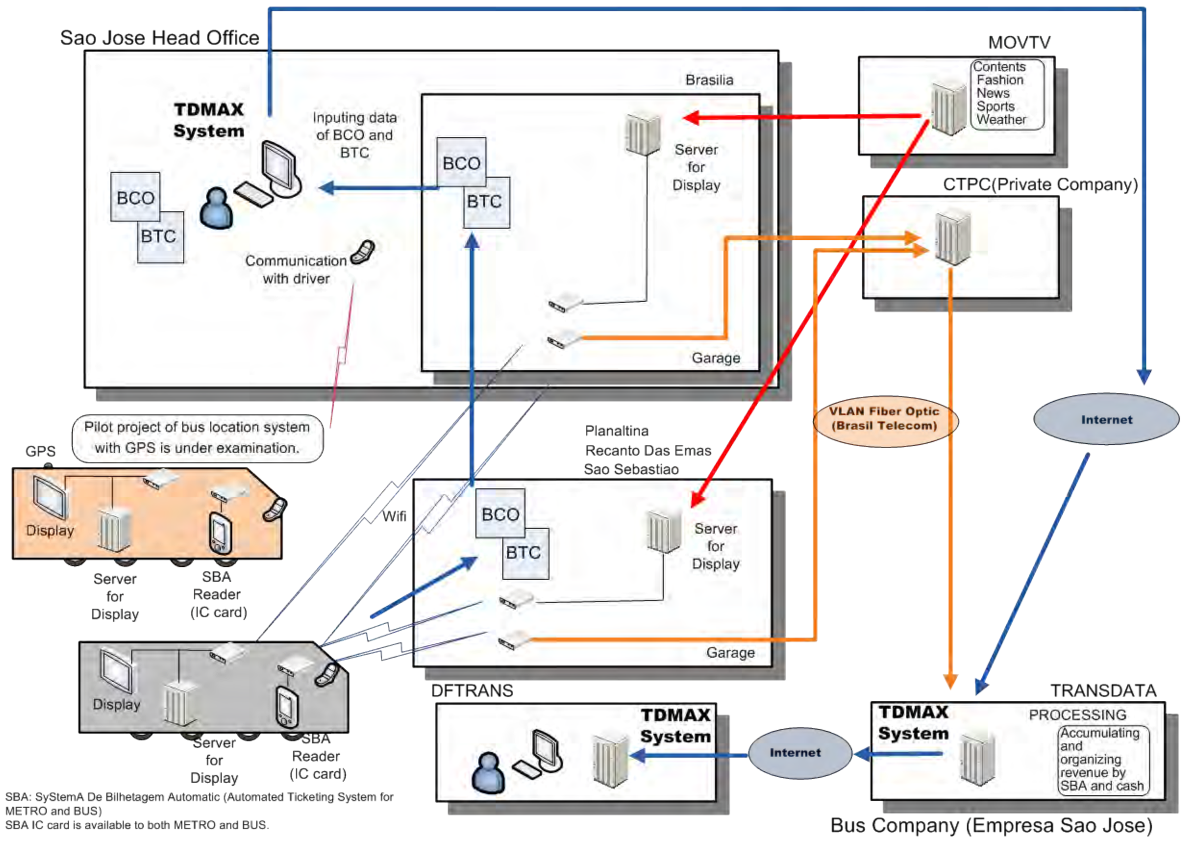
2. Call center agent asks availability of the nearest taxi from the client automatically via SMS.

3. Taxi driver responds to the call center agent his availability, if yes, call center agent send s client information to driver, if no; call center sends a request to second nearest taxi from the client.

System Composition	1. Taxi Dispatching System
Equipment	-Windows Mobile PDA/Smartphone; -Call Center -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**

Name of Agency or Entity: Bus Company (Empresa Sao Jose) -Inner City Bus Operator -

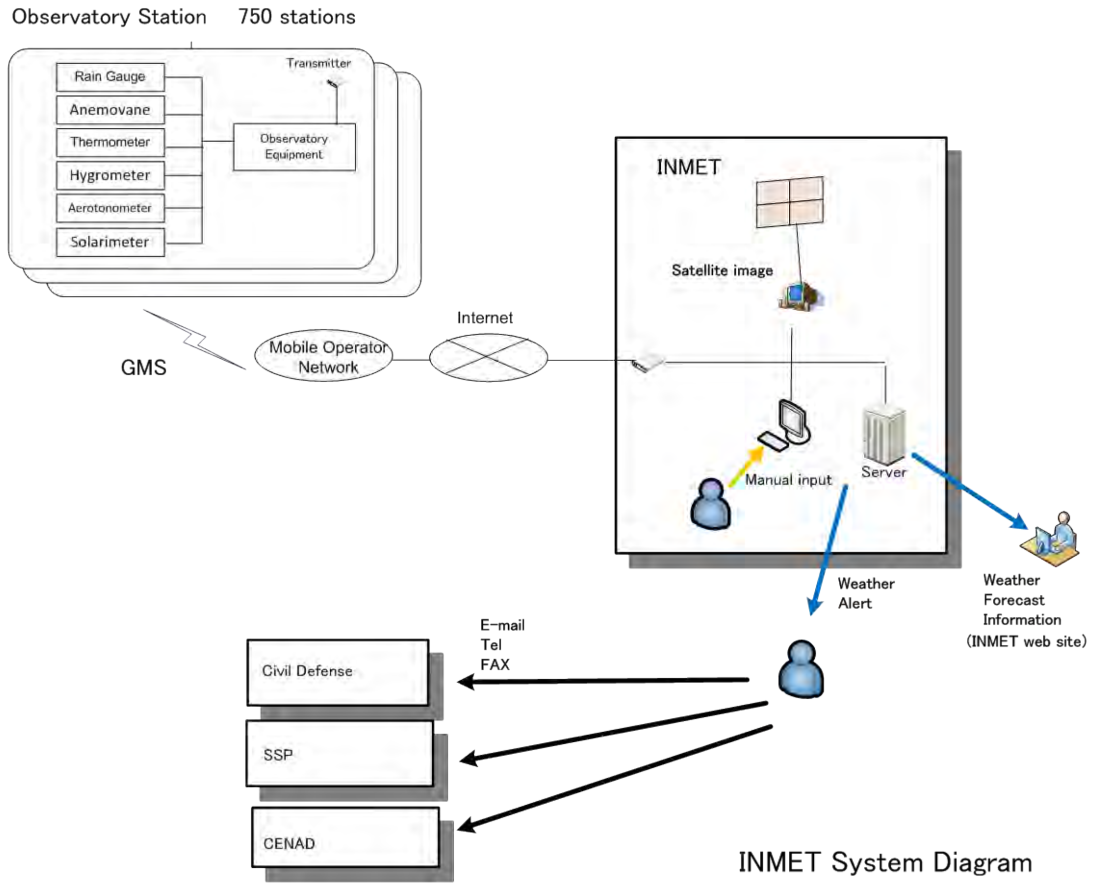
Diagram



System Composition	1. In-Vehicle Display Information Dissemination 2. Revenue Management System (TDMAX System introduced by DFTRANS)	
Equipment	Display, Desktop	
Inter-Connecting Other Systems	-Revenue and number of passengers are sent to DFTRANS through TDMAX system introduced by DFTRANS	
Communication Network	Fiber Optic, Internet, Mobile	
Keys for Further Development	- Next bus information shall be provided at important bus stops. - Next bus stop information shall be provided inside the bus. - Passenger counting is also important for user to avoid congested vehicle. - Fleet management system shall be introduced for effective operation. - Information exchange with other public transportation is important for supporting user travel.	
Keywords	**More Effective Information Provision, Automation, Integration**	

3) Other Agency

Agency or Entity: INMET	National Meteorological Agency-
Diagram	



System Composition	1. Weather Monitoring 2. Weather Forecasting
Equipment	Stations; 750 (-Rain gauge - Anemovane -Thermometer -Hygrometer – Aerotonometer -Solarimeter)
Inter-Connecting Other Systems	-INMET system gathers weather information via other agencies/countries website
Communication Network	GPRS/GMS, Fixed Line
Keys for Further Development	-Weather information shall be integrated into one database and server. - Weather information shall be shared with other agencies.
Keywords	**Integration, Information Exchange**

Source: JICA Study Team

(3) Issues of Existing Transportation and Transit Systems in the DF

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

1) No information exchange

Drivers should have road network information, such as travel time, congestion, closure of roads and construction work, to enable them to reach their destination in a timely and safe manner. However, there is no information exchange among road administration agencies and the driver has no knowledge on the situation or condition on the road ahead to his/her destination. In addition, although public transportation is used by many people in the DF, there is no information connection with and among public transportation operators. To improve public transportation service and to make it more convenient, the public transportation operators should exchange information with each other and provide other operators' information to users. This would make for smoother connections at the bus terminals, station terminals, and airports where much public transportation is congregated and would help shorten transit time of users.

2) No information provision

In connection with the above issue, provision of insufficient information is also noted. As per road traffic information, although there are sets of information collection equipment such as traffic counters and CCTV cameras on the road side, the collected information is not utilized effectively due to shortage 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 when they leave and how they could get to their destination easier.

3) Subsystem not integrated

A part of the agency has equipment, facilities, and systems to maintain its infrastructure or execute its obligations. 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. However, the information is displayed at each agency's separately built subsystem because the system is not integrated. In order to share information with other agencies, it is necessary to unify the information by putting it on the same map and in a common format.

10.4 PLANS IN THE DF

10.4.1 Traffic/Transport-Related Plan

(1) PDTU/DF

1) Summary

The PDTU/DF refers to the Master Plan for Urban Transport in the Metropolitan Region of DF approved in 2010. In this study, recommendations to improve individual and public transport systems were made and compared in terms of environmental impact, benefit for travelers, and investment cost. The final recommendations in the document will serve as a guide for the development of transport infrastructure in the DF and RIDE in the upcoming years.

The PDTU summary is shown in Table 10-20.

Table 10-20 Summary of PDTU/DF

Item	PDTU/DF	
Year of Formulation	2010	
Target Year	2010–2020	
Responsible Organization	SETRANS DF (State Government)	
Contents	Report 1	Analysis Information Raised
	Report 2	Socioeconomic and Land Use Characteristics
	Report 3	Characteristics of Transport and Mobility Inventory
	Report 4	Final Analysis of Information and Installation of Travel Matrix
	Report 5	Diagnosis of the Current Situation
	Report 6	Conclusion of Network Analysis and Diagnosis of Current Situation
	Report 7	Development Scenarios
	Report 8	Proposals for Immediate and Short Term Action
	Report 9	Completion of the Formulation of the Proposed Alternatives
	Report 10	Completion of the Selection of the Proposed Alternatives
	Report 11	Conclusion of Assessment of Selected Alternatives
	Report 12	Detailing the Selected Alternatives
	Report Final	Plan (Area, Transport System, Demand, Future Scenario, Alternatives, Simulation, and Evaluation)

Source: JICA Study Team

2) Aim

The goals of the PDTU/DF are the following:

> Improve general conditions of population movement in urban areas in the DF and surrounding areas,

> Develop actions in the short, medium, and long term, and

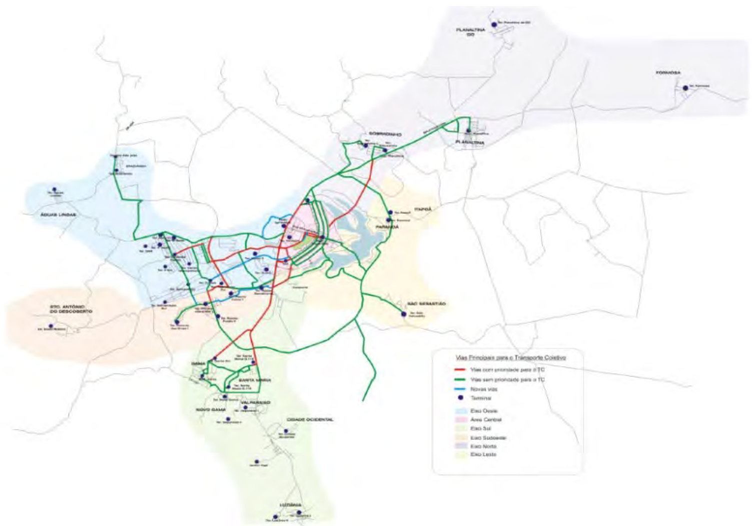
> Prioritize the desires and needs of the population.

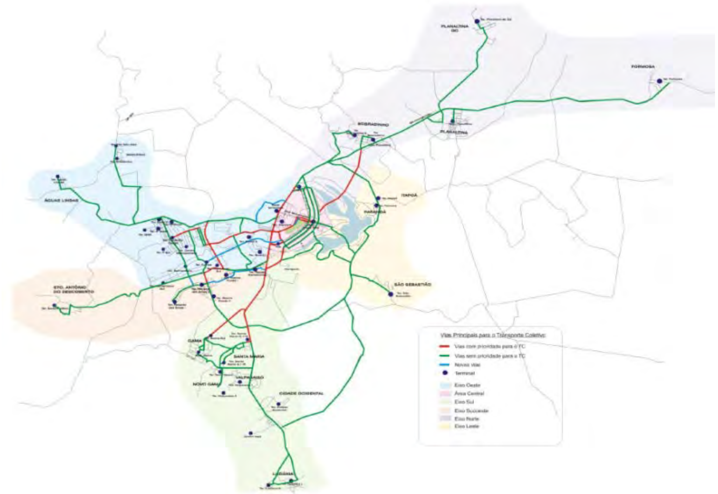
3) Considerations for the ITS Master Plan

The objective of an ITS master plan is to build the most effective investment plan for the transportation network in order to better manage the expanding transportation demand in the near future with ITS. Therefore, current conditions, assumption of demand estimation, ITS alternatives to address key issues and recommendations based on a cost-benefit analysis should be considered when formulating the ITS master plan.

[Cover page]

[Proposed alternatives]





Source: PDTU-DF

Figure 10-63 Example of PDTU Report

10.4.2 Urban Development Plan

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

1) Summary

The PAC is a four-year investment plan authorized by the federal government. The plan consists of nationwide projects in key development areas such as energy system, logistics and international transportation infrastructure, and high-speed traffic networks, which will be expected to accelerate the economy in Brazil.

To date, two PAC programs have been formulated by the government. The first PAC program was from 2007 to 2010 and PAC-2 started in 2011 with the target year of 2014.

Table 10-21 Summary of PAC

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

Source: JICA Study Team

Table 10-22 Summary of PAC2

Item	PAC
Year of Formulation	2011
Target Year	2014
Responsible Organization	Federal Government
Contents	Remaining Projects in PAC New Projects in order to prepare for: 2014 FIFA World Cup 2016 Olympic Games

Source: JICA Study Team

2) Aim

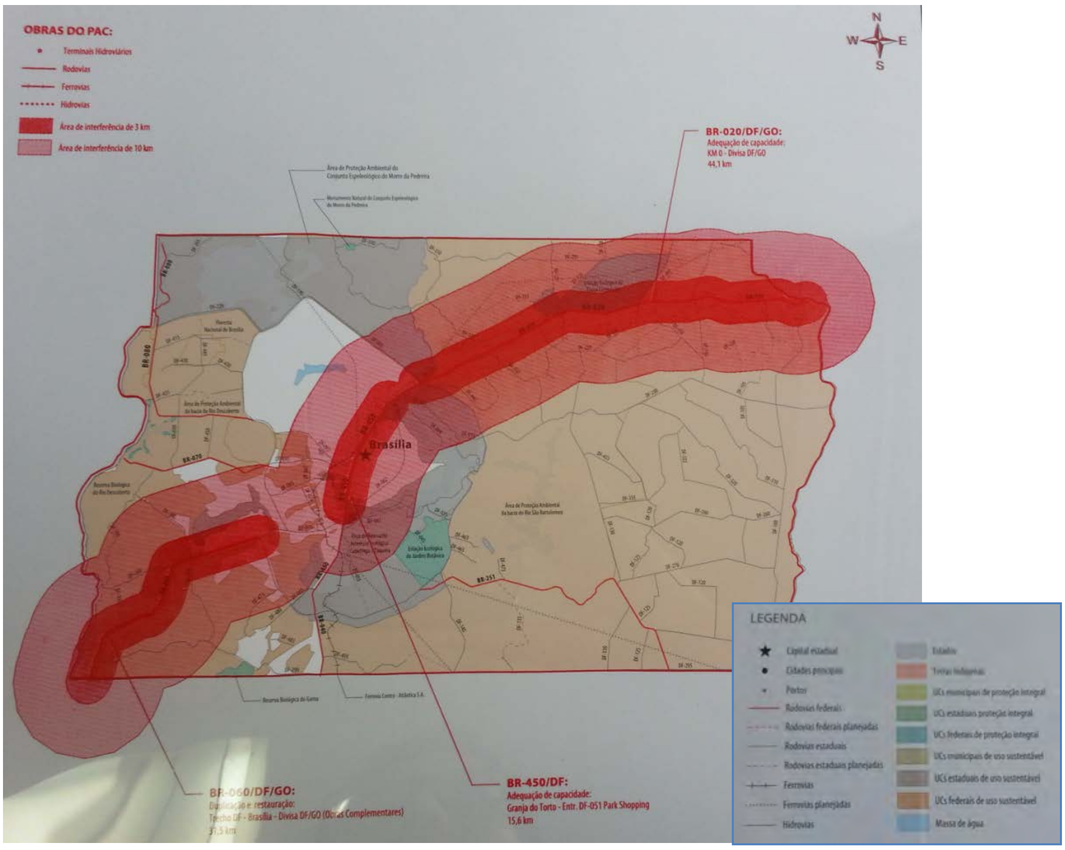
The PAC program aims to accelerate national economic development in Brazil, especially investments in PAC2 which are planned for the 2014 FIFA World Cup and the 2016 Olympic Games.

3) Consideration for ITS Master Plan

Projects authorized in the 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 DF]



Source: PAC2 Project

Figure 10-64 PAC2 Projects

(2) Multiannual Plan (*Plano Plurianual:* PPA)

1) Summary

This is the Multi-Year Plan of the DF 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 10-23 Summary of PPA

Item	PPA
Year of Formulation	2012
Target Year	2012–2015
Responsible Organization	Secretaria de Estado de Planejamento e Orcamento (DF Government)
Contents	PPA consists of > Strategic Objectives > Thematic Programmes and Specific Objectives > Budget and Actions Program contains plans to/for: • Reduce social inequalities, • Ensure an integral health care for citizens, • Public education, • Improve the quality of life, • Ensure public safety, • Developing economy, and • Performing an effective management, participatory, and transparent with citizens.

Source: JICA Study Team

2) Aim

The aims of this plan are listed below:

> To suggest plans and give answers for sustainable development of the DF;

> To solve the problems arising from the growth in the DF ;

> To transform city worldwide reference in Brasilia, capital of a true human development;

> To modernize public administration; and

> To achieve good quality in the provision of public services.

3) Consideration for the ITS Master Plan

Projects authorized in the Multiannual Plan (PPA) will be implemented during the horizon of the ITS master plan. Therefore, projects listed in the PPA should be considered as future conditions.

[PPA Cover]


GDF Governo do Distrito Federal

PLANO PLURIANUAL
2012 - 2015

ANEXO I: CONTEXTUALIZAÇÃO DO DISTRITO FEDERAL

[Program: Integrated Transport and Mobility]

<Objective>

Improve conditions for mobility and accessibility by implementing a modern transport system.

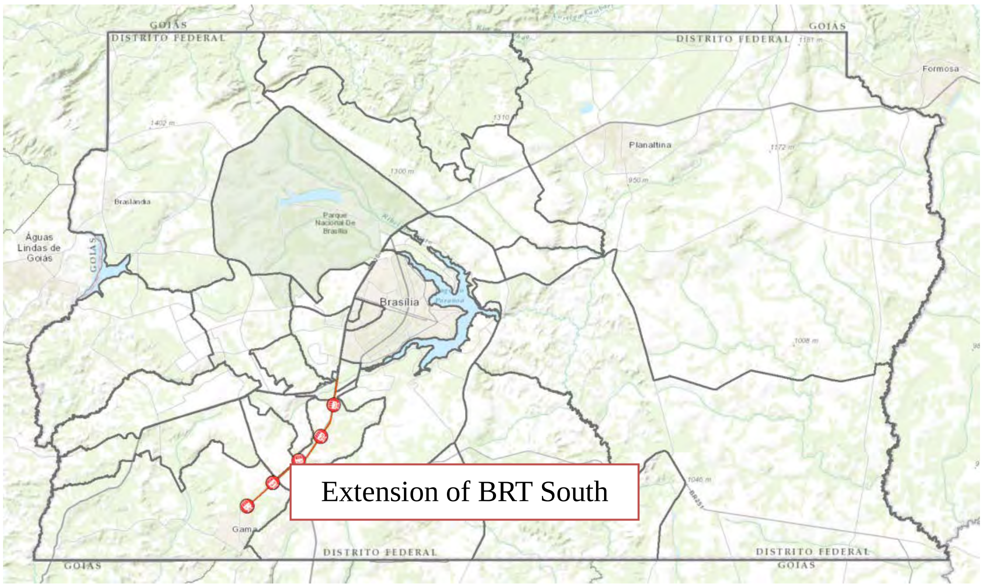
<Example of Specific Projects>

1. Deploy and maintain the infrastructure of roads.
2. Deploy and maintain the infrastructure of railways.
3. Develop and encourage the use of non-motorized modes of transport.
4. Ensure optimal traffic flow and road safety.
5. Provide the population of the DF with a public transport system with quality and efficiency, ensuring universal access, and comfort through the deployment of Intelligent Transport System (ITS).
6. Modernize individual and public transport, aiming services to the population with effectiveness, efficiency, safety, and quality.
7. Improve the management of transport services in order to provide the population safety, integration, and quality.

Figure 10-65 Example of PPA

(3) Future Public Transport Network

As future public transportation network, there are construction plans for 1) BRT, 2) LRT, and 3) extension of the Metro network. Each plan is shown in Figure 10-66 and Figure 10-67.



Source: JICA Study Team

Figure 10-66 BRT South

Source: Metro-DF

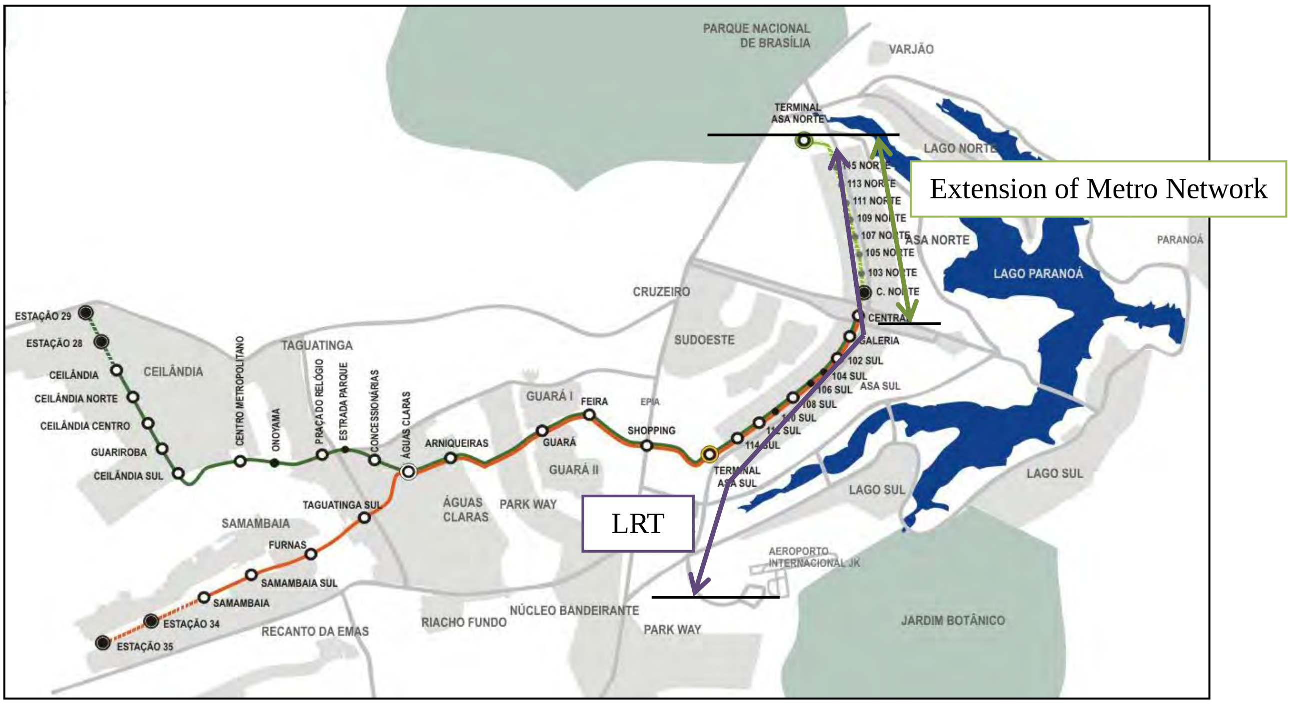


Figure 10-67 Network Extension of Metro-DF and LRT

10.4.3 ITS-Related Plan

Even though there are no concrete, comprehensive ITS development plans in the DF, there are other related plans in conceptual phase. The JICA Study Team reviewed several ITS-related plans, as summarized in Table 10-24.

Table 10-24 ITS-Related Plans

No.	Name	Summary	Owned by	Source
1	ITS Brasília – New Bus Management System		DFTRANS	Web/Open Tendering Document
2	Traffic Control Center at DETRAN-DF	DETRAN-DF requested to refurbish their traffic control center internally.	DETRAN-DF	Interview
3	ANTT Inter State Bus Monitoring Center on DF	ANTT wants to develop an interstate bus monitoring system	ANTT	Interview
4	ANTT Railway Monitoring Center	ANTT is planning to establish a nationwide railway monitoring center.	ANTT	Newspaper/Interview

The aforementioned plans are still in the conceptual phase. However, these plans reflect their needs and the direction for ITS development, which should be contemplated in the development of the preliminary ITS Master Plan of the DF.

All of the above plans are explained and summarized in the next section.

(1) ITS Brasília

1) Pre-Project Operational Control System (*Sistema Controle Operacional*: SCO)

System Functionality:

Travel and vehicle timetable, location of travel (route) and vehicles, historical operation line, travel time statistics, line dimensioning, monitoring offer, compliance route, landmarks, electronic fence, identification of supervisors , travel record results, called, panic button, over speed, frequency.

Technology/System Equipment:

- Geo-referenced Monitoring System (GPS/GPRS);
- Information for Users (Communication through Portal DFTRANS, mobile phones, through SMS and e-mail);
- Variable Message Signs-PMVs monitors (LCD) and displays (LED's);
- Trip computer/AVL with DVR (Digital Video Record); and
- Communication based on mobile networks (GPRS, GSM or 3G) and/or wireless networks in garages and terminals, or WI-FI 802.11 for collection of data.

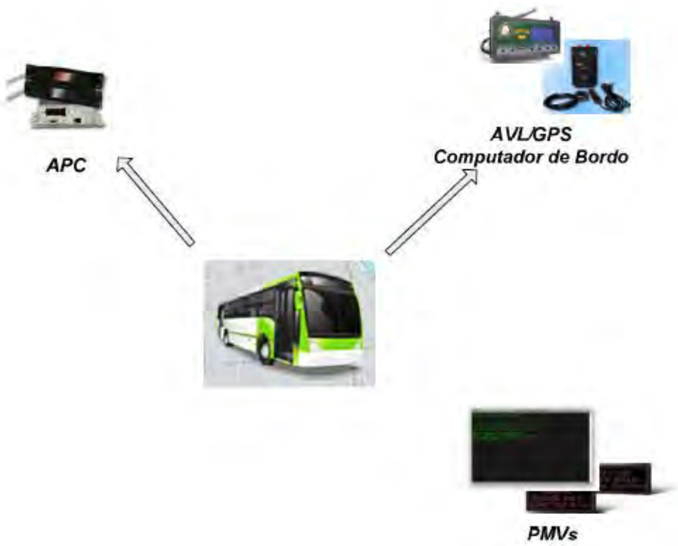


Figure 10-68 ITS Brasilia Communication Equipment

Time/Schedule:

From the approval of the contract bidding:

Executive project - 45 days

Top of implementation and operation - 105 days after the project

2) Pre-Project Automatic Ticketing System (in Portuguese SBA) - System and Marketing.

System Functionality:

General registrations, registration cards, inventory control, users extract, card issuance, card lock, card unlock, distribution card, maintenance card, request and issue of duplicate, statement of loss and theft, manager events, travel credit generation (or access), control of the distribution of travel credits for stations and sail point, control of orders for automatic recharge cards, accountability of boxes station of workstations and outlets, providing cash accounts of central control, collection and settling of accounts, control of integration and revenue distribution, control system centralized demand.

Technology/System Equipment:

- TDVMS Validator, of Smart Card Contactless Mifare Standard Technology (RF transceiver with an internal antenna, 2-door type RS232 and RS485 and USB-type)
- Ratchet electromechanical sensorized and locked;
- Integration with other billing systems through technologies in the database, XML for a Web Service;
- Stations and mini box stations (sail point) recharge card integrated into GDFNet;
- Modules of control and monitoring equipment validators and sell credits
- Portal WEB sales and electronic credits queries;
- Demand Control System;
- Validators Integration with Automatic Vehicle Location - AVL installed on tracked vehicles.

Time /Schedule:

From the approval of the contract bidding:
Executive project - 45 days
Top of implementation and operation - 210 days after the project

3) Pre-Project Transport Information System (in Portuguese SIT)

System Functionality:

Allows the control of operators, delegations, fleet, agents and operational infrastructure, record and consultation data for various charter services and tourism, control and the conduct of proceedings of infringement notices, electronic notification of operators receiving electronic resources, control lines, fundraising and operational control, access control, support for anti-pirating group, cost control and tariffs system and clearinghouse, document control, mobile inspection.

Technology/System Equipment:

Developed for Web environment without the need to install or update software or download files on the machines of users.

It must:

- Be compatible with the Internet Explorer browser, version 6.0 and Firefox version 3.0 and subsequent;
- Using the transport protocols HTTP and HTTPS;
- Using the communication protocol TCP / IP;
- Provide simultaneous access by the Web, an unlimited number of concurrent users;
- Possessing Electronic Signature in cases where the system requisite authorization records and data movement by authorized persons; and
- Must support the application servers Apache Tomcat, JBoss, IBM WebSphere and Oracle WebLogic.

Time /Schedule:

From the approval of the contract bidding:
Conception, Modeling and Migration - 90 days
Construction, Installation and Integration - 195 days after migration

(2) Traffic Control Center at DETRAN-DF

From stakeholder interviews, a new traffic Control Center (CCO) proposal was developed internally and is under evaluation. Follow-up interviews showed that there is no progress on the proposal approval due to budget constraints.

(3) ANTT Interstate Bus Monitoring Center

The ANTT's Plano de Outorgas calls for a new semi-urban (interstate) bus operation system with bus location provision and user information systems. In addition, a new CCO at ANTT is being planned to gather all the information being generated by the new semi-urban operation scheme. However, ANTT is still contracting consulting services to define the new CCO concept and systems. There is no anticipated date for implementation. Total cost is estimated at R$30 million.

(4) ANTT Railway Monitoring Center

A railway monitoring system (pilot project) was deployed in 2012 at ANTT for better control of railway concession services. The objective of the Monitoring Center is to verify rail schedule, cargo volume and operations in Brasil. The pilot project is currently deployed in Santos, Sao Paulo to verify operations towards the seaport of Santos. A CCTV and access to the concessionaires' monitoring system are provided.

CHAPTER 11 PRELIMINARY INTELLIGENT TRANSPORT SYSTEM MASTER PLAN FOR THE FEDERAL DISTRICT

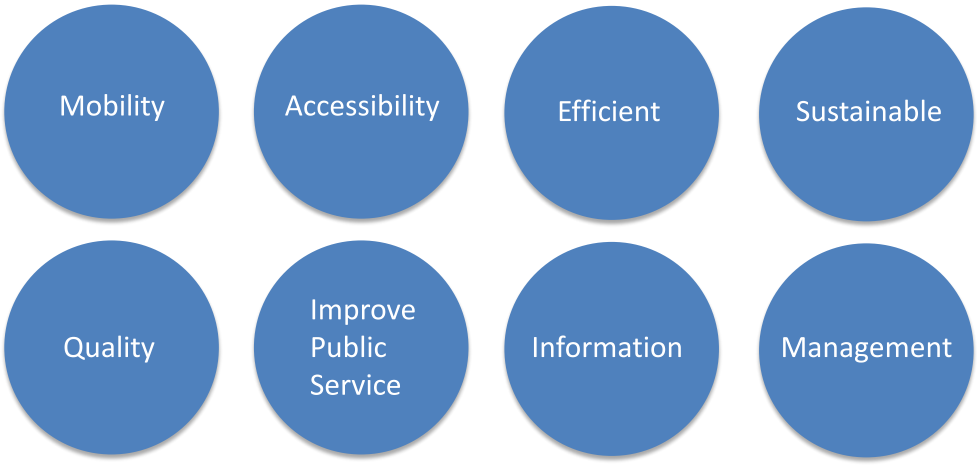
11.1 DEFINITION OF THE PRELIMINARY ITS MASTER PLAN DEVELOPMENT POLICY

The development of the intelligent transport system (ITS) master plan policy is fundamental for setting the grounds for specific ITS projects to be implemented in short- and long-term horizons. In addition, the policy development should be seen as a link between other related transportation plans, and integration and interoperability of transportation services for a more efficient system. The DF Preliminary ITS Master Plan policy aims to unify the guidelines of previous plans; therefore, the guidelines described on such documents were followed in developing the policy described herein.

The JICA Study Team revised and summarized the key aspects of the following documents in order to set the DF Preliminary ITS Master Plan policy:

- 2007 Urban Transportation Program for DF (Brasilia Integrada) - Infrastructure expansion and public transport improvements, such as BRT, VLT, and Metro financed by BID and the DF Government (US$246 million);
- 2009 Territorial Organization Master Plan (*Plano Diretor de Ordenamento Territorial*: PDOT) – This plan discusses urban mobility issues and transportation problems in the land use planning context;
- 2010 PDTU of the DF – The Urban Transportation Master Plan is the main document describing DF and RIDE transportation characteristics, issues, needs, and guidelines for a 10-year horizon, and the policy for development and investment in urban transportation;
- 2010/2011 ITS Brasilia – DFTRANS is reformulating and further integrating bus and mass transit system. Automated Ticketing System (SBA), User Information System, and Operational Control System (SCO) are the key components. These three systems will be integrated by an overall system interface named SIT; and
- 2011 ANTT Plano de Outorgas – The ANTT plan was created to comply with the 2010 PDTU guidelines and directions with regard to interstate bus transportation within the RIDE area. The plan attempts to reorganize routes and services in the form of new concessions.

The broad aspects related to transportation system planning from each document were extracted as shown in Figure 11-1.



Source: JICA Study Team

Figure 11-1 Essential Aspects of DF Transportation-related Plans

In addition to the review of transportation-related plans, the stakeholders' inputs during interviews were also considered during the development of the policy. Based on the information collected during the course of the project, the DF Preliminary ITS Master Plan policy was set as outlined below:

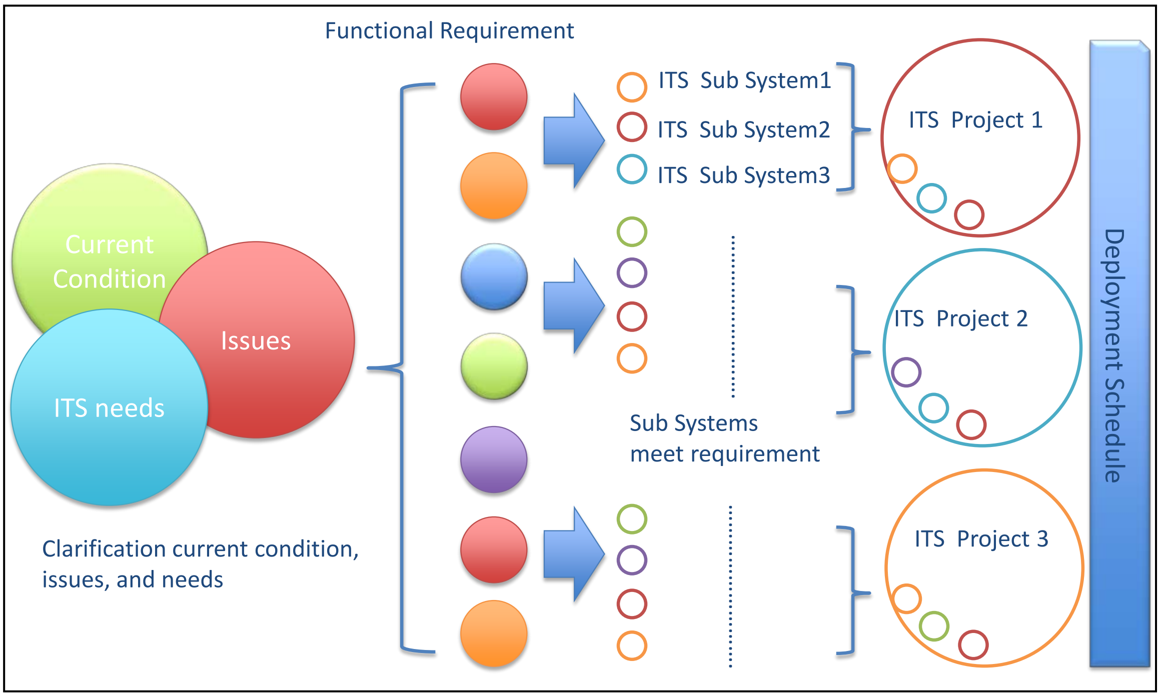
1. ***Promote efficient system mobility and accessibility to all users.***
2. ***Improve transportation system safety and security for all users.***
3. ***Enhance transportation system management and information dissemination.***
4. ***Improve transportation system integration and promote economic sustainability of DF and RIDE regions.***
5. ***Promote interagency cooperation to support better decision-making for regional planning and development.***

The development policy of the DF Preliminary ITS Master Plan shall include a wide range of perspectives, characteristics, and user needs to achieve sustainable development and efficient transportation system. Based on the policy outlined above, the components of the preliminary ITS master plan, such as functional requirements and conceptual design for ITS projects, were studied and described in the next sections.

11.2 CLARIFICATION OF FUNCTIONAL REQUIREMENT

11.2.1 Study Flow of Functional Requirements

To further develop the ITS projects needed to achieve the preliminary ITS master plan policy and goals, the JICA Study Team followed the framework illustrated in Figure 11-2 below.



Source: JICA Study Team

Figure 11-2 DF Preliminary ITS Master Plan Study Flow

Current conditions, issues, and ITS needs were developed and identified based on document review, interview with transportation stakeholders, field inspection, and related data collection. Each of these items was described in Chapter 10 and summarized below in Table 11-1. The needs were categorized into four categories, i.e.: “Institutional”, “System”, “Regional”, and “Traffic/Transport”.

These items were bundled and translated into “system functional requirements”. Such requirements are formal system specifications necessary to address the issues generated by the current conditions of regional, roadway, traffic and transportation characteristics, existing ITS systems, and stakeholders operations model. These are high-level specifications that set the ground for the development and implementation of the ITS projects, which are described in Section 11.3. The detailed system functional requirements and the matching subsystems are shown in Figure 11-3.

Table 11-1 Summary of Current Conditions and Needs

[Institutional]

Problems (Current Condition)	Needs
Fragmented road network among administrators	Agency interaction/exchange of information in real time
Separated transportation system among operators	Agency interaction/exchange of information in real time
Lack of standards and procedures	Develop unified methodology for data collection and decision-making
Lack of data and procedures for trip generation analysis	Better data and traffic forecast tools

[System]

Problems (Current Condition)	Needs
No user information	Promote information dissemination in real time
Shortage of traffic/transportation information provision equipment	Develop information provision equipment
No data exchange/cooperation among agencies	Integration/collaboration interface
Outdated traffic management system	Improve/promote management systems and upgrade internal processes

[Regional]

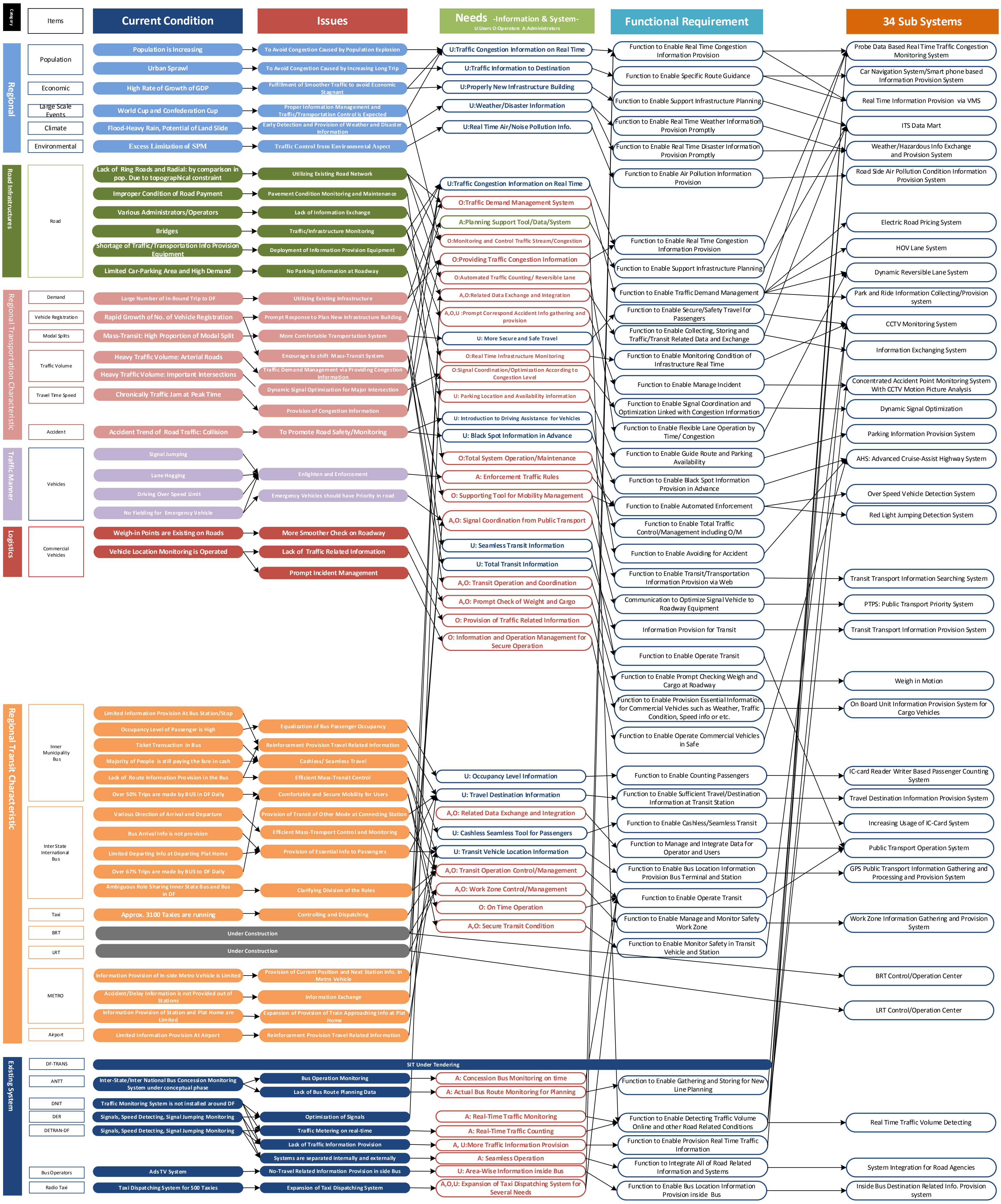
Problems (Current Condition)	Needs
Population increase and sprawl	Traffic congestion information and information to destination
Risk of natural disaster	Weather/disaster monitoring
Excess limitation of SPM	Real-time air/noise pollution information
Increasing auto fleet	Incentives for public transport use

[Traffic / Transport]

Problems (Current Condition)	Needs
Heavy traffic volume on arterial roads/ Peak period overcapacity	Promote smooth traffic/traffic congestion information/traffic demand management
RIDE area transportation needs coming to DF	Promote integration of interstate services and systems
High proportion of mass transit	Secured and safe transportation system/provide transportation condition information
High rate of fatal accidents	Improve safety/traffic monitoring
High parking demand	Parking management/parking information

Source: JICA Study Team

11.2.2 Functional Requirements Diagram



Source: JICA Study Team

Figure 11-3 DF System Functional Requirement Matching Diagram

11.3 CONCEPTUAL DESIGN FOR ITS PROJECTS

11.3.1 Study on Essential ITS Projects for DF

For the development of the conceptual design of ITS projects described in this section, the following three perspectives are considered:

1. Policy of the Preliminary ITS Master Plan
2. Current conditions and issues
3. ITS needs

Based on the system functional requirements and detailed analyses of the three items above, the keywords for the development of the ITS field in DF are the following:

1. User information
2. System integration
3. Data collection and provision
4. Technology implementation
5. Interagency cooperation

Moreover, the conceptual design also considered the existing and planned* ITS systems in DF. The design development took into account the current stakeholder systems shown in Table 11-2.

Table 11-2 Current Stakeholder in ITS Systems

Stakeholder	Current ITS
DNIT	Concession of OCR equipment on federal highways
DER-DF	CCTV and OCR equipment being monitored Concession of OCR equipment on state roads
DETRAN-DF	Limited traffic signal control capabilities Concession of OCR equipment on local roads
METRO	CCTV, vehicle location, system operation, and schedule
DFTrans	IC card deployed in bus system and metro stations DFTRANS needs paper records to validate operations and revenues *New system with bus location, operation control, user information, and automated revenue collection is being tendered
Private Taxi Dispatch Center	GPS system in vehicles. AUTOCAB software used to manage phone calls and fleet
SSP-DF/CIADE	Existing integrated emergency dispatch center for fireman, civil and military police, and civil defense. *New system with CCTV integration and full GPS location/dispatch is being planned.

Source: JICA Study Team

11.3.2 Conceptual Design for ITS Projects

(1) System Organization

As a result, 34 subsystems were selected and grouped into five subcomponents, namely: 1. Database/Data Processing (1 subsystem); 2. Information Exchange/System Integration (6 subsystems); 3. Information Provision (10 subsystems); 4. Traffic Monitoring/Control, Public Transport Monitoring/Coordination, and Concessionaire Operation Monitoring (13 subsystems); and 5. Traffic Demand Management (4 subsystems). These subsystems are shown in Figure 11-4.

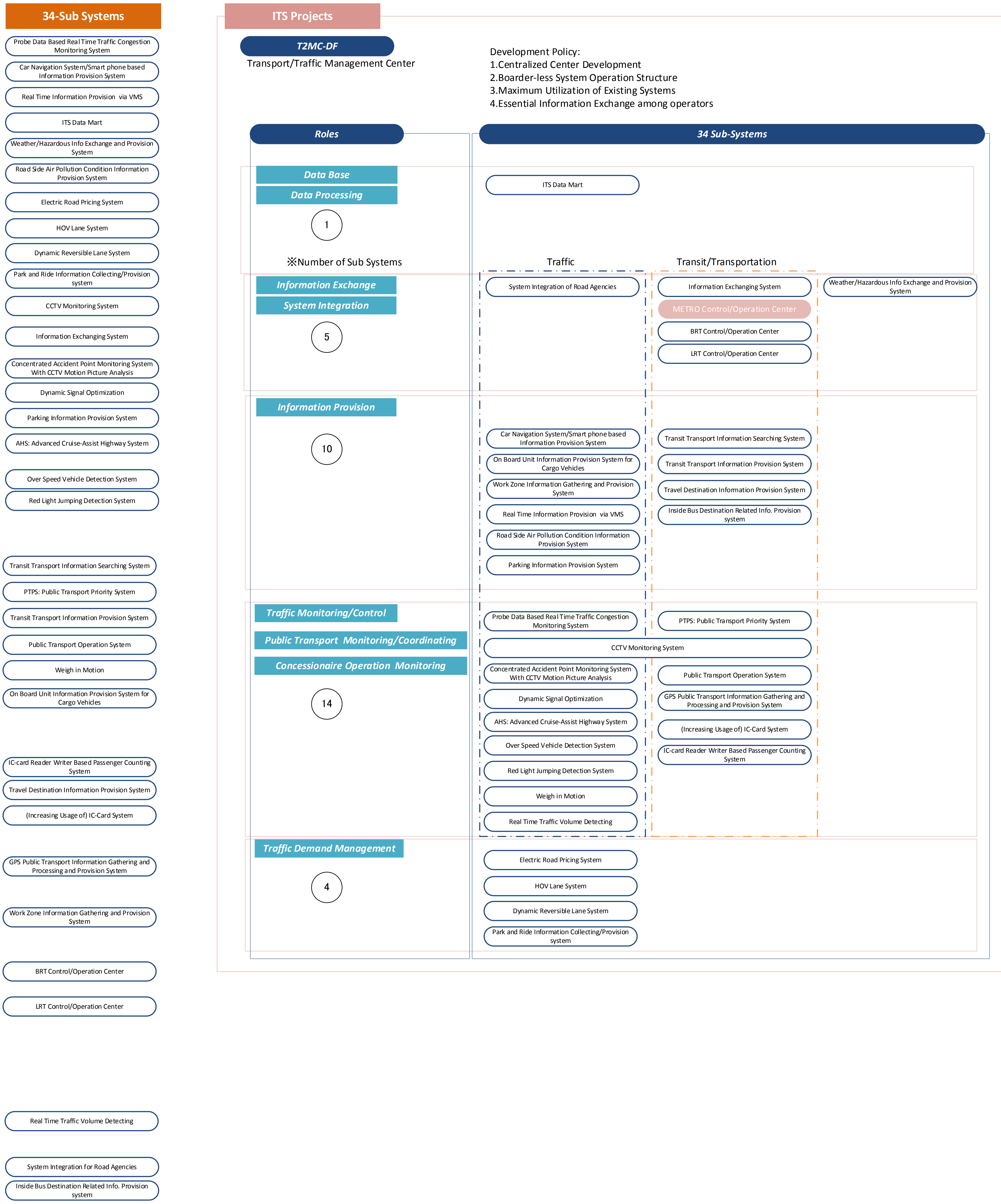
The abovementioned five subcomponents should then be deployed into one regional Traffic/Transportation Management Center (T2MC-DF). The deployment should be stepwise and divided into three phases as follows:

- Visualization Phase (Short term): The short-term goal of T2MC-DF is to visualize the current traffic/transportation conditions in real time. Existing system utilization, information exchange, and cross jurisdictional cooperation system agreements are the core components. In this phase, coordination among DNIT, DER, DETRAN-DF, DFTRANS, METRO, and the weather monitoring agencies is essential.

- System Expansion Phase (Medium term): The medium-term goal of T2MC-DF is to expand the ITS-related traffic systems such as CCTVs, traffic volume detection, speed detection, dynamic signal optimization system, and VMS. Mass transit systems are also considered such as operation center, GPS monitoring system, and concessionaire report generating system. In this phase, more advanced communication/information systems are deployed such as public transportation priority system, information provision system, and real-time congestion communication with car navigation system.

- Traffic Demand Management Phase (Long term): The long-term goal of T2MC-DF is to control traffic demand by deploying real-time control systems. These systems will be developed on top of the existing systems already developed in previous phases. High occupancy vehicle (HOV), electronic road pricing (ERP), park and ride provision, and dynamic reversible lane system are the systems that will compose the final phase of the T2MC-DF.

The overall system organization and concept assumed the following development context: (i) maximum utilization of existing systems, (ii) essential information exchange among operators, (iii) centralized center development, and (iv) seamless interstate (RIDE area) system operation structure.

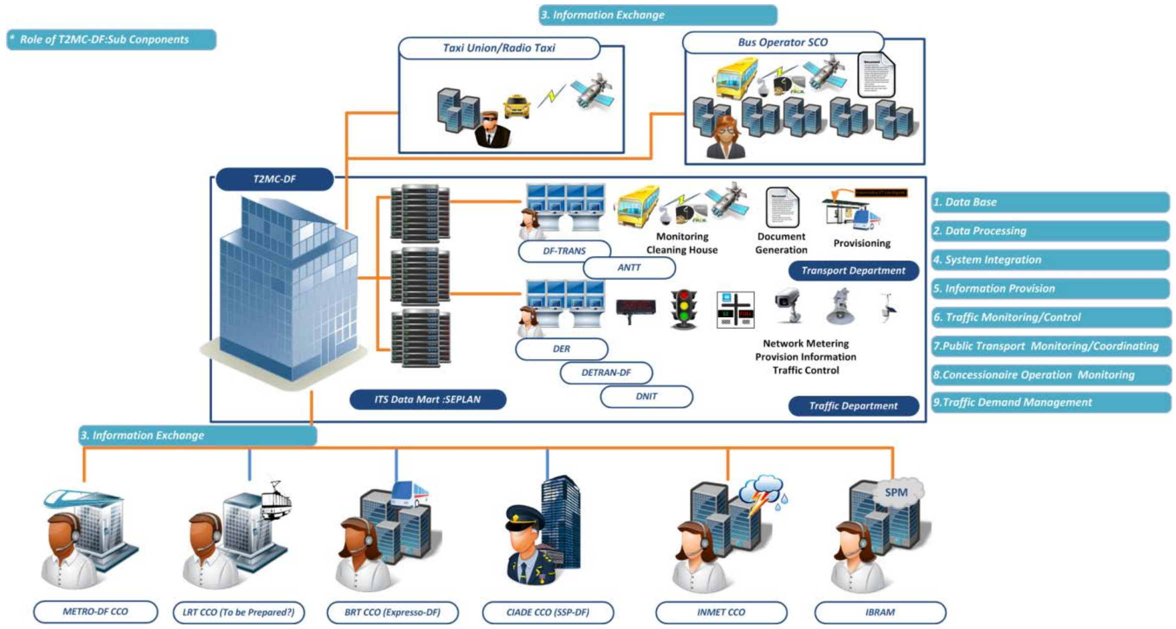


Source: JICA Study Team

Figure 11-4 DF ITS Subsystems Organization

(2) Conceptual Design Diagrams

<table>
<tr><td>ITS Project Name</td><td>1. T2MC-DF: Transport/Traffic Management Center of DF</td></tr>
<tr><td>Objectives</td><td>To achieve a centralized traffic/transport management development.
To establish a borderless system operation structure.
To maximize existing systems.
To exchange essential information among agencies and operators.</td></tr>
<tr><td colspan="2">Graphic



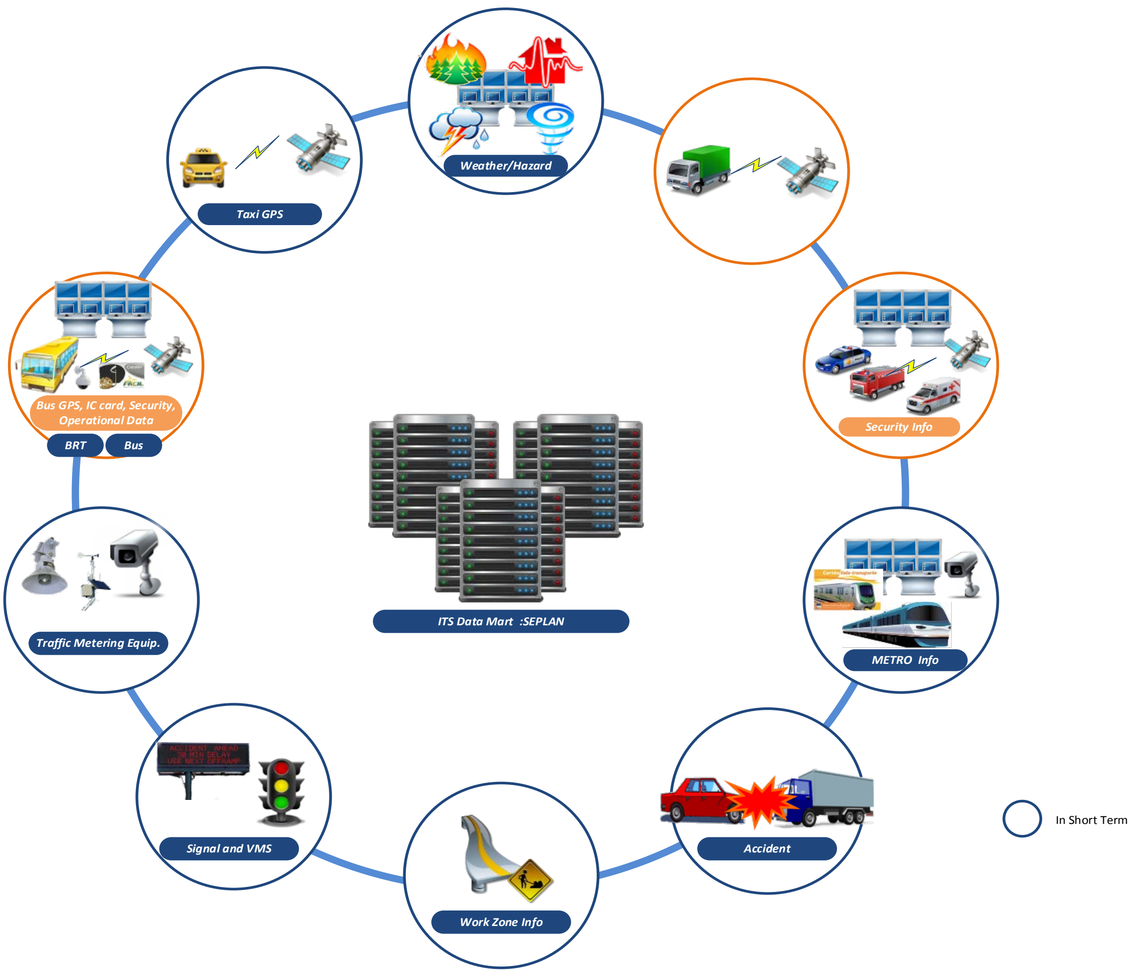
</td></tr>
<tr><td>Target Area (Area to be applied)</td><td>-Federal district (DF)
-Incoming/outgoing public transport</td></tr>
<tr><td>Role of T2MC-DF</td><td>1. Database/Data Processing: Subcomponent (1)
2. Information Exchange: Subcomponent (2)
3. System Integration: Subcomponent (2)
4. Information Provision: Subcomponent (3)
5. Traffic Monitoring/Control: Subcomponent (4)
6. Public Transport Monitoring/Coordination: Subcomponent (4)
7. Concessionaire Operation Monitoring: Subcomponent (4)
8. Traffic Demand Management: Subcomponent (5)</td></tr>
<tr><td>Implementation Period
Short Term: 1-2 years
Medium Term: 3-5 years
Long Term: 6-10 years
* Detailed schedule is shown in the final page of this report.</td><td>- Short term: to visualize the current traffic/transportation condition in real time utilizing existing systems in DF.
- Medium term: to control, monitor and coordinate traffic, transport and concessionaires' operating conditions with essential system expansion. Data gathering for better decision-making.
- Long term: to achieve real-time traffic demand management.</td></tr>
</table>

Parent Organization	SETRANS-DF (DER-DF, METRO-DF, DFTRANS) DETRAN-DF ANTT, DNIT SEPLAN

Source: JICA Study Team

ITS Project Name	1. Database/Data Processing ITS Data Mart T2MC-DF: Transport/Traffic Management Center of DF Subcomponent (1)
Objectives	To gather, collect, process, and store all essential information for travel, traffic, and transport.

Graphic

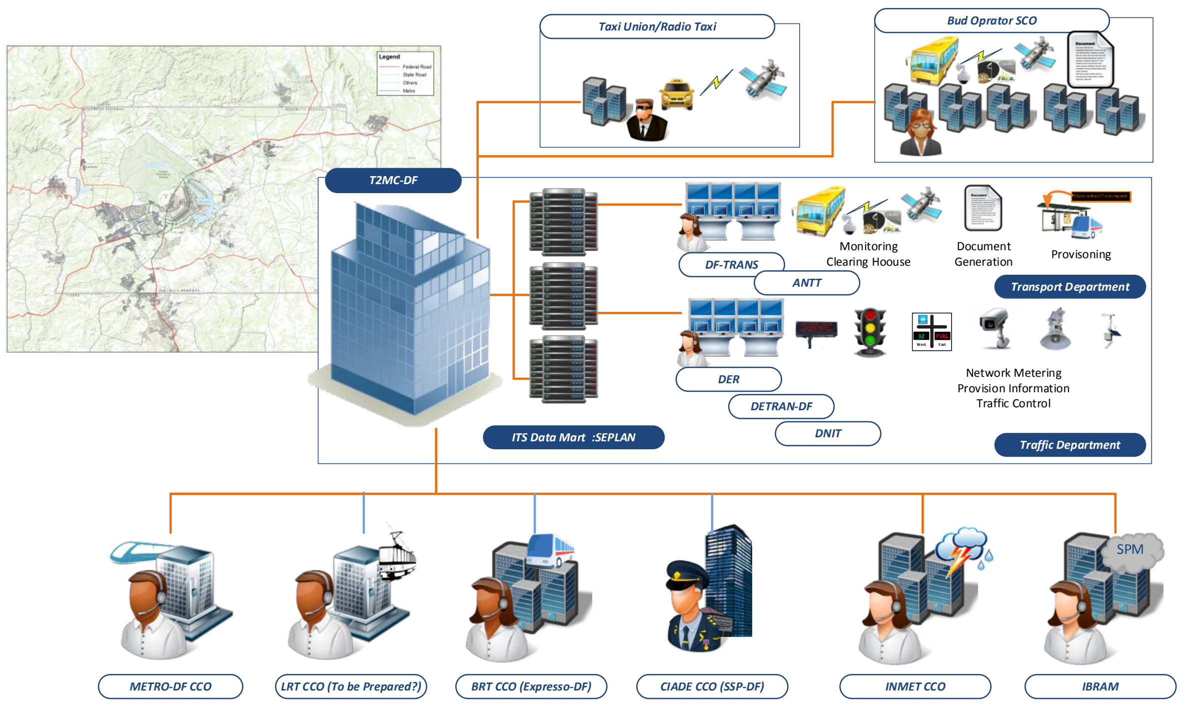


Target Area (Area to be applied)	-Federal district (DF) -Incoming/outgoing public transport
Role of Subsystem	ITS data mart shall secure essential data for all ITS-related agencies.
Implementation Period Short Term: 1-2 years Medium Term: 3-5 years Long Term: 6-10 years * Detailed schedule is shown in the final page of this report.	- Short term: 1. Creating ITS data mart for existing ITS related equipment. 2. Processing data to monitor and provision of real-time traffic condition. - Medium term: Get along with related system expansion - Long term: Catch up with further system expansion
Remarks	- SEPLAN-DF shall be the parent organization of the ITS data mart. - Plan for additional capacity of the new systems in the future.

	- Taxi probe data shall be gathered in the short term from taxi unions. - Metro/BRT/LRT timetable, bus route information, and indicators of concessionaire monitoring will also be stored as database for disseminating information.

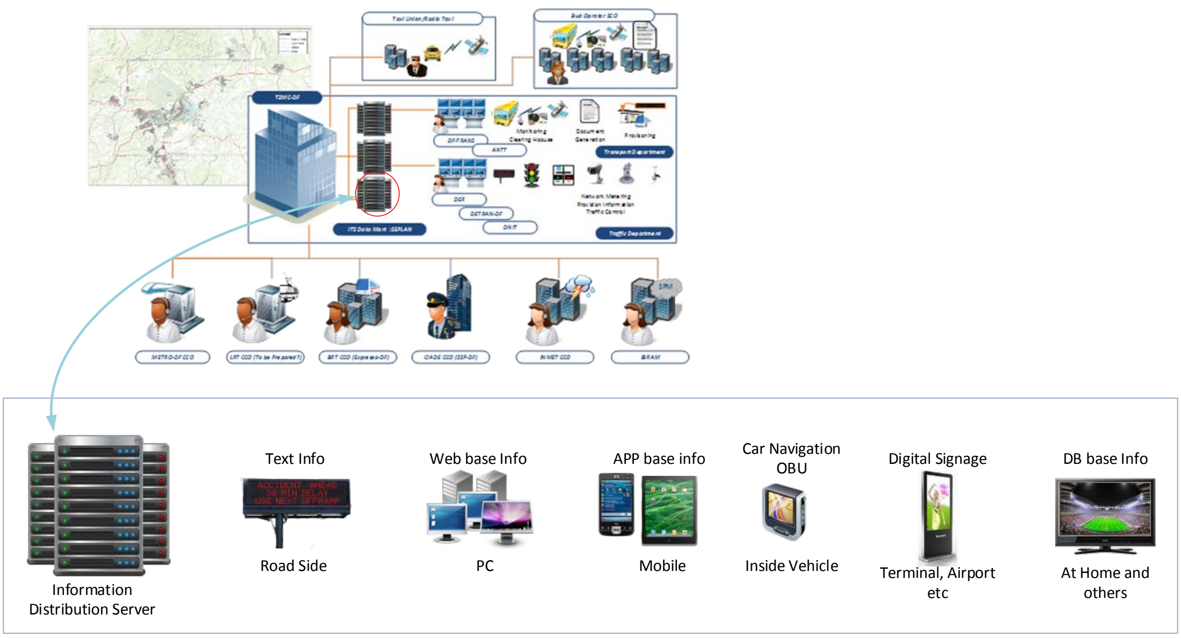
Source: JICA Study Team

ITS Project Name	2. Information Exchange; 3. System Integration T2MC-DF: Transport/Traffic Management Center of DF Subcomponent (2)
Objectives	To integrate traffic systems in DF. To exchange information among CCOs.
Graphic	



Target Area (Area to be applied)	- Federal district (DF) - Incoming/outgoing public transport
Role of Subsystem	- Hub system for information exchange - System integration of traffic agencies
Implementation Period Short Term: 1-2 years Medium Term: 3-5 years Long Term: 6-10 years * Detailed schedule is shown in the final page of this report.	Short term: 1. Start to exchange and assemble information from existing CCO to T2MC-DF. 2. Integrate traffic systems in one place. Medium term: Further development of information exchange between new CCOs such as BRT, weather monitoring center and bus operators SCO. Long term: Catching up with further system expansion
Remarks	

Source: JICA Study Team

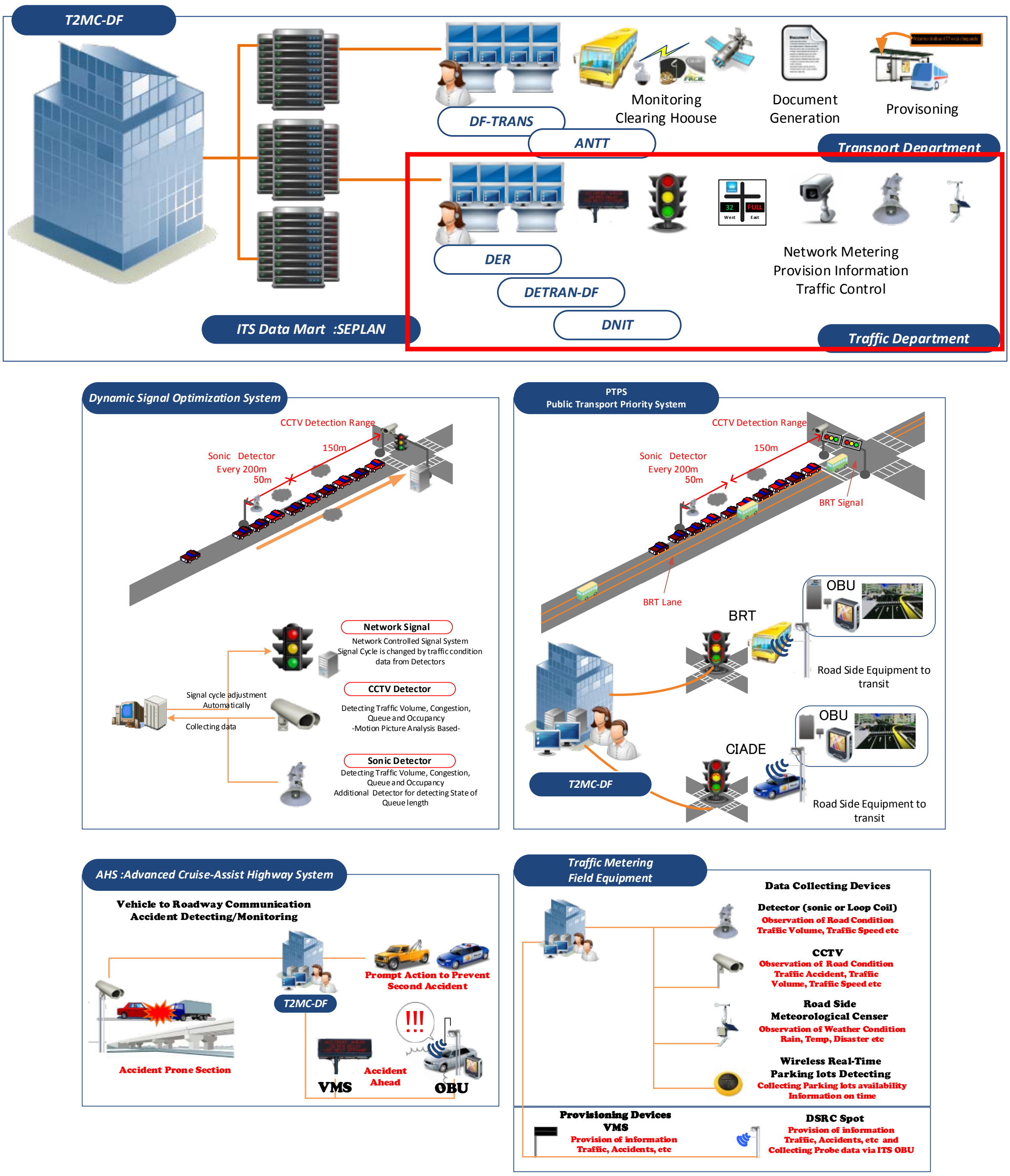
<table>
<tr><td>ITS Project Name</td><td>4. Information Provision
T2MC-DF: Transport/Traffic Management Center of DF
Subcomponent (3)</td></tr>
<tr><td>Objectives</td><td>To provide information to users.</td></tr>
<tr><td colspan="2">Graphic


</td></tr>
<tr><td>Target Area (Area to be applied)</td><td>- Federal District (DF)
- Incoming/outgoing public transport</td></tr>
<tr><td>Role of Subsystem</td><td>Information provision with several media and devices</td></tr>
<tr><td>Implementation Period
Short Term: 1-2 years
Medium Term: 3-5 years
Long Term: 6-10 years
* Detailed schedule is shown in the final page of this report.</td><td>- Short term: from existing system utilization
1. Provide web-based traffic/transportation condition information.
- Medium term:
1. Provide traffic condition information via VMS and car navigation system.
2. Provide more precise traffic condition information with probe system, traffic metering, and work zone/accident/parking information gathering.
3. Provide transport information provision via smart phone, digital signage at stops and terminals, and inside metro/bus displays.
4. Provide weather, security, and hazardous information.</td></tr>
<tr><td>Remarks</td><td>Information is also disseminated via digital broadcasting technology.</td></tr>
</table>

Source: JICA Study Team

ITS Project Name	5. Traffic Monitoring/Control T2MC-DF: Transport/Traffic Management Center of DF Subcomponent (4)
Objectives	To monitor and control traffic to reduce traffic jams, accidents, and violations. To grasp current traffic situation through several monitoring equipment in the road network.

Graphic



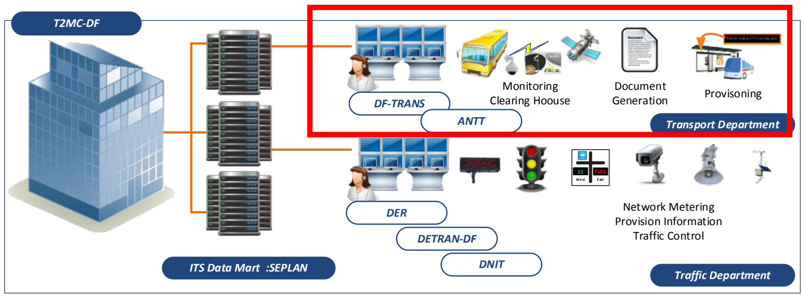
Target Area (Area to be applied)	- Federal district (DF) - Incoming/outgoing public transport

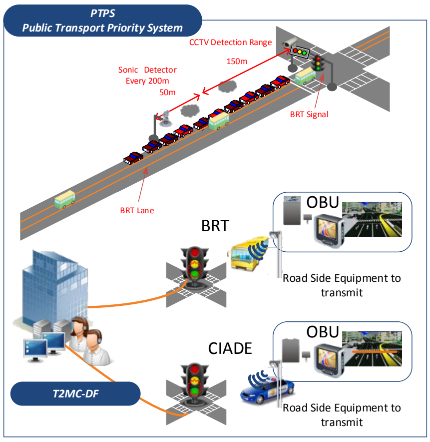
Role of Subsystem	Dynamic monitoring and control of traffic.
Implementation Period Short Term:1-2 years Medium Term: 3-5 years Long Term: 6-10 years	-Short term: from existing system utilization 1. Qualitative traffic monitoring from CCTV and OCR equipment by road administrators. 2. Process taxi probe data to grasp current traffic situation. -Medium term: 1. Quantitative monitoring by expansion of data collection equipment (CCTV, VMS, loop detectors, etc.). 2. Control of traffic using dynamic signal optimization. 3. Interconnection with public transportation priority system, weigh-in-motion device, and emergency detection. -Long term: Further system expansion
Remarks	Traffic information to be disseminated in real time to other related agencies.

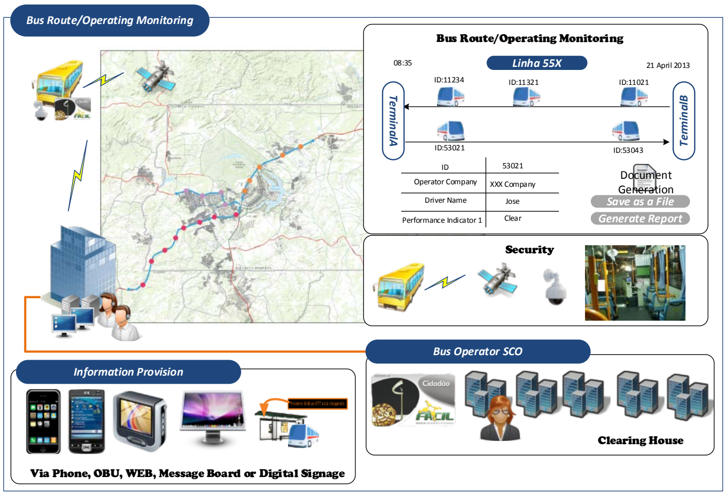
Source: JICA Study Team

ITS Project Name	6. Public Transport Monitoring/Coordinating; 7. Concessionaire Operation Monitoring T2MC-DF: Transport/Traffic Management Center of DF Subcomponent (4)
Objectives	To monitor and coordinate with road public transport. To monitor operating conditions of concessionaires.

Graphic





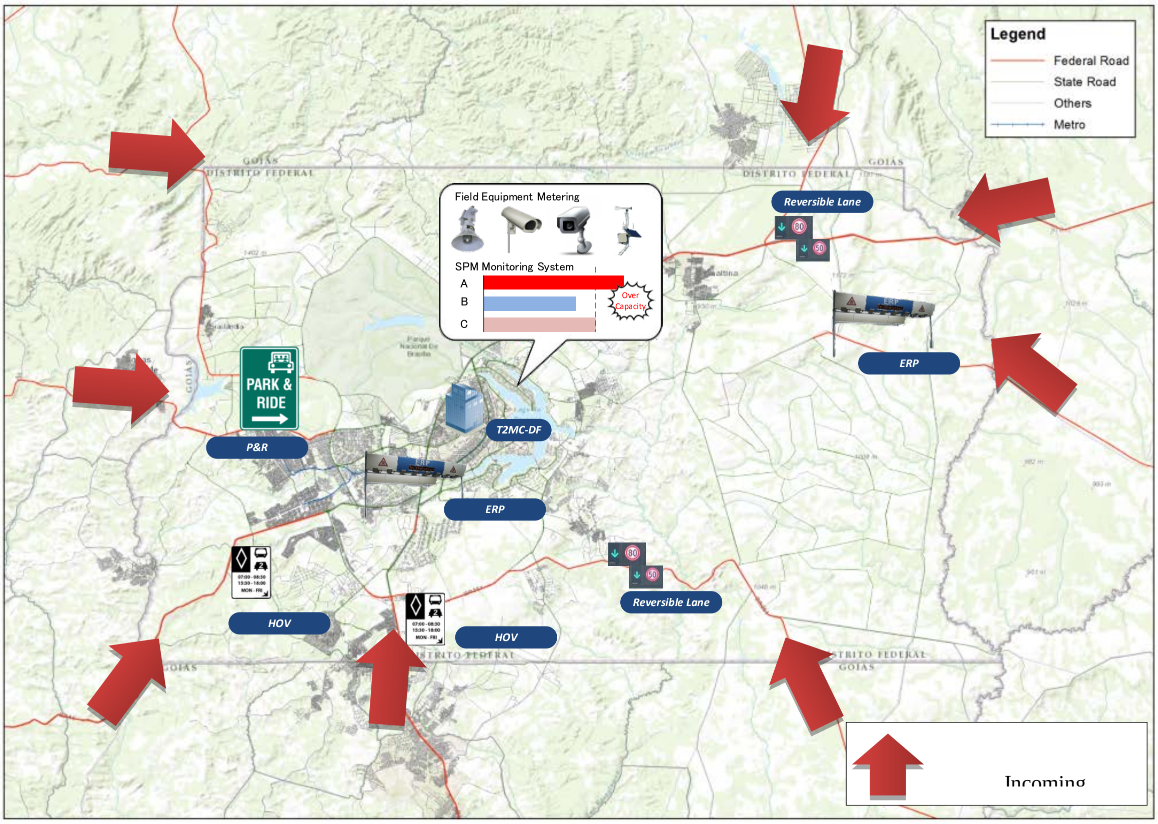


Target Area (Area to be applied)	- Federal district (DF) - Incoming/outgoing public transport
Role of Subsystem	Public transport operation monitoring and intervention
Implementation Period Short Term: 1-2 years Medium Term: 3-5 years Long Term: 6 -10 years * Detailed schedule is shown in the final page of this report.	-Short term: from existing system utilization 1. Planning and designing integration of IC card operation. -Medium term: 1. Integration and expansion of IC card operation for real-time passenger and revenue control. 2. Seamless operation with interstate buses. 3. Expansion of CCTV and GPS in buses for real-time monitoring. 4. Public transport priority at traffic signals. 5. Improve transfer and connecting schedule of Metro. -Long term: Further system expansion
Remarks	DFTRANS to coordinate public transport operation between DF and RIDE.

Source: JICA Study Team

ITS Project Name	8. Traffic Demand Management T2MC-DF: Transport/Traffic Management Center of DF Subcomponent (5)
Objectives	To manage traffic demand on time.

Graphic



Target Area (Area to be applied)	- Federal district (DF) - Incoming/outgoing public transport
Role of Subsystem	Dynamic management of traffic demand
Implementation Period Short Term: 1-2 years Medium Term: 3-5 years Long Term: 6-10 years * Detailed schedule is shown in the final page of this report.	-Medium term: 1. Analyze traffic volume and travel behavior. 2. Planning traffic demand management policy for ERP, HOV, dynamic reversible lane, and park and ride. 3. System design and legal system design (for ERP or HOV lane) 4. Disseminating on-board unit. -Long term: 5. System implementation and coordinating operation with real-time traffic impact, air pollution, etc.
Remarks	Legal framework for fare should be considered.

Source: JICA Study Team

11.3.3 Rough Cost Estimates for Short-term Projects

(1) Cost Estimation Policy

When requirements are not specified in the early stages of the project, a rough order of magnitude (ROM) estimate is used as a solution in estimating the capital cost. The ROM estimate is the least accurate estimate, and it is -50% to +50% accurate. In this preliminary master plan study, the ROM estimate is used to conduct the rough cost estimation of each ITS project.

(2) Summary of the Results of Cost Estimation

Table 11-3 below shows a list of the ITS projects. The conditions and assumptions used as basis of the rough cost estimates are shown in sub-clauses (3) and (4).

Table 11-3 Rough Cost Estimates of ITS Projects

No.	ITS Project Name	**Amount (R$)**	**Amount (¥)**
1	Project 1: Database/Data Processing ITS Data Mart	14.000.000	638,000,000
2	Project 2: Information Exchange Project 3: System Integration	8.000.000	339,000,000
3	Project 4: Information Provision	4.000.000	188,000,000
4	Project 5: Traffic Monitoring/Control	9.000.000	338,000,000
5	Project 6: Public Transport Monitoring/Coordination	2.000.000	61,000,000
	(Total)	37.000.000	1,614,000,000

Source: JICA Study Team

(3) Conditions of Cost Estimation

1) Common Conditions and Assumptions

The rough cost estimation is conducted based on the following common conditions and assumptions:

- Equipment cost is based on the consultant's experience;
- Installation cost is 10% of the equipment cost;
- Consultancy service is taken into consideration from the viewpoint of proper design, and schedule and quality management of implementation during the design and procurement stages; and
- Consultancy service cost is 10% of the sum of the equipment and installation costs.

2) Conditions and Assumptions for the Short-term ITS Projects in the Preliminary ITS Master Plan

The conditions and assumptions for the short-term ITS projects are summarized in Table 11-4.

Table 11-4 Conditions and Assumptions for Short-term ITS Projects

No.	ITS Project Name	Conditions and Assumptions
1	Project 1: Database/Data Processing ITS Data Mart	- Database/data processing system for collecting information and providing information - Target organizations/agencies: 5 (refer to Table 11-5) - T2MC-DF will be established in the existing building; the floor space needed for T2MC-DF is approximately 400 m^2 (20 m x 20 m)
2	Project 2: Information Exchange Project 3: System Integration	- System for information exchange among road administration offices and existing CCO - Target organizations/agencies: 5 (refer to Table 11-5)
3	Project 4: Information Provision	- Web-based traffic/transportation condition information provision - Provision to public and road administration offices and existing CCO - Target organizations/agencies: 5 (refer to Table 11-5)
4	Project 5: Traffic Monitoring/Control	- Qualitative traffic monitoring and analyzing system to utilize CCTV, OCR (barrier, red light camera, and speedometer) and taxi probe data
5	Project 6: Public Transport Monitoring/Coordination	- Integration of IC card operation between metro and bus companies

Source: JICA Study Team

Table 11-5 Related Organizations for Short-term ITS System

Stakeholder	Target Organization/Agency
DNIT	-
DER-DF	1
DETRAN-DF	1
METRO	1
DFTRANS	-
Private Taxi Dispatch Center	1
SSP-DF/CIADE	1
Weather Monitoring Center	-

There is no CCO in DFTRANS, Weather Monitoring Center and DNIT.
SSP-DF/CIADE will establish a CCO soon.

Source: JICA Study Team

(4) Breakdown of Rough Cost Estimates

The breakdown of the rough cost estimates of each ITS project is shown as follows:

Project 1 Database/Data Processing ITS Data mart Exchange rate : BRL1=JPY 46.92 as of March 26, 2013

No.	Item	Quantities	Unit Cost (¥1000)	Total (¥1000)	Total (R$1000)	Remarks
Equipment						
1	**Data Storage System**			300,000	6,394	
1-1	Probe Data Storage Server	1	80,000	80,000	1,705	hardware/software
1-2	Point Data Server	1	80,000	80,000	1,705	hardware/software
1-3	Transit Data Server	1	50,000	50,000	1,066	hardware/software
1-4	Incident Monitoring Data Server	1	20,000	20,000	426	hardware/software
1-5	Weather Monitoring Server	1	20,000	20,000	426	hardware/software
1-6	CCTV Data Server	1	50,000	50,000	1,066	hardware/software
2	**Processing System**			120,000	2,558	
2-1	Weather Information Processing Server	1	40,000	40,000	853	hardware/software
2-2	Incident Information Processing Server	1	40,000	40,000	853	hardware/software
2-3	Report Generating Server	1	40,000	40,000	853	hardware/software
3	**Monitoring System**			77,000	1,641	
3-1	Large Display Panel	1	16,000	16,000	341	hardware/software
3-2	Desktop computer for Large Display Panel	1	11,000	11,000	234	hardware/software
3-3	System Status Monitoring System	1	50,000	50,000	1,066	hardware/software
4	**Power Supply System**			30,000	639	
4-1	Uninterrupted Power Supply	1	15,000	15,000	320	
4-2	Diesel Engine Generator	1	15,000	15,000	320	
	Subtotal			527,000	11,232	1～4
5	**Installation and Test**	1		52,700	1,123	1～4 *10%
	Subtotal			52,700	1,123	
6	**Consultant Fee**			57,970	1,236	1～5 *10%
	Subtotal			57,970	1,236	
Total				**637,670**	**13,591**	

Source: JICA Study Team

Project 2 Information Exchange Project 3 System Integration Exchange rate : BRL1=JPY 46.92 as of March 26, 2013

No.	Item	Quantities	Unit Cost (¥1000)	Total (¥1000)	Total (R$1000)	Remarks
Equipment						
1	**Data Gathering System**			280,000	5,968	
1-1	Data Gathering Server for ITS center	1	80,000	80,000	1,705	hardware/software
1-2	Data Gathering Server for Stakeholders	5	20,000	100,000	2,131	hardware/software
1-3	Modification of Existing System	5	20,000	100,000	2,131	software
	Subtotal			280,000	5,968	
2	**Installation and Test**	1		28,000	597	1～ *10%
	Subtotal			28,000	597	
3	**Consultant Fee**			30,800	656	1～2 *10%
	Subtotal			30,800	656	
Total				**338,800**	**7,221**	

Source: JICA Study Team

Project 4 Information Provision Exchange rate : BRL1=JPY 46.92 as of March 26, 2013

No.	Item	Quantities	Unit Cost (¥1000)	Total (¥1000)	Total (R$1000)	Remarks
Equipment						
1	**Distribution System**			155,000	3,303	
1-1	GIS Server	1	90,000	90,000	1,918	hardware/software
1-2	WEB Server	1	60,000	60,000	1,279	hardware/software
1-3	Information Sharing Console	5	1,000	5,000	107	hardware
	Subtotal			155,000	3,303	
2	**Installation and Test**	1		15,500	330	1～ *10%
	Subtotal			15,500	330	
3	**Consultant Fee**			17,050	363	1～2 *10%
	Subtotal			17,050	363	
Total				**187,550**	**3,997**	

Source: JICA Study Team

Project 5 Traffic Monitoring/Control Exchange rate : BRL1=JPY 46.92 as of March 26, 2013

No.	Item	Quantities	Unit Cost (¥1000)	Total (¥1000)	Total (R$1000)	Remarks
Equipment						
1	**Qualitatative Traffic Monitoring System**			320,000	6,820	
1-1	Motion Picture Analysis Server	1	80,000	80,000	1,705	hardware/software
1-2	Traffic Volume Processing Server	1	100,000	100,000	2,131	hardware/software
1-3	Velocity information Generating Server	1	100,000	100,000	2,131	hardware/software
1-4	Fixed Route Travel Time Calculation Server	1	40,000	40,000	853	hardware/software
	Subtotal			320,000	6,820	
2	**Installation and Test**	1		32,000	682	1～ *10%
	Subtotal			32,000	682	
3	**Consultant Fee**			35,200	750	1～2 *10%
	Subtotal			35,200	750	
Total				**387,200**	**8,252**	

Source: JICA Study Team

Project 6 Public Transport Monitoring/Cordinating Exchange rate : BRL1=JPY 46.92 as of March 26, 2013

No.	Item	Quantities	Unit Cost (¥1000)	Total (¥1000)	Total (R$1000)	Remarks
Equipment						
1	**SBA (IC Card) System**			50,000	1,066	
1-1	Integration of SBA Server systems	1	50,000	50,000	1,066	
	Subtotal			50,000	1,066	
2	**Installation and Test**	1		5,000	107	1～ *10%
	Subtotal			5,000	107	
3	**Consultant Fee**			5,500	117	1～2 *10%
	Subtotal			5,500	117	
Total				**60,500**	**1,289**	

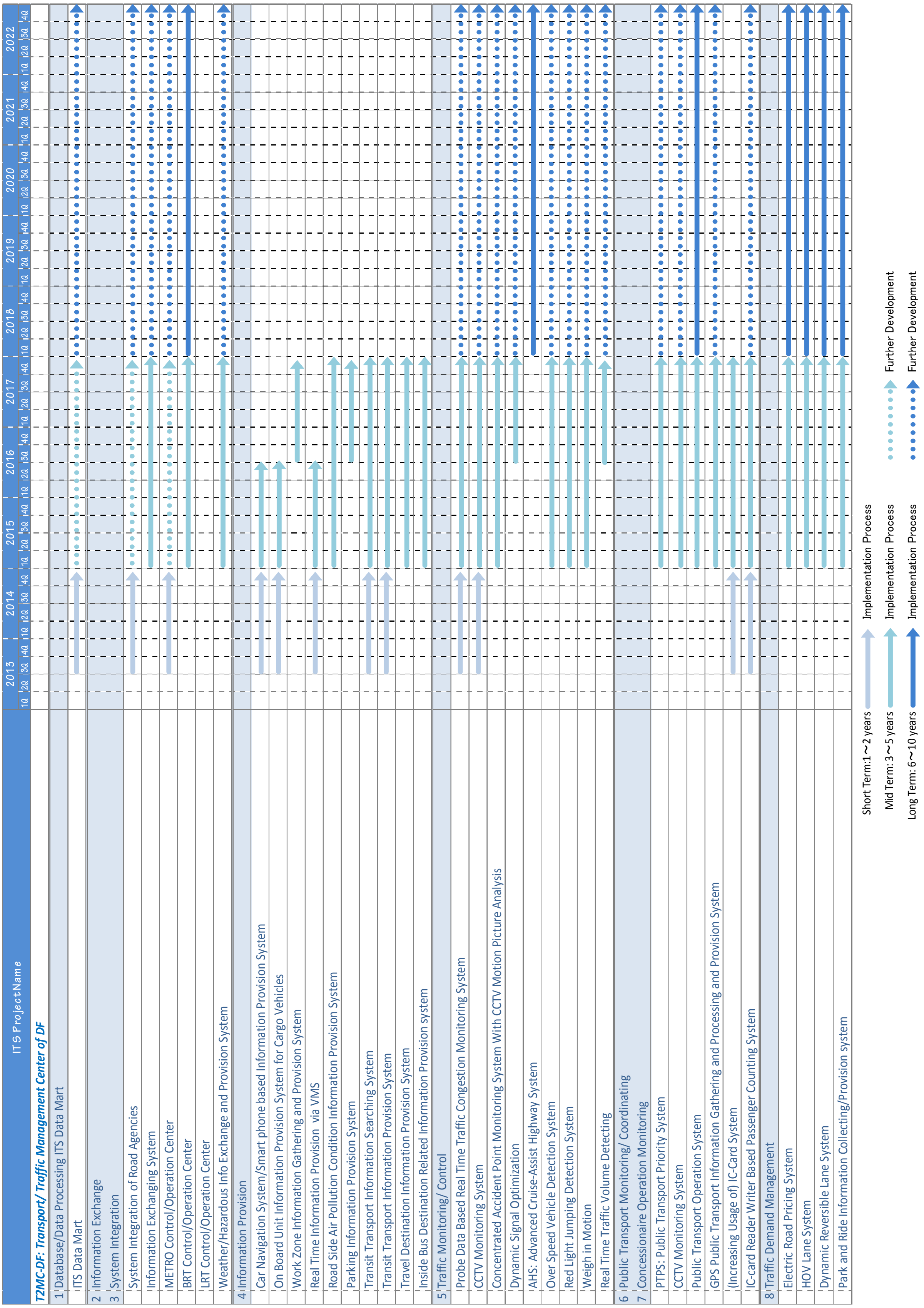
Source: JICA Study Team

11.4 PROPOSAL FOR DEVELOPMENT SCHEDULE

The development of T2MC and its subsystems shall be paced according to the three phases of implementation, i.e.: (i) visualization phase (short term), (ii) system expansion phase (medium term), and (iii) traffic demand management phase (long term). The short-term systems should be implemented for not more than one year; medium-term systems should be considered step-wise between 2 and 5 years; and long-term systems should be considered between 5 and 10 years – upon successful implementation and operation of phases 1 and 2. Further refinement of the schedule may be needed upon development of a complete master plan.

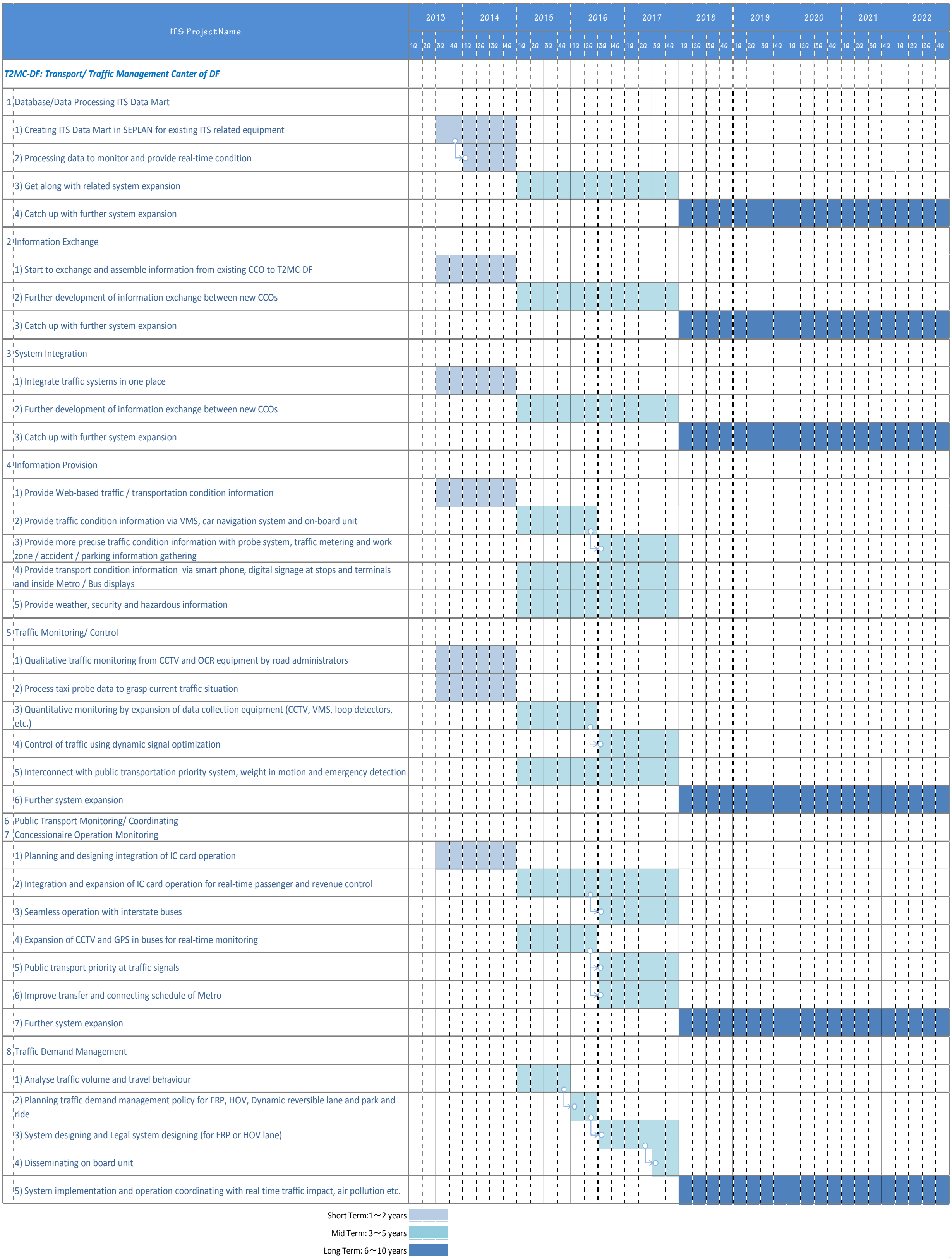
The schedule for implementation is shown in Tables 11-6 and 11-7. Table 11-6 (Implementation Plan) describes when each project shall be implemented and Table 11-7 (Work Plan) describes the necessary tasks and work flow for implementation.

Table 11-6 DF Implementation Plan



Source: JICA Study Team

Table 11-7 Work Plan



Source: JICA Study Team

CHAPTER 12 CONCLUSIONS AND RECOMMENDATIONS

12.1 CONCLUSIONS

12.1.1 Formulation of the ITS Master Plan for Rio de Janeiro

Study Team (i) identified the functional requirements, (ii) checked the matching condition of needs, user services and services packages, (iii) developed ITS projects based on the aspects of ITS architecture, current issues, and ITS needs, and (iv) planned the deployment schedule. Based on these results, ITS Master Plan for Rio de Janeiro was developed.

(1) ITS Project for Rio de Janeiro

ITS project was developed based on three perspectives (1.Policy of ITS Master Plan, 2.Current Condition and Issues, 3.ITS Needs) and five keyword for further development of the ITS field (1.Integration, 2.Information Exchange, 3.Utilization, 4.Dissemination, 5.Cooperation).

Considering the circumstances, the JICA Study Team proposed thirteen ITS projects, which are shown below.

Table 12-1 ITS Projects for Rio de Janeiro

No.	ITS Project Name
1	ITS Center
2	Real Time Traffic/Transport Condition Information Processing
3	Olympic Security and Transport Coordination Center
4	Bus Condition Information Provision
5	Dissemination of On-board Unit for More Integrated Transport
6	Information Exchange of Road Operators
7	Information Exchange via ITS Center between Municipalities
8	Improvement of Traffic/Transit Operational Center with Essential ITS Equipment in Rio de Janeiro Municipal Area
9	Improvement of Traffic/Transit Operational Center with Essential ITS Equipment in Other Municipal Areas in RMRJ
10	Emergency Vehicle Operating Management
11	Commercial Vehicle Operation and Management
12	Advanced Vehicle Safety Systems
13	Deployment of X-band Radars

Source: JICA Study Team

(2) Deployment Plan for ITS Projects Equipment

Based on t the ITS services and facilities necessary for each target, how to deploy ITS facilities required by each target (Road Traffic, Land Public Transport, Safety and Security) was considered. Then, based on these results and interviews with road administrators, the current situation of with/without ITS facilities and management condition was organized. And the placement of the new ITS facility and ITS deployment plan for each individual service were considered.

(3) Evaluation of ITS Projects

Study Team calculated rough cost estimation of proposed ITS project, then conducted the economic evaluation of main project by traffic simulation. As a result, ITS project is economically feasible, proposed project is effective for Rio de Janeiro.

Table 12-2 Result of Economic Analysis for ITS Project

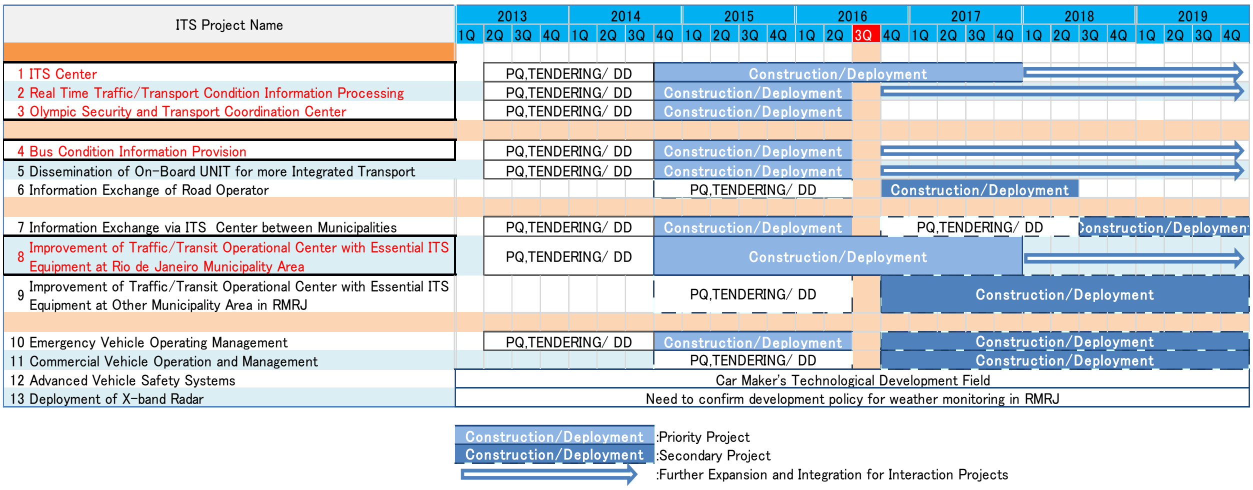
Projects	NPV	B/C	EIRR
1.ITS Center	225.24	4.99	44.30%
2.BRT Priority System	290.1	8.86	75.34%
3.Bus Location Information Provision	182.57	4.22	32.94%
4.ETC	71.5	5.89	51.93%
5.ERP	695.14	6.18	23.18%

Source: JICA Study Team

(4) Implementation Schedule

The JICA Study Team summarized the schedule of all the projects. However, the milestone of ITS projects for Rio de Janeiro is the Rio 2016 Olympic and Paralympic Games. The short-term projects shall focus on the Rio de Janeiro municipal area to archive the success of the Olympic Games.

The short-term projects were selected for the smooth introduction of ITS in Rio de Janeiro Metropolitan Area and was defined based on the three perspectives (1.Effective immediately, 2.Operability, 3.Achieve smooth transport for the 2016 Olympic Games). As a result, five of the highest priority ITS projects were selected.



Source: JICA Study Team

Figure 12-1 ITS Projects and Implementation Schedule

12.1.2 Preliminary design for short term project

(1) Short Term Project Cost

The JICA Study Team suggested that the six projects above are proposed to be classified into three project packages as shown in Table 12-3, and carried out a preliminary study for these packages. Total Project cost was calculated about R$ 205 million.

Table 12-3 Project Package

Project Package No.	ITS Project	
Project Package 1	No.1	ITS Center
	No.2	Real-time Traffic/Transport Condition Information Processing
	No.3	Olympic Security and Transport Coordination Center
	No.6	Information Exchange of Road Operator
Project Package 2	No.4	Bus Condition Information Provision
Project Package 3	No.8	Improvement of Traffic/Transit Operational Center with Essential ITS Equipment in Rio de Janeiro Municipal Area

Source: JICA Study Team

(2) Implementation Plan

Since there is insufficient time for a stepwise implementation of each project, the Study Team suggested that these projects shall be carried out simultaneously as shown in Table 12-5.

The key milestones to complete the project successfully are as follows:

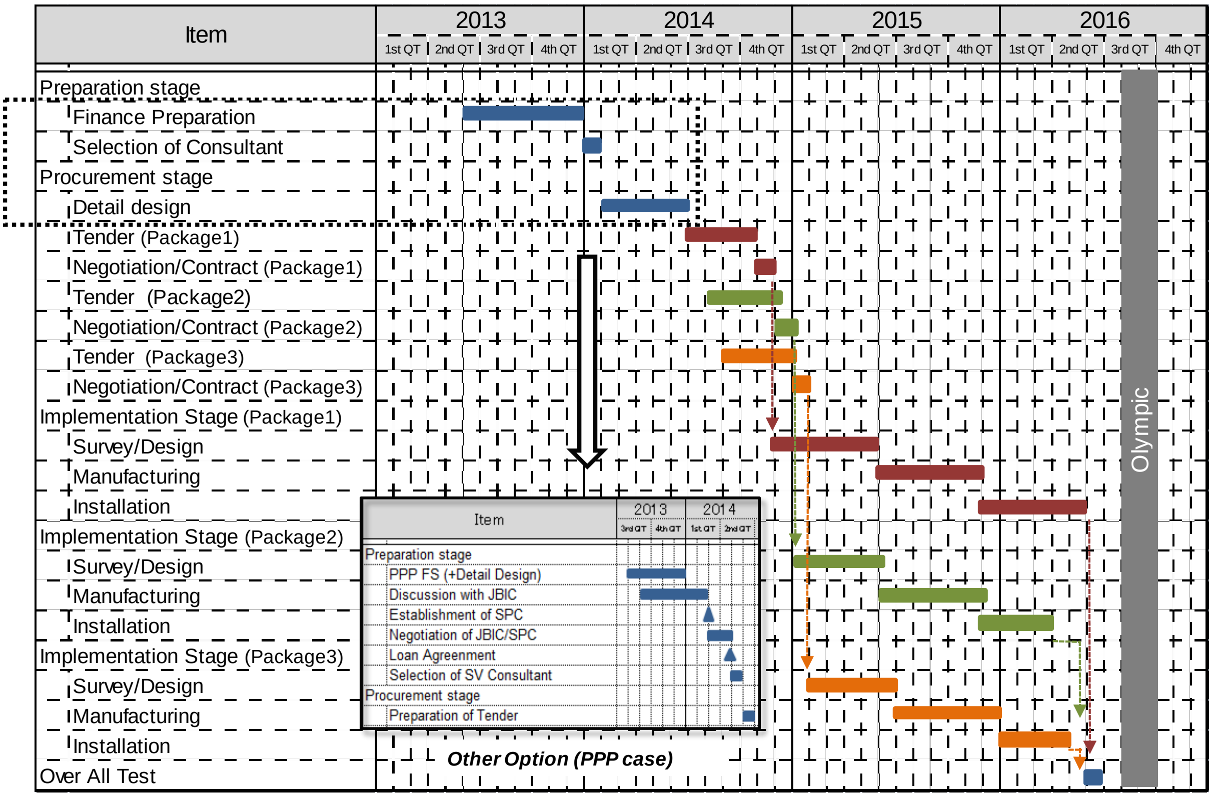
- Financing shall be prepared by the end of 2013.
- Tender preparation (e.g., detailed design) shall be finished by the middle of 2014.
- Tender shall start in the middle of 2014.
- Project Package 1 shall start by the end of 2014.
- Overall testing for Project Packages 1, 2, and 3 shall be finished by June 2016.

Table 12-4 Project Cost

No.	Item	Amount (R$)	Amount (JPY)	Remarks
1	**Equipment Procurement and Construction Cost**	**162,000,000**	**7,564,000,000**	
1-1	Project Package 1 ITS Center Real Time Traffic/Transport Condition Information Processing Olympic Security and Transport Coordination Center Information Exchange of road operators	66,000,000	3,085,000,000	
1-2	Project Package 2 Bus Condition Information Provision	71,000,000	3,326,000,000	
1-3	Project Package 3 Improvement of Traffic/Transit Operation Center with Essential ITS Equipment at Rio Municipality Area	25,000,000	1,153,000,000	
2	**Consultancy Service (Design and Supervision)**	**11,340,000**	**529,480,000**	**1. x 7%**
3	**Administration Cost**	**8,100,000**	**378,200,000**	**1. x 5%**
4	**Price Escalation**	**4,860,000**	**226,920,000**	**1. x 3%**
5	**Project Cost**	**186,300,000**	**8,698,600,000**	**1.+2.+3.+4.**
6	**Contingency**	**18,630,000**	**869,860,000**	**5. x 10%**
	TOTAL PROJECT COST	**204,930,000**	**9,568,460,000**	**5. +6.**

Source: JICA Study Team

Table 12-5 Implementation Plan



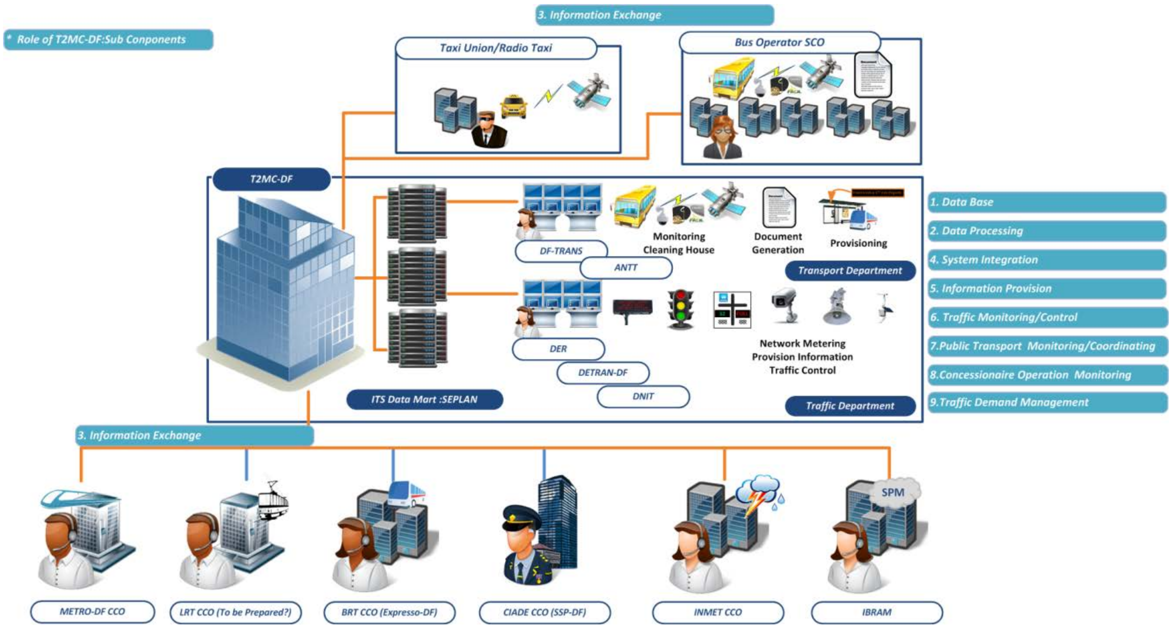
Source: JICA Study Team

12.1.3 Prelimiary ITS Master Plan for Federal District

The Study Team proposed five DF Preliminary ITS Master Plan policies based on regional and transportation characteristics and transportation related plan. Based on the policy, the components of the preliminary ITS master plan, such as functional requirements and conceptual design for ITS projects, were developed.

(1) ITS Project Conceptual Design

The Study Team proposed 34 subsystems, and grouped into five subcomponents. The five subcomponents should then be deployed into one regional Traffic/Transportation Management Center (T2MC-DF).



Source: JICA Study Team

Figure 12-2 Design Diagram of T2MC

And Study Team conducted rough cost estimation of short term project. As a result, the total amount was estimated R$ 37 million.

(2) Proposal for Development Schedule

The development of T2MC and its subsystems shall be paced according to the three phases of implementation.

(i) Visualization phase (short term),

(ii) System expansion phase (medium term), and

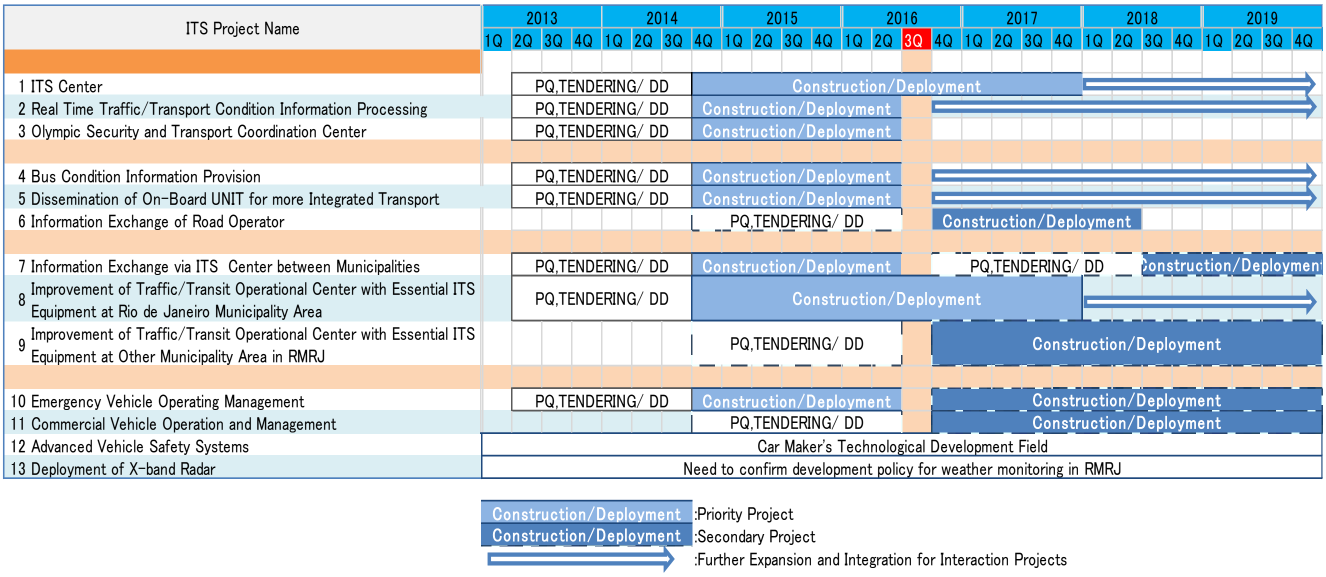
(iii) Traffic demand management phase (long term).

The schedule for implementation is shown in Tables 11-6 (Work Plan) and 11-7 (Implementation Plan) of Chapter 11.

12.2 RECOMMENDATIONS

12.2.1 Consideration of Major Aspects for ITS Project Implementation

The objectives of ITS are not only for the Olympic Games, but also for the traffic/transit management for daily life. For example, the target area of the ITS Center is the Rio de Janeiro Metropolitan Area and is not just short term. Hence, the implementation schedule was developed considering four major aspects like: 1. Olympic period, 2. Rio de Janeiro municipal area, 3. Information integration and existing system utilization, and 4. Security and transport.



*1Q: From January **PQ: Procurement DD: Detailed Design

Source: JICA Study Team

Figure 12-3 Implementation Schedule

12.2.2 Smooth Implementation of Project Packages and Effective Usage of ITS on Rio de Janeiro ITS Short Term Project

(1) For Smooth and Successful Implementation of Project Package

1) Task Force Project Team

Several stakeholders are included in this project. It is expected that there will be modification to the stakeholders' existing subsystems for gathering ITS information through the ITS Center. Understanding and cooperation between the stakeholders listed in this study are essential for successful implementation.

Therefore, steering committee meetings shall be held periodically. A strong leadership identified by the project task force team is also necessary. The team shall be established as soon as possible. The team shall conduct the preceding works until handing the work over to the operational organization of the ITS Center.

2) Operational Organization for the ITS Center

The ITS Center will be a newly established and built facility in Project Package 1. To commence the operation of the ITS Center smoothly at the same time as the Olympic Games and to adequately and promptly deal with casual system problems during operation, the establishment of an operational organization is needed by August 2015, one year before the completion of the project.

(2) For Effective Usage of the ITS system

1) Effective Usage of Adaptive Signal Control System

Many signalized intersections will be controlled according to the traffic situation automatically or manually by COR. When public transport signal priority is activated in case of a disaster emergency or VIP transport, the nearby intersection areas shall be activated and controlled according to the schedule of prioritized public transport. Such coordination shall be done among CICC, SEDEC, and other related agencies.

2) Effective Usage of the VMS System

Any related agency will be able to know the traffic situation through several display devices. Road operators can also get important related traffic information from computer monitors that are directly connected to the ITS Center. Thus, the road operator shall operate the VMS messages to show important information such as accidents or traffic congestion.

3) Coordination among Olympic Support Parties and Agencies

The proposed ITS system will be able to gather traffic information from related agencies and disseminate it not only to other agencies but also to the public through information provision display. These displays will be installed at Olympic stadiums and venues, terminals and through personal telephone, internet and at OBUs of cars.

For the effective usage of the ITS system for the smooth operation of the Olympic Games, coordination meetings among Olympic support parties and agencies are important.

12.2.3 Next Step for the DF ITS Preliminary Master Plan

The DF ITS Preliminary Master Plan should be used as the starting point for the development and implementation of ITS systems proposed in this study. A complete master plan shall also include additional data collection such as traffic volume, travel time, and speed data during peak periods, detailed analysis of traffic demand and network (simulation), detailed communication and ITS architecture, and basic design of the suggested systems as next steps. In addition, an update of the current conditions may be needed depending on the timeframe.