Republic of Indonesia

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Preparatory Survey on Intelligent Transport System Project to mitigate Traffic Congestion in Jakarta (PPP Infrastructure Project)

Final Report

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Japan International Cooperation Agency(JICA)

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Acronyms

ATCS	Area Traffic Control System
BRT	Bus Rapid Transit
CCTV	Closed Circuit TeleVision
DKI	Daerah Khusus Ibukota
EPC	Engineering, Procurement, Construction
ERP	Electronic Road Pricing
ETC	Electronic Toll Collection System
GDP	Gross Domestic Products
GPS	Global Positioning Service
IC	Integrated Circuit
IDR	InDonesia Rupiah
IIGF	Indonesian Infrastructure Guarantee Fund
ITS	Intelligent Transport Systems
JETRO	Japan External TRade Organization
JABODETABEK	Jakarta, Bogor, Depok、Tangeran, Bekasi
JICA	Japan International Coordination Agency
LTA	Land Transport Authority in Singapore
METI	（Japanese） Ministry of Economic, Trade and Industry
MOF	Ministry of Finance
MOT	Ministry of Transport
MPA	Metropolitan Priority Area for investment and industry
MRT	Mass Rapid Transit
OBU	On-Board-Unit
ODA	Official Development Aid
PCU	Passenger Car Unit
PFI	Private Finance Initiative
PPP	Public-Private Partnership
PSIF	Private Sector Investment Finance
R&D	Research and Development
SPC	Special Purpose Company

Preface Background and Aim of the Study

Pre.1. Study Background

(1) Challenges and Achievements (as of today) of Urban Transport Sector in Republic of Indonesia

The population of Jakarta metropolitan area (hereafter JABODETABEK area) in Republic of Indonesia has extended to approximately 1.6-fold in the last 20 years that is to say the growth was approximately 28 million people in 2010 from about 17 million in 1990. JABODETABEK area is a economoic growth center, in which population accounts for about 10% of the entire Indonesia, the size of the economy reaches about 30% of GDP and 40% of foreign investment has been concentrated.

With the economic growth and population growth, vehicle registration number in JABODETABEK area has soared to almost 5 times to about 14 million units in 2012 from about 3 million units in 2000. On the other hand, since road infrastructure is not keeping up with the rappid increase of the number of vehicle, there is serious traffic congestion in JABODETABEK area, and it has caused major economic loss. In particular, congestion of morning and evening commuting hours is occurring regularly in the 13 km section, which is located in the heart of JABODETABEK area, between Block-M as a business and resdidential area in the southern Jakarta, and Kota as an business destrict and old town in the northern half. In order to improve the above-mentioned situation, the Provicnial Government of DKI Jakarta (hereafter refered as DKI Jakarta Gov.) has introduced a Bus Rapid Transport system (hereafter refered as BRT or Transjakarta). In addition, the Government of DKI Jakarta introduced a policy so-called as “3 in 1” regulation, which is vehicle less than 3 passengers per car are not allowed to pass in the certain road in morning and evening rush hour in order to suppress the flow of vehicles to the city. However, there are people called “Jockey” on the street who are available when the the number of passenger is less than 3 that will help to avoid the restrciton of “3 in 1” regulation. Therefore, the effect of the regulation is remained to be limited, and further measures for the traffic congestion in necessary.

(2) Positioning of this Project and Development Policy of Urban Transport Sector in Republic of Indonesia

According to DKI Jakarta ordinance (Regional Regulation No.12/2002and Governor Regulation No.103/2007), aiming toward the easing of road traffic congestion in Jakarta metropolitan area, implementation of Electronic Road Pricing (ERP) policy utiliing Intelligent Transport Systems (ITS) is planned as an alternative to “3 in 1”regulation, in addition to such policy implementation as the development of mass transit system including the construction of the subway, the strengthening of traffic regulations and the expansion of the road network. By implementing the ERP, the inflow restriction of the vehicle into the city is expected to be strengthened. Furthermore, by encouraging simultaneous shift to public transport such as a BRT or subway which is now being constructed, further effcte of easing traffic congestion can be expected. The ITS project including introdction of ERP system to be introduced in the seriously congested roads for restriction of inflow traffic into the city along the above-menthioned

ordinance and easing traffic congestion, was positioned as the prioritized project which is to be completed by 2020 under the agreement between Japan Government and Indonesian Government in MPA in December in 2010.

(3) Aid Policy of Japan and JICA for Urban Transport Sector

In the JICA country analysis paper for Republic of Indonesia, it is analyzed that support of strengthening of transportation through public-private partnership, and major metropolitan transportation development with a focus on the JABODETABEK area is a prioritized issue. Moreover, support for further economic growth as a prioritized support field and support for improvement of business and investment environment through infrastructure development around JABODETABEK area are specified in the aid policy for Republic of Indonesia published in April in 2012.

Pre.2. Purpose of the Study

The purpose of this study is to conduct feasibility study on implementation of the investment to be done by Japanese enterprises in the field of ITS and ERP, which can be considered one of the efficient measures to ease traffic congestion in DKI Jakarta and formulate the proper business plan based on the public-private-partnership including application of the JICA PSIF financial scheme.

Pre.3. Outline of the Project

(1) Study Target

Study target area is “JABODETABEK area” in Republic of Indonesia. Target area for project implementation is DKI (Daerah Khusus Ibukota) Jakarta. Furthermore, ERP introductory target routes are Corridor 1 (between Blok M and Kota), and Corridor 6 (between Ragunan and Bundaran HI).

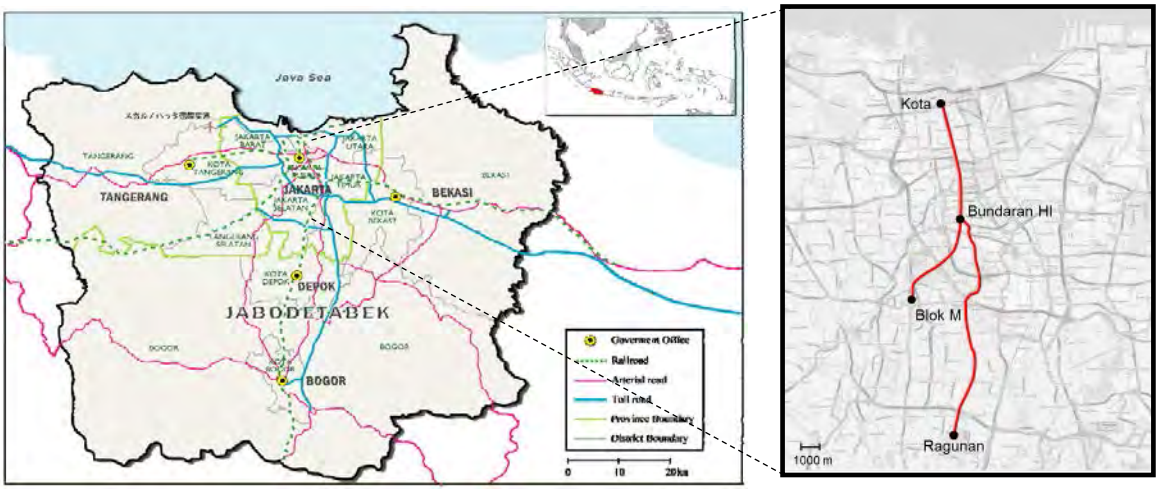
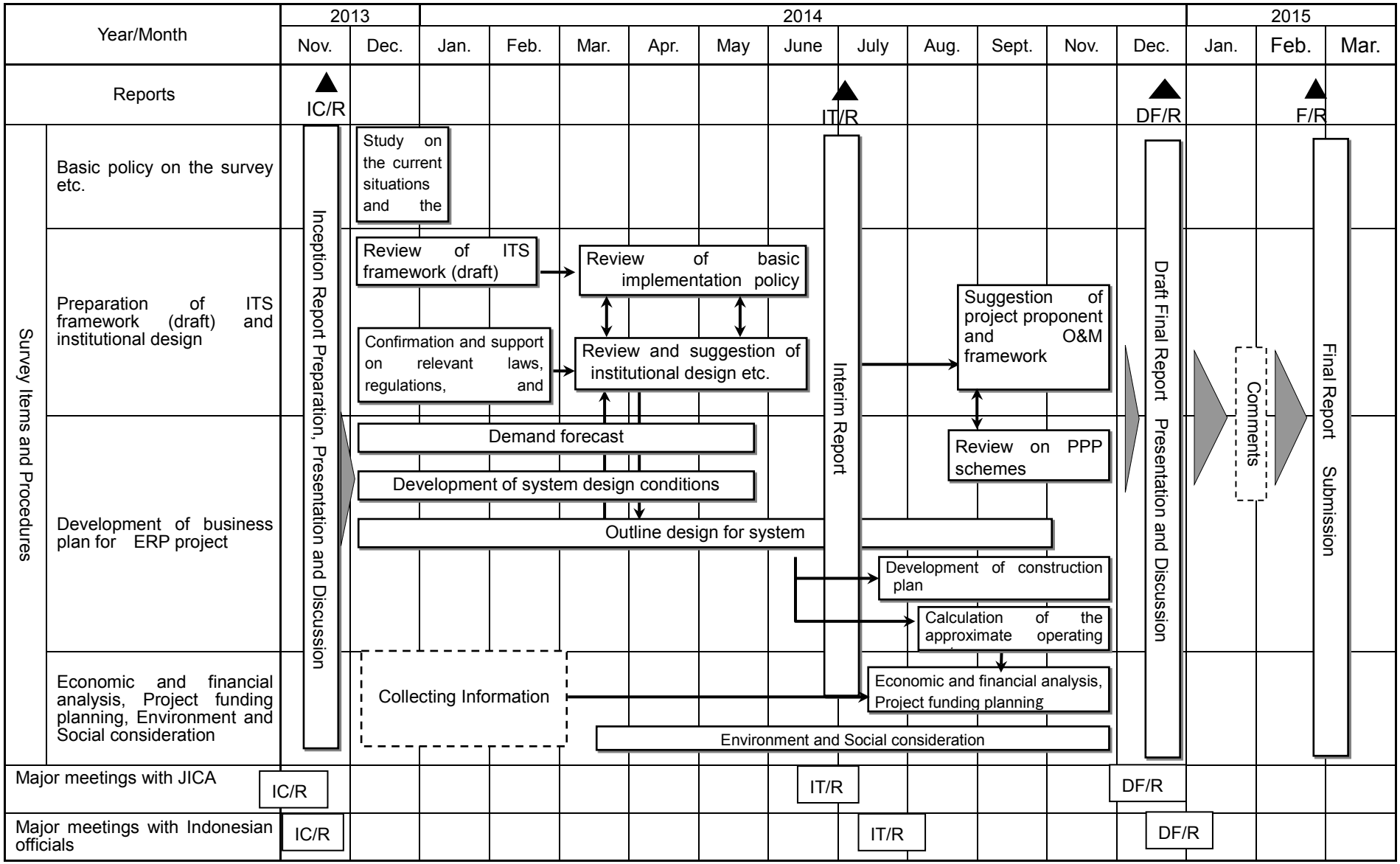


Figure Pre.-1 Study target area

Pre.4. Flowchart of the Study

Flowchart of the study is shown as below.

Table Pre.-1 Study Flowchart



Chapter 1. Overview of Socioeconomic Condition of DKI Jakarta

1.1 Transportation

1.1.1 Public Transportation

1.1.1.1 Bus and taxi

The number of buses of Transjakarta Busway is shown in the table below. The number of buses has increased up to 565 in 2012. The number of taxies and other buses in DKI Jakarta is shown as below. The number of taxies is around 25,000, and the number of bus of intercity and interprovincial is around 3,000. The revenue and the number of passengers of Transjakarta are shown in the table below. Both the revenue and the passengers have increased about 1.5 times from 2008 to 2012. In 2012, the annual revenue is around 364 billion Rupiah and the annual passengers reached 111 million people.

1.1.1.2 Railway

The ratio of travel ranging from inside DKI Jakarta and outside DKI Jakarta (Bogor, Depok, Tangeran, Bekasi area) is overwhelmingly high. The number of passengers in the above section is about 130 million and accounts for 84% of annual passengers in 2012 which is 160 million.

1.1.2 Number of Registered Motor Vehicles

The number of registered motor vehicles in DKI Jakarta is shown as below. The total number has increased 5 times from 3 million in 2000 to 14 million in 2012. The growth of motor cycles is prominent and the number of motor cycles has increased from 1.6 million in 2000 to 10.8 million in 2012. The average annual growth rate is around 17.2%. However, the average annual growth rate tends to decrease from around 23.5% of year 2000-2005, to 13.5% of year 2005-2010 to 11.1% of year 2010 -2012. The number of registered motor vehicles in DKI Jakarta has increased 2.6 times from1.05 million in 2000 to 2.74 million in 2012. The average annual growth rate is 8.3%.

1.1.3 Current Status of Road Development

The paved road length and area of 2012 in DKI Jakarta is shown as below. The total road length is 6,955.8km and the total road area is 48.5km2 in 2012. The road area is nearly equivalent to 7.3% of the total area of DKI Jakarta. The growth rate of the paved road length is 0.01% per year which indicates slow pace for improvement. The DKI Jakarta's road length per population (,000) is 0.7km and the area per population (,000) is 0.005km^2. In comparison with the data of Tokyo as of the end of 2012, the level is less than half those of Tokyo. The DKI Jakarta's road length per number of vehicle (excluding motor cycle) (,000) is 1.8km and the area per number of vehicle (excluding motor cycle) (,000) is 0.013km^2. As compared to the data of Tokyo as of the end of 2012, the

level is equivalent to one-quarter of those of Tokyo and the paved road length does not reach an adequate level.

1.1.4 Public Transport Network

1.1.4.1 Present status of public transport

There are various kinds of road based public transport systems in JABODETABEK area. Namely, TransJakarta in DKI Jakarta, transPakuan in Bogor and so forth. Big buses with more than 50 seats such as Patas AC, Patas Non-AC and Regular buses, midium-sized buses with 24 seats like Metro Mini and Kopaja, mini-buses with 9 to 14 seats like Microlet, Angkot, are in operation. Taxi, bajaj and bike-taxi (ojek) are serving individual transport service. Tricycle such as Beca is a short-distance traffic measues, which has not been allowed in operation in DKI Jakarta since 1990s, because it causes traffic congestion.

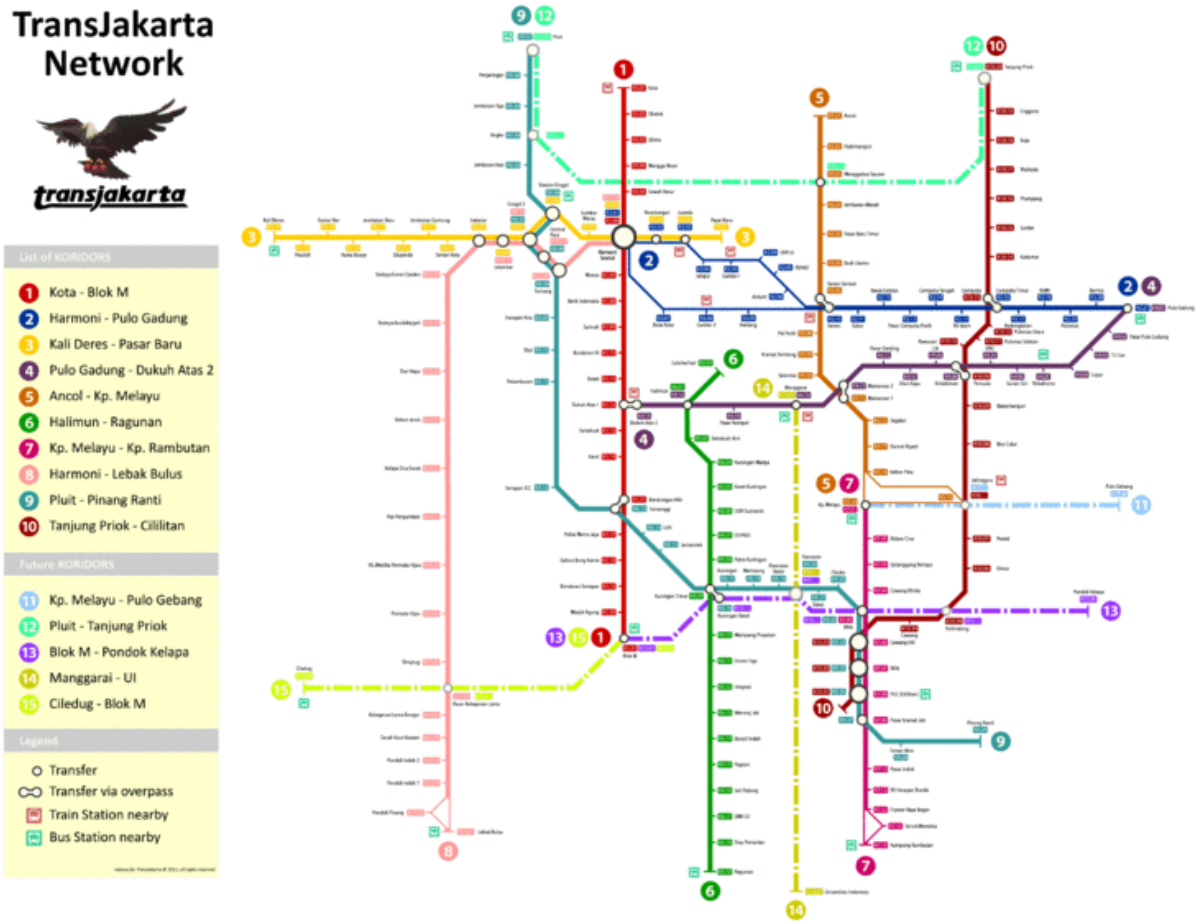


Figure1-1-1 Transjakarta network

Source：Transjakarta web site

1.2 Necessity of the introduction of ERP in DKI Jakarta

As discussed in prior, macroeconomic indicators and population are shown and socio-economic status of DKI Jakarta, maintenance plans, current status of transport, transport infrastructure and the like were described.

Further deepening on the road traffic congestion in DKI Jakarta can be envisaged in the future even by looking at any of them. One strategy to halt the further deepening of these road traffic congestion is the expansion of public transportation, including the city bus and train. Urban development projects to encourage commuting patterns of peoples behavior that does not depend on the car is also important. In addition, in order to alleviate road traffic congestion, which currently become obvious already, the introduction of appropriate automobile traffic management measures is also important.

Another measures to encourage these traffic measures is the reduction of economic policy incentives for car. Namely raising the economic compensation for vehicle use can be a measure to reduce the relative attractiveness of motor vehicle. ERP can be positioned in such category of measures. In addition to this, as a measure to induce a higher cost that occurs with vehicle use, increase of the parking tarrif and raising the price of gasoline are also placed on the same level of ERP.

By the increase in cost measures associated with vehicle use and raising measures of public transport service levels being operated concurrently, road traffic congestion in DKI Jakarta will be managed properly. It can be said that in this context, for the alleviation of serious road traffic congestion in DKI Jakarta today, introduction of ERP is an essential measure.

Chapter 2. Comprehensive Urban Transport Planning

2.1 Framework of the Comprehensive Urban Transport Planning

(1) Basic principle

The ERP can be considered a tool aiming at urban road traffic congestion mitigation. On the other hand, ERP alone cannot be expected to sufficiently work as a tool to mitigate urban road traffic congestion. Similarly ITS alone also cannot be expected to be enough measure to alleviate urban road traffic congestion.

Measures contributing to alleviation of urban road traffic congestion need to be combined with various measures to be comprehensive. They are, for instance: 1) land-use adjustment policy which maintains proper level of trip generation based on wide range and long term perspective, 2) economic disincentive policy for road users, 3) raise of level of service of public transport.

(2) Framework of the Comprehensive Urban Transport Planning

The Comprehensive Urban Transport Plan has a management plan for each of different stages such as the trip generation, modal split, and road traffic flow. At the stage of trip generation, measures to restrain total trip can be considered. These measures include inhibit growth management policy, city formation and urban development with small commuting traffic load and urban growth control policy.

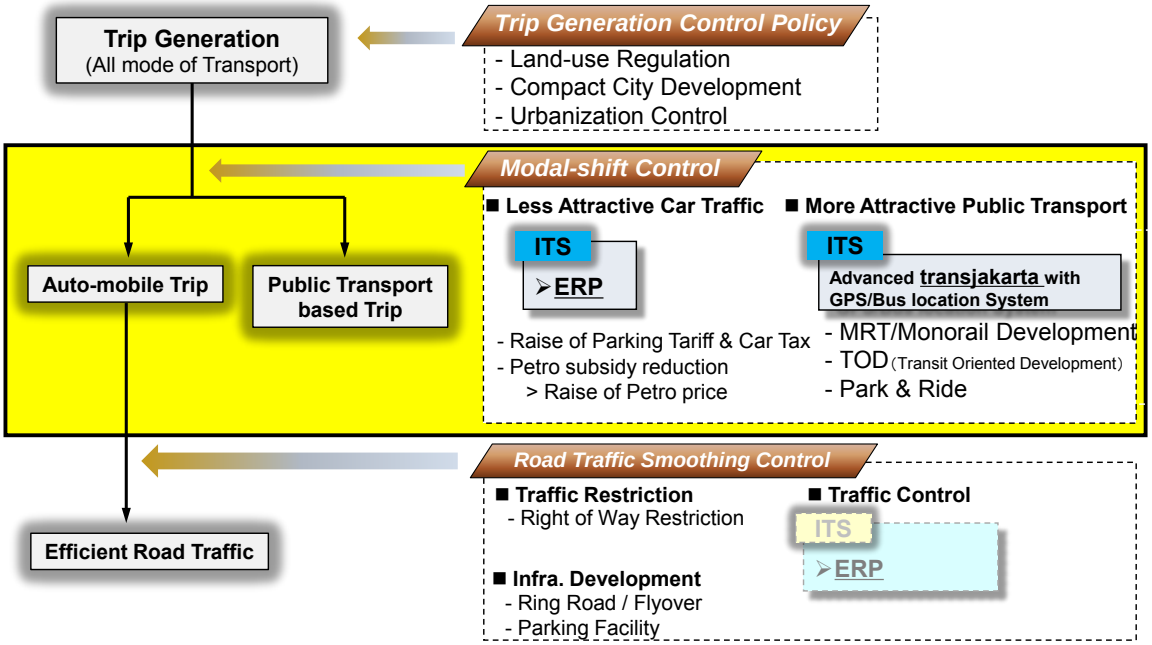


Figure2-1-1 Framework of the comprehensive urban transport planning

2.1.2 Roads under ERP and Public Transport

2.1.2.1 Targeted Roads for ERP

The targeted roads or corridor to implement ERP are shown in Figure 2-2-2. According to DKI Jakarta, Corridor I and Corridor VI are planned in the ERP roads.

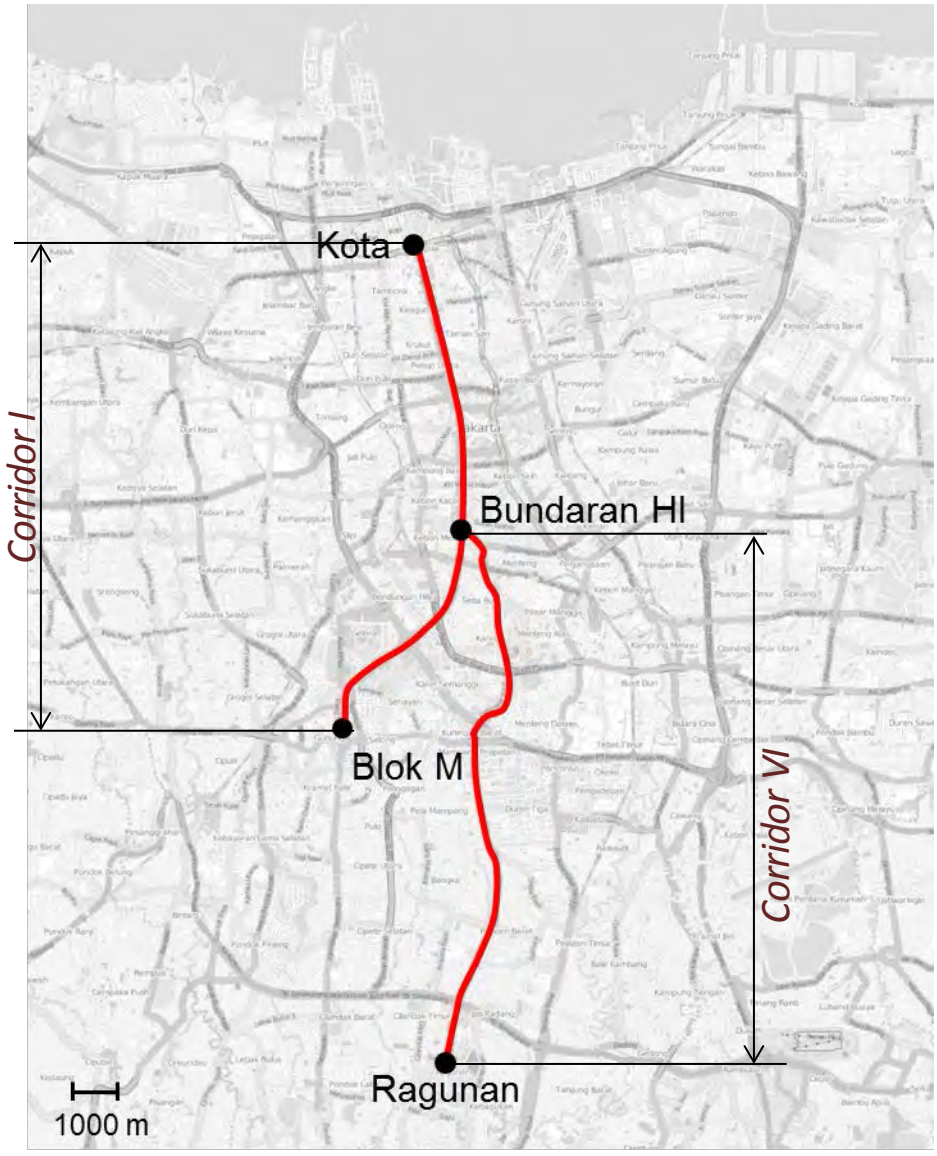


Figure2-1-2 Roads under ERP

Source: JICA Study Team

2.1.3 Process of Reviews on Modal Shift

The process of reviews on modal shift is shown in Figure 2-2-4. First of all, current service standards such as operational frequency, speed and congestion situation in Corridor I and VI are grasped. Then, the amount of modal shift in ERP is estimated on a basis of each survey result and demand absorption of route bus and BRT is considered. Finally, improvement items of public transport service which are important to promote modal shift are organized.

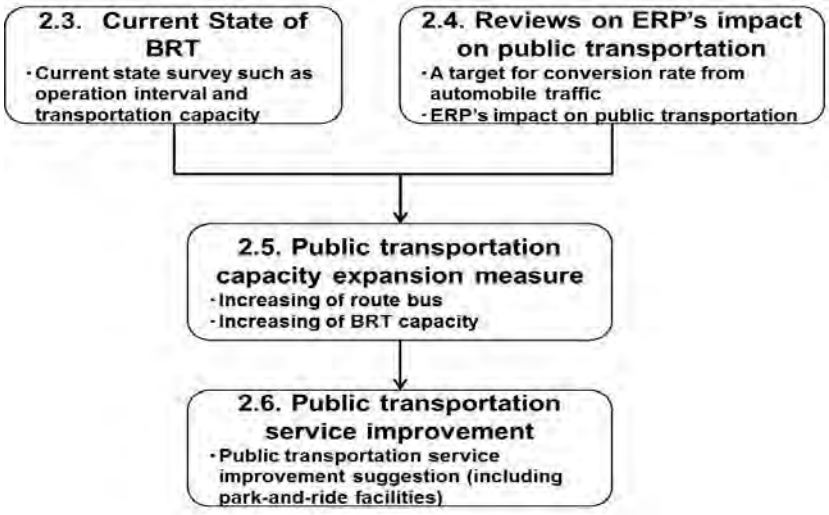


Figure2-1-3 Overview of review flow on modal shift

Source: JICA Study Team

2.2 Reviews on Impact on Public Transport by ERP

2.2.1 Targeted Conversion Rate from Automobile Traffic

Traffic congestion can be decreased significantly through traffic action change of 10% car drivers in general time, and 30% in rush hour. Thus, the targeted conversion rate from automobile traffic is set as 20% to 30%.

2.2.2 Impact on Public Transport by ERP

In this section, increasing volume of public transport users in Corridor I and VI will be estimated.

2.2.2.1 Corridor1

1) Based on the questionnaire survey, modal shift rate was set as 20 %.
2) Current traffic volume on Corridor I is estimated as 1,799 cars per hour and 2.06 persons per one car based on the result of the traffic volume survey in 7.2.
3) As a result, 1,799×0.2x2.06=741 persons per hour will possibly shift from motor vehicle to public transport.

2.2.2.2 Corridor6

1) Based on the questionnaire survey, modal shift rate was set as 20%.

2) Current traffic volume on Corridor VI is estimated as 1,249 cars per hour and 2.41 persons per one car based on the result of the traffic volume survey in 7.2.

3) As a result, 1,249x0.2x2.41=602 persons per hour will possibly shift from motor vehicle to public transport.

Table2-2-1 Prediction of modal shift from car to public transport

Item	Corridor1	Corridor6	Source
Sfifting factor (Shifting from motor vehicles)	20%	20%	Impact Survey (JICA ERP Study Team)
Current traffic volume	1,799 vehicle/hour	1,249 vehicle/hour	Traffic volume Survey (JICA ERP Study Team)
Shifted traffic volume (Additional BRT passengers)	741 person/hour	602 person/hour	***2.06,**2.41person/vehicle** (JICA ERP Study Team)

2.3 Plan for increase of public transport capacity

2.3.1 Increase of Route Bus

1) 741 persons per hour will possibly shift to public transport in Corridor I and 602 persons per hour in Corridor VI.

2) The increasing number of BRT or bus which absorb the above demand is shown below. Note: In calculation, the number of passengers is set as follows: 125 (articulated bus) on Corridor I and 85 on Corridor VI in BRT and 50 on bus.

Table2-3-1 The number of BRT/Bus needed for modal shift

(veh/1h)

Corridor	Public transport	
	BRT	Bus
1	5.9	14.8
6	7.1	12.0

3) Assuming bus conversion factor of private car as 2.0, and comparing traffic volume before shifting: 2,569 cars per hour on Corridor 1 and 1,587 cars per hour on Corridor VI, and after shifting, then it can be said that increase of traffic volume of bus after modal shift is only 1.2 – 1.5%.

4) Therefore, increase of route bus can absorb the shifted demand from motor vehicle to public transport on the road, and it ensures smooth traffic.

Chapter 3. ITS related Measures

Inthis survey, the development of ITS master plan was initially considered as the study framework of automobile traffic congestion mitigation measures in DKI Jakarta. ERP was also supposed to be positioned in the ITS master plan. However, in consultation with DKI Jakarta, many officials had the opinion that the study on ITS was not enough for considering road traffic congestion mitigation measures.

With this background, the study on ITS master plan has been slightly less meaningful while the meaning and the importance of considering comprehensive urban road traffic congestion mitigation measures has been recognized again. Then, it has developed the recognition between the survey team and DKI Jakarta officials that the interactive development of ITS through ERP could solve traffic congestion and significantly reduce CO2.

In addition, MOT published “Laporan Akhir – Grand Design Penembangan Intelligent Transport System (ITS)” (final report – grand design of ITS) in 2012. Based on that, this survey provides indirect support for MOT and therefore it creats ITS master plan centering on ERP in order to support the concretization of MOT’s ITS master plan.

3.1 Overview of ITS

3.1.1 ITS Services

To review ITS services in DKI Jakarta, ITS services need to be categorized into possible types. There are 9 service sectors in the early stage of ITS in Japan as Table 3-1-1.

In these ITS service sectors, ERP can be positioned as one of comprehensive ITS measures with utilizing (2) electronic toll collection systems and (4) optimizing traffic management to reduce traffic congestion. There arealso desired functions and measures such as (6) support for public transportation and (9) support for emergency vehicle operations at the same time as ERP. In addition, the functin is expected to bring other function and measures and have majorripple effect.

ERP and the related measures are one of extremely valuable and high-level ITS measures because those not only resolve traffic congestion but also become a foundation of various ITS services in DKI Jakarta, Indonesia.

Table3-1-1 ITS Service Sectors

Sector	Major function	ERP releted sector	(Ref.)ITS sector in Indonesia(Table 3-2-1)
(1)Advances in navigation systems	Providing traffic information for drivers		Traveler Information Systems (TIS)
(2)Electronic toll collection systems	Charging for road usage, IC card	++	Electronic Financial System (EFS)
(3)Assistance for safe driving	Providing safety information for drivers		Advanced Vehicle Control & Safety Systems (AVCSS)
(4)Optimization of traffic management	Traffic signal control, traffic control	++	Advance Traffic Management Systems (ATMS) -Including Transportation Demand Management
(5)Increasing efficiency in road management	Increasing efficiency of maintenance		
(6)Support for public transport	Management of public transportation operation, PTPS	+	Public Transport Systems (PTS)
(7)Increaseing efficiency in commercial vehicle operations	Commercial vehicle operation and management		Commercial Vehicle Management System(CVMS)
(8)Support for pedestrians	Route guidance for pedestrians		
(9)Support for emergency vehicle operations	Disaster and accident announcement	+	Emergency Management Systems (EMS)

The table below shows a list of ITS services in Indonesia. Major services include Advance Traffic Management Systems (ATMS), Traveler Information Systems (TIS), Public Transport Systems (PTS), Commercial Vehicle Management System(CVMS), Electronic Financial System (EFS), Emergency Management Systems (EMS), and Advanced Vehicle Control & Safety Systems (AVCSS). The service related to ERP is Electronic Financial System (EFS). The similar systems such as ETC and electronic payment system for introduction of ERP have been already built.

Table 3-1-2 List of ITS services

ITS Services	Service components
Advance Traffic Management Systems (ATMS)	1. Traffic Control 2. Traffic Management/Signal Control 3. Traffic Demand Management System 4. Automated Detection of Weather/Road Condition
Traveler Information Systems (TIS)	1. Route Guidance 2. Traveler Services Information 3. En-route Driver Information 4. Pre-trip Travel Information 5. Parking Information
Public Transport Systems (PTS)	1. En-route Transit Information 2. Public Transportation Management
Commercial Vehicle Management System(CVMS)	1. Commercial Vehicle Operations (CVO) 2. Hazardous Material Incident Response 3. Automated Roadside Safety Inspection
Electronic Financial System (EFS)	1. Electronic Toll Collection 2. Electronic Payment System

ITS Services	Service components
Emergency Management Systems (EMS)	1. Incident Management 2. Emergency Notification 3. Personal Mayday Support 4. Emergency Vehicle Management 5. Public Mayday Support
Advanced Vehicle Control & Safety Systems (AVCSS)	1. Safety Readiness 2. Pre-crash Restraint Deployment 3. Driving Safety Warning

3.1.1.2 Roadmap of ITS

The systems which promote ITS related measures easing congestion and promoting modal shift to public transport were stated so far and the figure below shows the roadmap of them. This schedule is moved up in comparison with the MOT plan. These ITS services are desired to be planned and implemented as soon as possible in order to ease chronic congestion, reduce CO_2 and stimulate economy and life of citizens in Jakarta city.

ITS is expected not only to provide a stand-alone service but also to promote modal shift to public transport more effectively through multiple systems and measures.

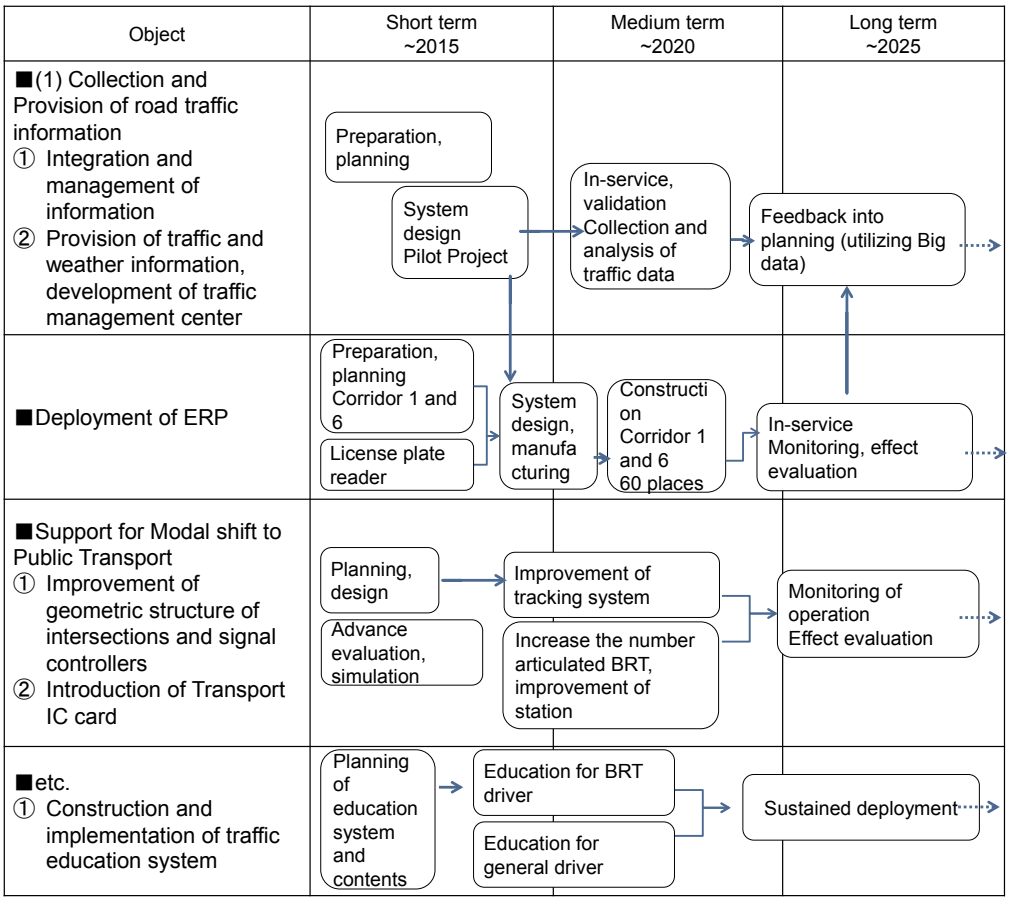


Figure 3-1-1 Roadmap of ITS service

3.1.1.3 Importance of pioneering introduction of ERP

While we suggested various ITS services, introduction of ERP is considered to contribute directly and effectively to ease traffic congestion in urban area of Jakarta.

The figure below shows the outline of modal shift to public transportation and change in traffic volume of vehicle flowing into the urban area. There are three steps in modal shift to public transport: improvement of BRT (optimization of TransJakarta operation), introduction of ERP and introduction of MRT. Although multiple utilization of ITS measures is desired for realization of targeted user services, introduction of ERP is the most effective measure of ITS which realizes the Jakarta's goal of easing traffic congestion and early implementation is desired.

MRT improvement is also expected as a measure for mass transit but it needs much cost and time. ERP is a light infrastructure comparatively and expected as a measure realizing the revitalization of local economy and improvement of quality of life.

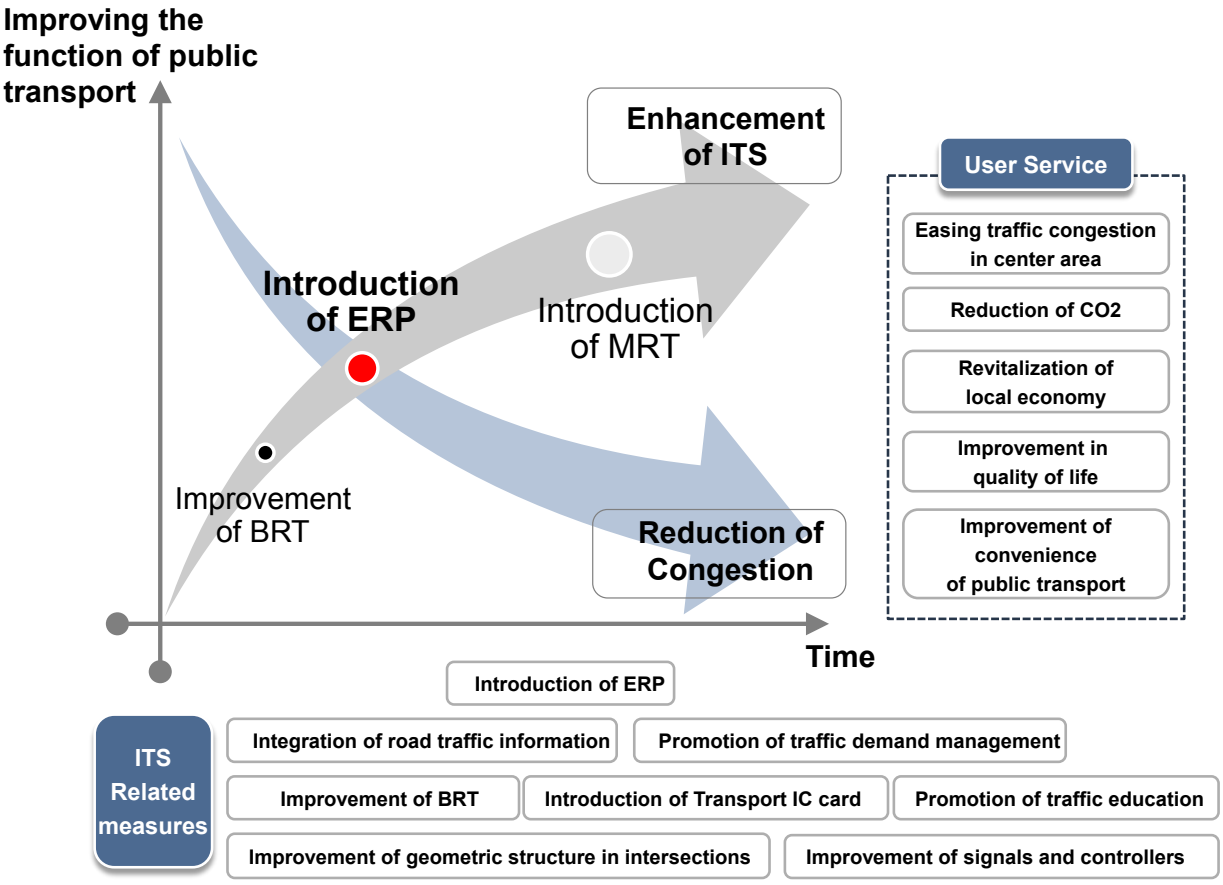


Figure 3-1-2 Outline of ITS approach and introduction of ERP (drawn up by JICA Study Team)

Chapter 4. Review of the Legal Framework

4.1 Legal Structure for ERP Project Implementation

Major legal structure for ERP project implementation is shown as the figure below.

The legal system for ERP project implementation can be categorized into 5 groups: road traffic, retribution, local government, project scheme and others (spatial planning, environment, information communication). For ERP implementation, PP (Government Regulation) 32/2011 on road traffic management and PP 97/2012 on Traffic Control Retribution are the key regulations in the legal structure.

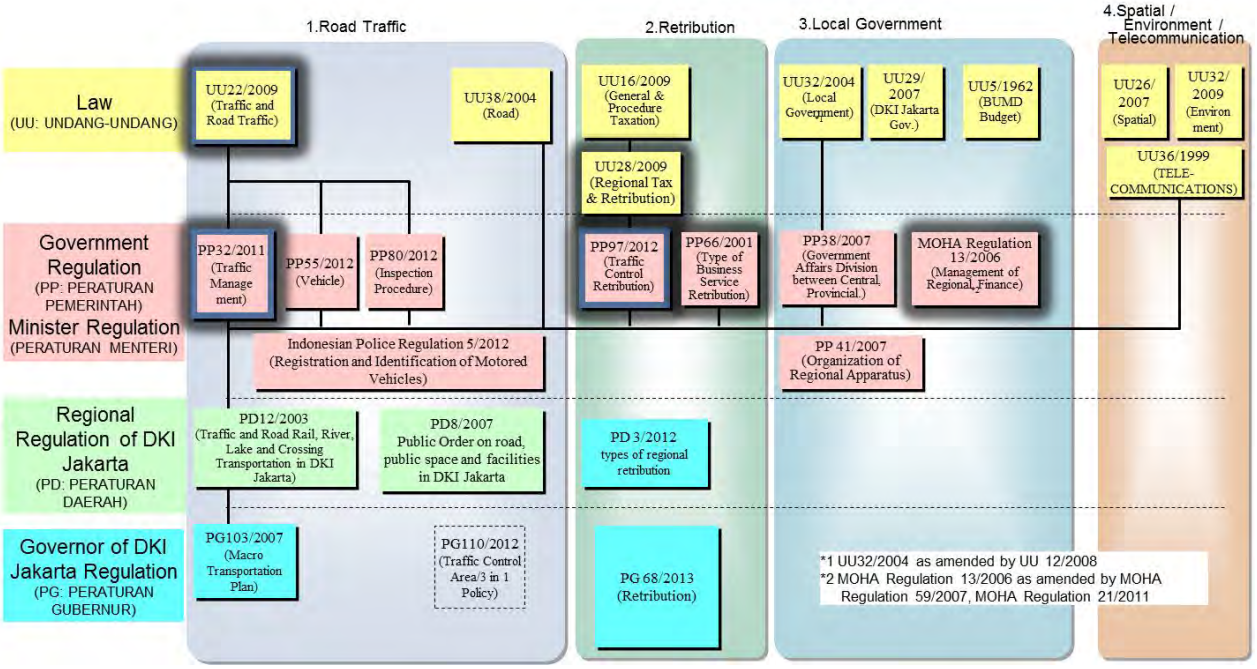


Figure4-1-1 Legal Structure for ERP (1/2)

Source: Created by JICA ERP Study Team

For project scheme, ERP project is not included in the scope of PPP in Presidential Regulation 67 of 2005 (partially amended by Presidential Regulation 13/2010, 56/2011, and 66/2013) for PPP infrastructure of Indonesian central government. Thus, ERP project scheme has to be reviewed based on regulations of regional partnership project of local government such as widely applicable PP50/2007 (See 4.4).

4.2 Legal Basis of Imposition of ERP

4.2.1 Imposition of ERP

In Article 60 (2) of PP 32/2011, traffic demand management can be conducted by the traffic restriction shown as below. Article 60 (3) and Article 79(1) of PP 32/2011 also stipulate that traffic restriction on private vehicle and goods vehicle can be done by the imposition of Traffic Control Retribution.

Based on Article 1(2) of PP 97/2012, Traffic Control Retribution is a collection on the use of certain road segments, certain corridors, certain areas at certain time, and certain density level.

In addition, Article 8 of PP 97/2012 stipulates that the system and equipment for ERP the regional government must provide is required to be an electronic system.

As stated above, ERP Charge could be considered as Traffic Control Retribution based on current regulations and be introduced on private vehicle and goods vehicle.

4.2.2 Implementation Body

Article 2(2) of PP 97/2012 stipulates that the collection of Traffic Control Retribution shall be conducted by the provincial government in the provincial road segments. Article 2 of PP 32/2011 also stipulates that management and traffic engineering activities are the responsibility of Governor and Head of Police of the Republic of Indonesia for provincial road. Based on current regulations shown as the table below, local government is responsible for introducing system and equipment necessary for Traffic Control Retribution.

4.2.3 Targeted Roads

Article 79(3) of PP 32/2011 stipulates that traffic restriction on private vehicle and goods vehicle may not be conducted on national roads. So the applicable roads of ERP are all roads excluding national roads.

4.2.4 Charged Classes of Vehicle

Article 3 of PP 97/2012 stipulates as the following table. ERP charged classes of Vehicle are limited (e.g. motorcycles excluded).

4.2.5 Formulation of Regional Regulations on ERP (Traffic control Retribution)

UU 28/2009, PP97/2012 and PP 32/2011 do not regulate the details of imposition of Traffic Control Retribution. Shown as below, UU 28/2009, PP97/2012 and PP 32/2011 stipulates that the details shall be regulated by regional regulation.

4.2.6 ERP Violation and Enforcement

Measures of payment failure of ERP charge and vehicles without on-board unit need to be stipulated. Especially, in case payment failure of retribution is considered as unpaid money, it's possible to demand it, however, the unpaid status is not within "illegal action" and it may be hard to make an arrest on the spot.

In the existing legal framework, UU22/2009 stipulates the definition of road traffic violation and the enforcement procedure as below. Therefore, the definition of ERP violation should be shown on road signs and others to road users and any violation of ERP should be sanctioned within the scope of UU22/2009. In the 3 in 1 traffic control, the enforcement of violation is in accordance with UU 22/2009.

Although UU28/2009 also regulates violation of retribution, it is a penalty for direct retribution collectors who fail to pay collected retribution to the local government. Like entrance fee for zoo, retribution from citizens is based on the assumption that public service is provided to them at the same time, so there is no penalty for citizens who violate retribution.

4.3 Institutional Framework on Retribution, Regional Government Revenue and Expenditure

4.3.1 Legal Basis of Traffic Control Retribution

Article 80 (1) of PP32/2011 stipulates that Traffic Control Retribution is a public service retribution. Public service retribution is not a kind of tax but a payment for public service. Retribution is considered as revenue of regional government.

Article 3 (1) of PP97/2012 stipulates that the object of traffic control retribution is the use of specific roads, specific corridors, or specific areas on a specific time by private or freight motored vehicle. Therefore, in terms of PP32/2011, it is supposed that Traffic Control Retribution is considered as a payment by road users for usage of public service such as provision of public road, however, it becomes revenue of regional government directly and it is not tariff as toll road tariff.

Article 160 of UU28/2009 also regulates that collection of retribution is done through the issuance of a letter stating the payable retribution or other documents. Other documents can be in the form of ticket, coupon, and subscription cards. No current laws and regulations explicitly regulate electronic charge of retribution.

4.3.2 Usage of income received from Traffic Control Retribution

According to Article 9 (1) of PP 97/2012 and Article 80 (2) of PP32/2011, income received from Traffic Control Retribution must be utilized to increase the traffic performance and public transport services.

4.3.3 Overview of Institution on Regional Government Revenues and Expenditures Budgetary (APBD)

Article 26(1) of MOHA Regulation 13/2006 (as lastly amended by MOHA Regulation 21/2011) stipulates that income received from the collection of retribution is classified as regional government revenue. According to Article 122 of MOHA Regulation 13/2006, all regional government revenues and expenditures for the implementation of local government affairs shall be managed within Regional Government Revenues and Expenditures Budgetary (APBD).

In addition, according to Article 15 of MOHA Regulation 13/2006, under the framework of Regional Government Revenues and Expenditures Budgetary (APBD), changes of Regional Government Revenues and Expenditures, and implementation of Regional Government Revenues and Expenditures each year is set by regional government regulations.

In order to use the income received from collection of Traffic Control Retribution, such expenses must be formulated in Regional Government Revenues and Expenditures Budgetary (APBD) which is determined annually under regional regulation as well.

Regional regulation on Regional Revenues and Expenditure (APBD) shall be formulated in accordance with the following flowchart. For formulation of Regional Revenues and Expenditure (APBD), regional regulation on APBD must be stipulated annually with approval of DPRD (Dewan Perwakilan Rakyat Daerah: Regional Parliament) and evaluation of MOHA. The purpose of evaluation of MOHA is to ensure whether the draft of

regional regulation is in accordance with higher hierarchy laws and regulations.

In case approval by DPRD and/or evaluation by MOHA for draft regional regulation on APBD are delayed, there is a possibility that annual expenditure for traffic performance activity improvement from income of traffic control retribution not conducted as scheduled.

Chapter 5. Review of ERP Project Scheme

5.1 Public-Private-Partnership Project Scheme

As stated in Chapter 4, Presidential Regulation 67/2005 (Presreg 67/2005) (partially amended in Presidential Regulation 13/2010, 56/2011, and 66/2013) and Regional Partnership 50/2007 are regulations related to PPP in Indonesia. The difference between each regulation is Presreg 67/2005 is related to cooperation between central government and private entity and PPP 50/2007 is related to cooperation between regional government and private entity.

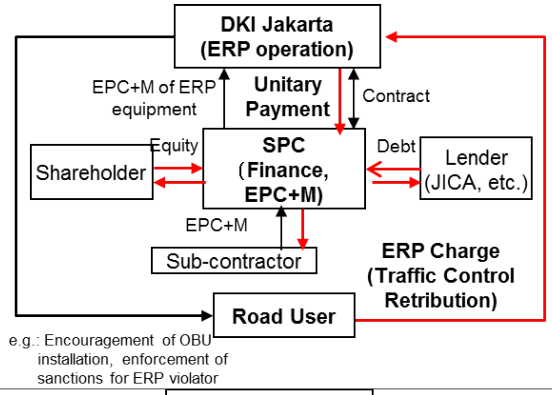
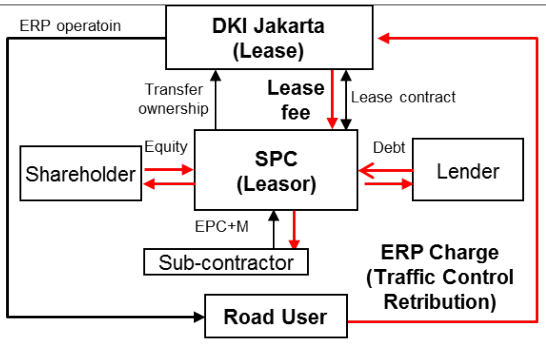
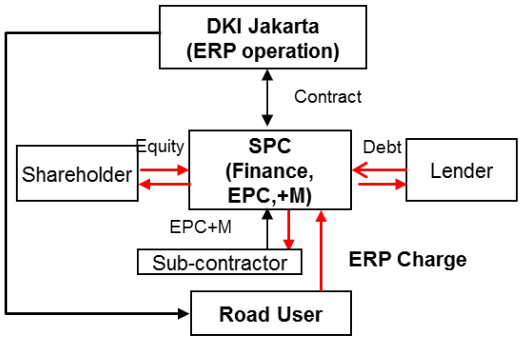
Since ERP is not explicitly included in the scope of PPP (Presreg 67/2005), ERP project cannot be a PPP project which is done with central government. In other words ERP project cannot be implemented as PPP project under Presidential Regulation 67/2005.

On the other hand, ERP project in DKI Jakarta can be considered as a project under the authority of DKI Jakarta Gov. Which means ERP can be implemented under the “cooperation agreement” between DKI Jakarta Gov, and private entities in accordance with PP 50/2007.

5.1.1 Comparison of Project Schemes

The comparison of major functions among the 3 project schemes reviewed in the previous section is shown in the table as below. Either the unitary payment (BTO) scheme or the finance lease can fulfil the same function as Directly Collected From Road User (BOT) including initial investment by private entity (no fund provided by DKI Jakarta Gov.).

Table5-1-1 Comparison of Project Schemes

Main Function	Project Scheme	Initial Investment	Precise Collection of ERP Charge	Management & Traffic Engineering Activities	Maintenance Cost, etc.
Unitary Payment (Service-purchasing type)(BTO)		Financed by private sector	Possible	The responsibility of DKI Jakarta governor	Disbursed from unitary payment
Finance Lease (Transfer ownership)		Financed by private sector	Possible	The responsibility of DKI Jakarta governor	Disbursed from lease fee
Directly Collected From Road User (Financially independent type) (BOT)		Financed by private sector	Possible	The responsibility of DKI Jakarta governor	Disbursed rom income of ERP charge

Source: JICA Survey Team

5.2 The Legal Feasibility of ERP Project Scheme

5.2.1 Organization Framework

The current regulation stipulates that the authority to collect ERP charge only belongs to DKI Jakarta (article2 PP97/2012) and Management and traffic engineering activities are the responsibility of DKI Jakarta (article2 PP32/2011). Consequently, the implementing body of ERP Project is solely DKI Jakarta and the private entity will engage only as an outsourcing contractors.

5.2.2 Public-private Role sharing of ERP Project

Public-private Role sharing of ERP Project with Unitary Payment Scheme (BTO) is described in the chart below.

Table5-2-1 Public-private Role sharing in ERP Project

Classification	Item	Public	Private
Overall	Planning	✔	
	Regulation	✔	
	Empowerment	✔	
	Supervision	✔	
Construction	Acquisition of Land	✔	
	Financing		✔
	Design, development and construction of ERP Infrastructure		✔
	Design, development and manufacturing of OBU		✔
	Design and installment of network		✔
	System Monitoring		✔
Maintenance	System maintenance		✔
	Publicity before commencement	✔	
Operation	OBU distribution and installation (public – being responsible, private - acting)	✔	(✔)
	ERP charge transactions (private – system maintenance and management)	✔	(✔)
	ERP charge collection	✔	
	Detection of violation (Private – system maintenance and management)	✔	(✔)
	Management of delinquent (Private – system maintenance and management)	✔	(✔)
	Legal execution for the violator	✔	
	Construction of Vehicle Ownership Database (Private – system maintenance and management)	✔	(✔)
	Registration and management of ERP user (Private – system maintenance and management)	✔	(✔)
	Traffic monitoring and analysis (Private – acting)	✔	(✔)
	Planning of monitoring (Private – acting)	✔	(✔)
	Review ERP Charge	✔	
Environment	Cutting roadside trees (public – being responsible, private - acting)	✔	(✔)
	Control of environment degradation (waste, noise, vibration, etc.) during work (public – being responsible, private - acting)	✔	(✔)
	Security for labor environment during work (public – being responsible, private - acting)	✔	(✔)
	Promotion of improving alternative public transportation	✔	
	Monitoring of air quality, etc. during work (public – being responsible, private - acting)	✔	(✔)
	Monitoring of air quality, etc. during operation	✔	
	Measures to unemployed people (Jockeys)	✔	

*(✔) means that a private body partially implements.

Source: JICA Survey Team

5.2.3 Operation of ERP

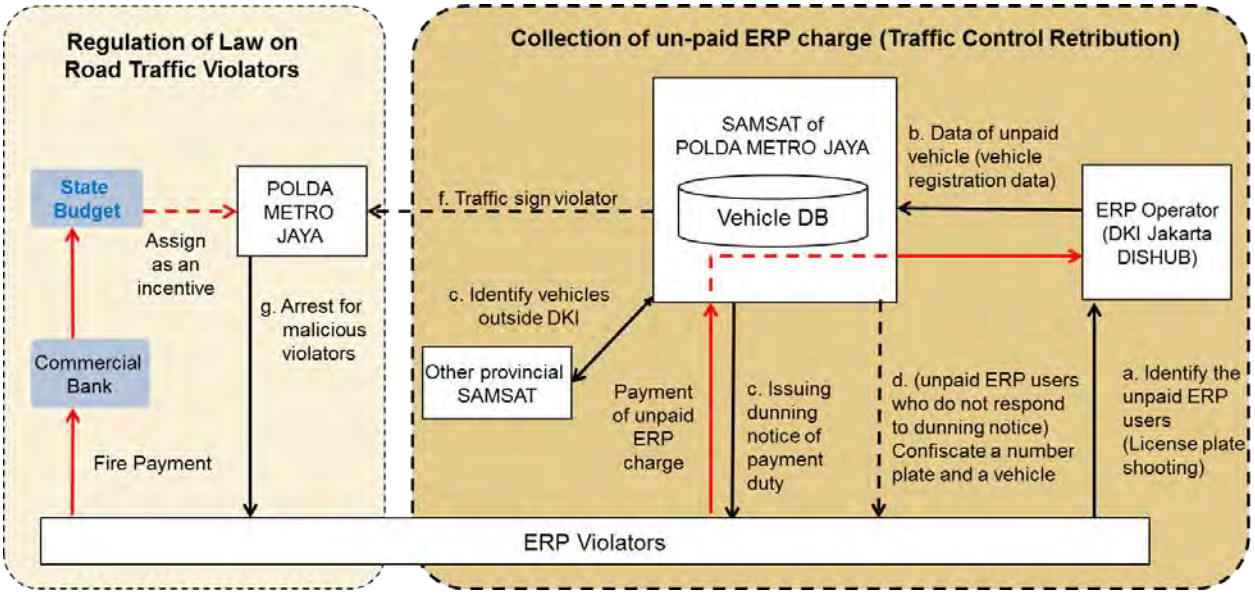
5.2.3.1 ERP Charge Collection

ERP charge is collected automatically by vehicle equipped with on-board-unit (OBU) are passing the gantry and ERP charge being deducted from the account opened. The account could be pre-paid account where ERP users can top up at convenience store or internet banking. The details are described in Chapter 6.

5.2.3.2 Violation and Enforcement

(1) Legal system for violation and enforcement

ERP violators could be enforced by road traffic sign board likewise regulation of 3 in 1 based on Road Traffic Law. However, the unpaid ERP charge itself has no legal basis through existing laws, because ERP charge is "traffic retribution" and there has no regulation regulating the status of unpaid retribution. Therefore, another provincial regulations needs to be newly developed.



Source: JICA Survey Team

Figure5-2-1 Scheme of Regulation of ERP Violator

5.3 Response to risks on ERP project

5.3.1 Overview of major risks on ERP project

The below table shows main assumed risks on ERP project and its risk allocation for public and private sector. For stable operation, measures against the risk of unitary payment (failure or delay of unitary payment due to delay in government's budget process) is the most important among the following risks.

Table5-3-1 Major risks on ERP project

Risk			Allocation		Mitigation Measure
			Public	Private	
1. Sponsor risk (evaluation of sponsor)		Project interruption due to lack of financial and technical capability of sponsor, etc.		✔	On the stage of creating a project, selecting private entities as partners, which have local construction experience, enough structure for implementation and financial capacity.
2. Financing risk		Delay of financial closure, risk of not getting an investment from a sponsor and/or a loan from lender as originally planned		✔	It's important to coordinate with investors and lenders on project (details of contract, government guarantee and anticipated income and payout) and receive a firm commitment from them on the stage of creating a project.
3. Construction/ Technical risk	Applied technology	Risk of not producing an effect of ERP introduction due to applied technology not matching the road situation for ERP		✔	Mitsubishi Heavy Industry has much experience of introducing ERP system within and outside country.
	Cost and construction schedule, etc.	Risk of requiring more project cost and construction period than expected due to the situation of construction site	✔	✔	It is necessary to coordinate with public sector (such as Dishub, police) for technical matter and to make a project plan.
	Content of EPC contract	Risk of SPC taking responsibility of the damage of cost increase and delay in completion due to lack of capability of EPC contractor in case that contract		✔	EPC contractor is responsible for design and construction risk. For a contract between SPC and EPC contractor, full tern key contract (with fixed lump sum and data certain) is assumed. EPC contractor is obligated to provide performance guarantee and enter into insurance

Risk			Allocation		Mitigation Measure
			Public	Private	
		conditions (contract price and completion date, etc.) are not clear			for construction.
4. Operation risk	Operation capacity of DISHUB	Risk of not producing an effect of ERP introduction due to lack of capability of ERP operation body	✔		SPC, in charge of operation support and maintenance of ERP system, makes a structure to support Dishub. Mitsubishi Heavy Industry has experience of being in charge of maintenance of ERP system in Singapore for more than 10 years. For operation, it is assumed that experts would be invited from Singapore Land Transport Authority or domestic /international road business operators.
5.Revenue risk	Unitary payment (budgeting) risk	Due to delay of permission by the provincial congress and MOHA, unitary payment can be delayed.	✔		Specifying the regulation for compensation for damage/loss due to contract violation by public sector such as delay of unitary payment in the project contract between DKI Jakarta and SPC.
	Traffic demand risk	Risk of not reach expected income due to less traffic volume than originally expected	✔		Under current laws and regulations, only unitary payment (BTO) is can be applied to ERP project, which DKI Jakarta can collect Traffic Control Retribution from road users directly and shall pay to SPC in exchange for EPC&maintenance services. In unitary payment, constant amount is paid to SPC regardless of traffic volume, so public sector takes traffic demand risk by adopting the unitary payment scheme.
	ERP charge collection risk	Missed ERP	✔		Introducing unitary

Risk				Allocation		Mitigation Measure
				Public	Private	
			charge collection from OBU non-installed vehicle, unofficial OBU installed vehicle, and ERP violating vehicle			payment scheme which provides constant payment in exchange for services regardless of charge amount (it must be regulated by a contract between DKI and SPC. Public sector takes ERP charge collection risk excluding insufficient design, installation and maintenance of ERP system.)
	ERP charge amount revision risk		Risk of not reaching expected income due to change of ERP charge amount	✔		Adopting unitary payment scheme which provides constant payment in exchange for services regardless of change of the charge amount.
6. Others	Permission risk	Criteria fulfillment for ERP imposition	Risk of not implementing ERP project as planned due to failure of acquiring necessary permissions	✔		As an implementation body, public sector takes the risk. (it must be regulated by a contract between DKI and SPC)
		Approval on ERP regional regulations		✔		
		Permission on using wireless radio frequency spectrum		✔		
		Certification of electronic equipment and/or system for ERP			✔	Support for smooth obtaining certification by appealing Japan's experiences and superiority in ERP system.
		Permission on usage of radio wave		✔	(✔)	As an implementation body, public sector becomes an applicant but SPC pre-coordinates radio wave interference.
		Permission on environment		✔		No necessary to acquire AMDAL under current laws and regulations.
	Land acquisition risk		Project delay due to delay of land acquisition for ERP project	✔		Basically, land acquisition will not be needed for the ERP project.
	Related infrastructure/utility risk		Risk of project delay and	✔		As an implementation body, public sector takes

Risk				Allocation		Mitigation Measure
				Public	Private	
			failure due to the difference with the expected situation of power lines, telecommunication cables, and vehicle database			the risk. (it must be regulated by a contract between DKI and SPC)
	Exchange rate and Interest rate risk	Exchange rate risk	Loss of income on Japanese yen basis due to weakening of rupiah (e.g. increase of loan repayment on Japanese yen basis)		✔	Unitary payment will be paid by rupiah because ERP is implemented as a public service of DKI Jakarta. SPC needs to utilize a loan scheme in rupiah and introduce foreign currency swap contract.
		Interest rate risk	Increase of loan repayment by SPC due to rising interest rates		✔	Utilizing a loan scheme with fixed interest
	Inflation risk		No revenue by original unitary payment due to inflation	✔		Introducing a scheme to change the amount of unitary payment based on price escalation.(it must be regulated by a contract between DKI and SPC)
	Common	Monetary exchange/remittance risk	Not able to repay debts and pay a dividend in case that exchange into Japanese yen and money transfer to overseas from Indonesia are not permitted for unitary payment	✔		Guarantee for currency inconvertibility by public sector (or compensation for loss) (It must be regulated by a contract between DKI and SPC)
		Unilateral termination of contract by public sector	Not be able to recoup the investment amount due to termination of contract	✔		Compensation for loss by public sector (It must be regulated by a contract between DKI and SPC)

Risk				Allocation		Mitigation Measure
				Public	Private	
		Law and policy change risk	Difficulty of continuing ERP project and additional cost for facility improvement due to law and policy change	✔		Compensation for loss by public sector (It must be regulated by a contract between DKI and SPC)
		Natural disaster	Restoration cost for damages by natural disaster such as abnormal weather, flood, and earthquake, war, terrorism, and riot		✔	Covered by all risk insurance
		Political risk (war, civil war, riot and terror)		✔	✔	For force majeure not covered by existing insurance, allocating risks through mutual consultation between public and private sector. (It must be regulated by a contract between DKI and SPC)

*(✔) means that a private body partially takes risks.

Source: JICA Survey Team

Chapter 6. Traffic Condition Survey

6.1 Survey Outline

The traffic condition surveys as shown in the Table 6-1-1 were conducted in this study.

Table6-1-1 Traffic Condition Survey Outline

	Title	Purpose	Survey Location/Target	Note
1	Traffic counting	・Obtain the information of current traffic volume on ERP corridor to forecast the traffic demand when ERP is introduced ・Grasp the current situation of BRT (Transjakarta) operation	・Corridor 1：9 locations ・Corridor 6：8 locations	Two weekdays 6:00～22:00
2	Travel speed	・Obtain the information of travel speed by section and time period to set ERP-charging sections and hours and to evaluate the impact of ERP	・Corridor 1：between Blok M and Kota ・Corridor 6：between Ragunan and Budaran HI	Three weekdays 6:00～22:00
3	WTP (Willingness To Pay)	・Grasp the attitude and behavior change of car users when ERP is introduced in Jakarta and consider the appropriate charge price ・Forecast traffic demand of the target road based on the survey results, estimate the number of people shifting to public transport, and verify the capacity of public transport service	・Car users on Corridor 1 and Corridor 6	1,200 samples
4	Jockey interview	・Grasp the price drivers pay to Jockeys to consider the price into account for ERP charge setting	・Jockeys on 3-in-1 restriction road	120 samples

6.2 Travel Speed Survey

6.2.1 Outline

Survey period and survey day

- Survey period：from 6:00 to 22:00
- Survey day：Corridor 1：Wed 19, Thu 20 and Tue 25 March, 2014
  Corridor 6：Tue 25, Wed 26 and Thu 27 March, 2014

Survey method

GPS log data was obtained by a GPS logger mounted on a survey vehicle which made a round trip to the target road as many as possible during the survey period except a small rest.

Survey route

The survey routes are Corridor 1 and 6 of Transjakarta.

6.2.2 Survey Results

(1) Average Travel Speed

The average travel speed by time period are shown in Table 6.3-1. The Figures marked in red shows the speed less than 10 km/h, which is regulated as the maximum speed for ERP charging by the Article 5 of PP 97/2012. The Figure marked in orange, less than 20 km/h, are possible to be less than 10 km/h during the rainy seasons, Lebaran and so on.

Table6-2-1 Average Travel Speed by Time Period

Corridor 1 (from Blok M to Kota)

North to South

Section	Distance (km)	6:00 -7:00	7:00 -8:00	8:00 -9:00	9:00 -11:00	11:00 -13:00	13:00 -15:00	15:00 -16:00	17:00 -18:00	19:00 -21:00	21:00 -22:00
Jl. Jembatana Batu - Jl. Mangga Besar	1.30	34	27	22	22	14	8	2	9	12	23
Jl. Mangga Besar - Jl. Suryo Pronoto	2.00	23	13	10	15	8	4	5	4	11	—
Jl. Suryo Pronoto - Jl. Medan Merdeka S	1.56	29	36	21	20	15	9	13	23	20	—
Jl. Medan Merdeka S - Bundaran HI	1.59	26	28	18	15	13	3	7	20	17	—
Bundaran HI - Jembatan Dukuh Ata	0.85	25	35	30	19	6	4	8	6	13	—
Jembatan Dukuh Ata - Jl. Prof. Dr. Satrio	1.44	53	5	45	8	8	6	12	13	8	23
Jl. Prof. Dr. Satrio - Semanggi Jct.	0.85	32	5	8	10	7	6	16	23	13	20
Semanggi Jct. - Bundaran Senayan	1.80	32	33	25	27	28	28	32	19	11	39
Bundaran Senayan - Trunojoyo	1.21	20	10	20	12	13	29	14	12	14	18

South to North

Section	Distance (km)	6:00 -7:00	7:00 -8:00	8:00 -9:00	9:00 -11:00	11:00 -13:00	13:00 -15:00	15:00 -16:00	17:00 -18:00	19:00 -21:00	21:00 -22:00
Trunojoyo - Bundaran Senayan	1.21	16	12	10	8	8	25	14	21	—	15
Bundaran Senayan - Semanggi Jct.	1.80	33	27	20	21	33	23	36	46	—	38
Semanggi Jct. - Jl. Prof. Dr. Satrio	0.85	32	31	40	44	34	49	47	47	—	42
Jl. Prof. Dr. Satrio - Jembatan Dukuh Ata	1.44	31	13	47	21	16	11	12	53	—	45
Jembatan Dukuh Ata - Bundaran HI	0.85	37	32	25	27	22	10	12	35	—	33
Bundaran HI - Jl. Medan Merdeka S	1.59	23	22	26	22	24	26	24	24	18	17
Jl. Medan Merdeka S - Jl. Suryo Pronoto	1.56	30	30	18	14	10	13	10	16	19	20
Jl. Suryo Pronoto - Jl. Mangga Besar	2.00	35	32	23	22	17	19	16	10	19	13
Jl. Mangga Besar - Jl. Jembatana Batu	1.30	28	25	26	16	8	9	6	9	18	17

Corridor 6 (from Blok M to Kota)

North to South (km/h)

Section	Distance (km)	6:00 -7:00	7:00 -8:00	8:00 -9:00	9:00 -11:00	11:00 -13:00	13:00 -15:00	15:00 -16:00	17:00 -18:00	19:00 -21:00	21:00 -22:00
Jl. Diponegoro - Jl. Casablanca	2.99	47	35	26	9	32	14	16	6	7	37
Jl. Casablanca - Jl. Gatot Subroto	1.50	28	36	10	13	20	6	5	3	3	7
Jl. Gatot Subroto - Jl. Kapten Tendean	0.41	14	12	20	7	8	8	6	3	7	6
Jl. Kapten Tendean - Jl. Duren Tiga Selata	2.15	23	35	19	16	19	18	15	9	12	24
Jl. Duren Tiga Selata - Jl. Pejaten Barat	2.36	29	26	35	32	24	15	13	18	16	22
Jl. Pejaten Barat - JORR	1.71	14	8	10	11	17	11	12	10	10	11

South to North (km/h)

Section	Distance (km)	6:00 -7:00	7:00 -8:00	8:00 -9:00	9:00 -11:00	11:00 -13:00	13:00 -15:00	15:00 -16:00	17:00 -18:00	19:00 -21:00	21:00 -22:00
JORR - Jl. Pejaten Barat	1.71	6	4	5	7	7	17	14	20	26	38
Jl. Pejaten Barat - Jl. Duren Tiga Selata	2.36	17	13	34	18	24	22	23	16	30	24
Jl. Duren Tiga Selata - Jl. Kapten Tendean	2.15	7	5	4	11	9	11	7	18	18	24
Jl. Kapten Tendean - Jl. Gatot Subroto	0.41	7	8	5	8	6	8	7	11	9	38
Jl. Gatot Subroto - Jl. Casablanca	1.50	43	25	25	21	45	15	24	33	43	39
Jl. Casablanca - Jl. Diponegoro	2.99	43	28	29	19	17	17	18	10	22	38

Note: the Figures marked in red shows the speed less than 10 km/h, marked in orange, less than 20 km/h.

6.3 WTP (Willingness To Pay) Survey

6.3.1 Survey Method

6.3.1.1 Outline

In order to grasp the attitude and behavior change of car users when ERP is introduced in Jakarta and to consider the appropriate charge price, WTP (Willingness To Pay) survey based on CVM (Contingent Valuation Method) was conducted to the car users on Corridor 1 and Corridor 6. The survey was an interview method that surveyors conducted interviews to respondents and filled in the questionnaire. Furthermore, based on the survey results, estimation of the number of people shifting to public transport such as Transjakarta, verification of the capacity of public transport service, the traffic demand forecast of the target road will be conducted. The pre-survey was taken before the main survey in order to verify the extraction method of the samples, the setting of the presented charge and the validity of the questions.

6.3.2 Survey Results

Table 6-4-12 and Figure 6-4-3 shows the questionnaire results about the attitude and behavior change when ERP is introduced on Corridor 1. Most respondents chose shifting to public transport, therefore it would be the issue to secure enough capacity of public transport. Shifting to motorcycles was selected the second most. Traffic congestion would be mitigated by the shifts from a car to a motorcycle, however it may cause other problems such as aggravation of the traffic order and the shortage of parking facilities. For many of the respondents indicating the shift to motorcycles, accessibility to trunk public transport such as Transjakarta from home/destination is not sufficient at this moment, therefore enhancement of service level of feeder transport is one of the most important factors to promote the shift not to motorcycle but to public transport. Shift of the departure time and route change were also selected a lot as alternatives. As the extension of ERP corridor, such behavior is expected to decrease, hence it is necessary to monitor the traffic condition and set the ERP charge appropriately so as not to cause excessive detour traffic.

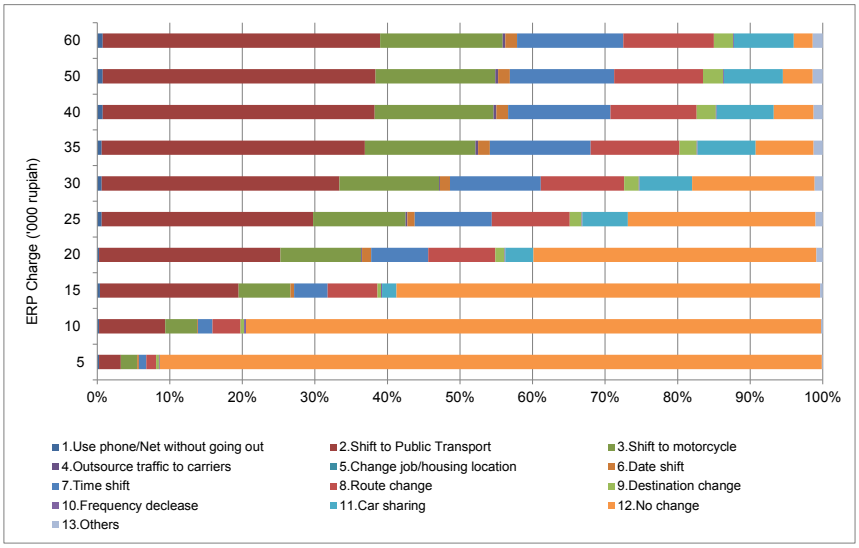


Figure6-3-1 Impact of ERP on Driver Behavior (Corridor 1)

Table 6-4-13 and Figure 6-4-4 shows the questionnaire results in terms of the attitude and behavior change when ERP is introduced on Corridor 6. The conversion ratios to public transport are similar to those of Corridor 1. The biggest difference with the case of Corridor 1 is very high conversion intention to motorcycles. In this regard, it is considered as the reason that the service level of Transjakarta is lower than that of the Corridor 1, transit to other Transjakarta lines is inconvenience and the feeder transport is not substantial. 3-in-1 regulation has not been introduced in Corridor 6. Therefore, the Corridor-6-users may not know well how to deal with such restriction comparing to the users of Corridor 1 where 3-in-1 regulation has already been introduced and the users has taken several measures, and it may led such answer.

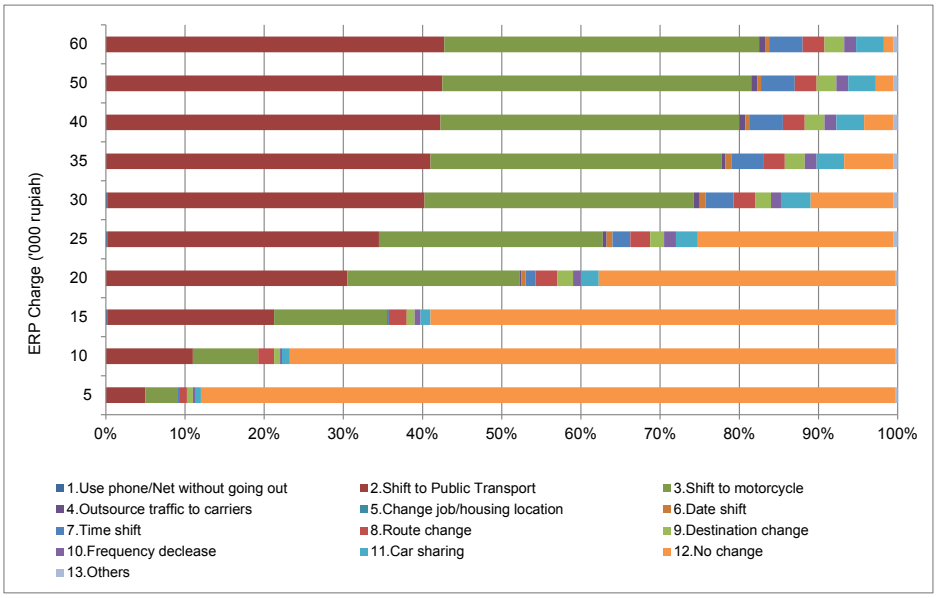


Figure6-3-2 Impact of ERP on Driver Behavior (Corridor 6)

6.4 Jockey Interview

6.4.1 Methodology

6.4.1.1 Outline

Some drivers who do not have enough passengers to legally use 3-in-1 corridor use Jockey in order to meet the minimum number of passengers and cheat the rule. The objective of this survey is to grasp the price drivers pay to Jockeys and consider the price into account for ERP charge setting. The survey was the interview method that surveyors conducted interviews to respondents, to fill in the questionnaire answers.

6.4.2 Survey Results

6.4.2.1 Jockey Price

The Jockey price for each section was asked in the interview. Table 6-4-1 shows the tabulation result and Figure 6-4-1 illustrates the Jockey price for the major sections. The result shows that the Jockey price is based on distance however it is not a direct proportion to distance. Meanwhile, the proportion of Jockey user is not

high, 13% as shown in Figure 6-4-1. Therefore, it can be said that when setting the ERP charge it is not highly necessary to consider the Jockey price.

Table6-4-1 Average Jockey Price (rupiahs)

	1	2	3	4	5	6	7	8	9	10
1. BlokM/Senayan	-	18,000	19,000	21,000	23,000	23,500	28,000	33,500	21,500	23,500
2.GBK		-	17,500	19,500	21,000	22,500	27,000	36,000	16,500	22,500
3. Semanggi/ Karet			-	18,500	19,500	21,500	25,500	29,500	18,000	21,000
4. Dukuh Atas				-	17,500	18,500	22,000	33,000	20,000	27,000
5. Bundaran HI					-	18,000	20,000	30,500	21,000	26,500
6. Bank Indonesia						-	18,500	29,000	22,500	31,000
7. Harmoni							-	29,000	28,500	35,500
8. Kota								-	34,000	51,000
9. TVRI									-	24,000
10. Kuningan										-

Note: The Jockey price which was interviewed is not an expected price by Jockeys but the actual income they earn.

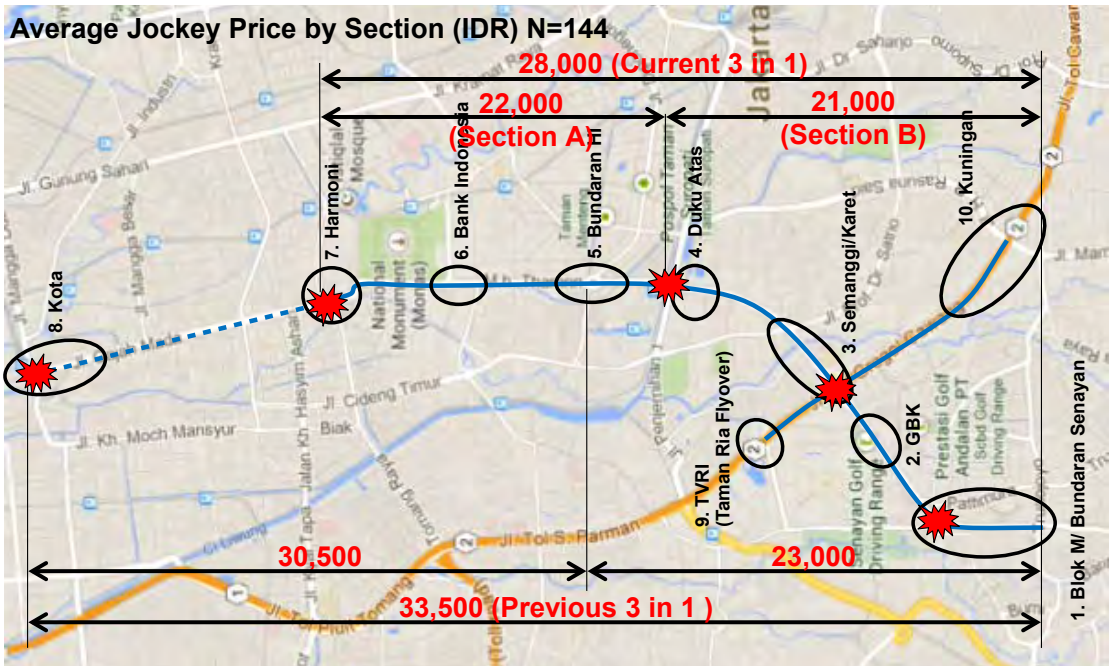


Figure6-4-1 Jockey Price for Major Section (rupiahs)

Chapter 7. Traffic Demand Forecast

7.1 Procedure of Forecast

The purpose of traffic demand forecast in this study is to grasp the impact on traffic demand in the case where ERP is introduced and to estimate ERP revenue to assess the project feasibility. The procedure is shown in Figure 7-1-1 and the main points of the procedure are summarized below:

1) Estimate the total travel distance of each corridor based on the traffic volume and the length of each section.
2) Estimate the average vehicle-trip length on each corridor based on the OD (Origin-Destination) traffic volume. The OD traffic volume has been compiled using the data obtained through the WTP survey.
3) Estimate the number of vehicle-trips of ERP target by dividing the total travel distance by the average vehicle-trip length, and estimate traffic demand on ERP corridor by multiplying the number of vehicle-trips of ERP target by the diversion rate obtained from WTP survey (refer to Table 7.4.12 and 7.4.13).
4) Estimate ERP revenue by multiplying traffic demand on ERP corridor by ERP charge.

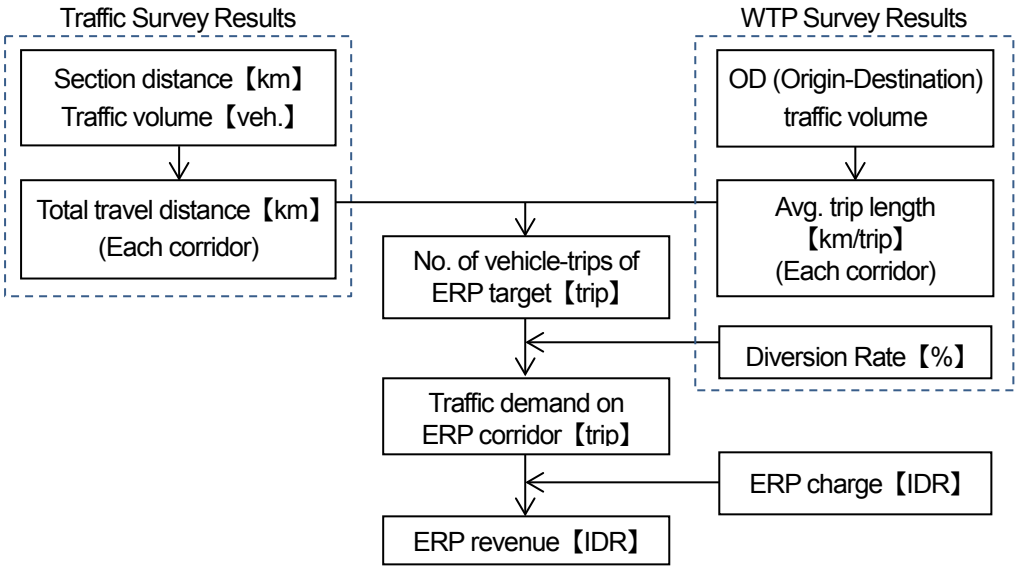


Figure7-1-1 Procedure of Traffic Demand Forecast

7.2 Assumptions

(1) Days of the Week for ERP Application

PP97/2012 stipulates that ERP can be applicable for the traffic congestion which "occurs on every working day". Therefore, it is proposed that ERP is applied from Monday to Friday except for the national holidays. The number of ERP days in 2014 is 245 as shown in Table 7-2-1. In this study, this "245 days" is adopted to estimate ERP revenue in a year etc.

ERP: Applied from Monday to Friday except for the national holiday (Article 5, PP 97/2012)
245 days in 2014

Table7-2-1 Working Days in Indonesian Calendar (in 2014)

Month	Working Day	Sat.	Sun.	Holiday	Total
January	20	4	4	3	31
February	20	4	4	0	28
March	20	5	5	1	31
April	21	4	4	1	30
May	18	5	4	4	31
June	21	4	5	0	30
July	19	4	4	4	31
August	20	5	5	1	31
September	22	4	4	0	30
October	23	4	4	0	31
November	20	5	5	0	30
December	21	4	4	2	31
Total	245	52	52	16	365

(2)ERP Hours

Policy

In the 3-in-1 regulation, it is observed that traffic demand concentrates before and after the 3-in-1 hours and the traffic condition is deteriorated in these time zones. Thus, the ERP hours shall be continued from the beginning until the end of time. ERP charge can be changed in accordance with the congestion situation. The beginning and ending time of ERP need to be unified all over the sections of ERP corridors to make the system drivers-friendly. Article 5 of PP97/2012 stipulated that mass public transport network and service shall be available along ERP route. Therefore, it is assumed that vehicles cannot be charged beyond the operation hours of Transjakarta.

Table7-2-2 Operation Hours of Transjakarta (September 17, 2014)

Corridor 1	From 5:00 a.m. until 11:00 p.m. (24-hour operation trial now)
Corridor 6	From 5:00 a.m. until 10:00 p.m.

Note: as for the operation hours of Transjakarta, it is necessary to monitor the usage hours of passengers diverted from private vehicles and examine the needs of extension of the operation hour.

Charging Hours

Article 5 of PP 97/2012 stipulates that ERP can be imposed when the average speed of vehicles in peak hour is equal or less than 10 km/h. The result of travel speed survey shows that there are some sections where the average speed is less than 10km/h during survey period; between 6:00 and 22:00. Hence, based on the result of travel speed survey and the policy mentioned above, ERP charging hours are set as follows:

ERP Charging Hours：6:00 a.m. to 10:00 p.m. (16 hours)

Note: vehicles passing through an ERP gantry during the above period will be charged.

7.3 Traffic Demand Forecast

(1) Case of Traffic Demand Forecast

Considering the tendency of travel behavior of car users observed through the WTP survey results and additional transportation costs, seven cases are set for traffic demand forecast as the following table.

Table7-3-1 Cases of Traffic Demand Forecast

Case	ERP Charge (IDR/trip)	Additional Transportation Cost (IDR/month)	Ratio of Additional Transportation Cost to Average Monthly Income of 50 Percentile of Low Income Respondents
1	5,000	308,000	7 %
2	7,500	462,000	11 %
3	10,000	616,000	14 %
4	12,500	770,000	18 %
5	15,000	924,000	21 %
6	17,500	1,078,000	25 %
7	20,000	1,232,000	29 %

Assumptions: 2.8 trips per day, 22 week days in a month, monthly income is IDR 4,300,000 (average of 50 percentile of lower income respondents). All is based on WTP survey results.

(2) Results of Traffic Demand Forecast

The predicted traffic demand and increase-decrease volume/ratio of traffic demand by ERP charge are estimated. ERP charge of 10,000 to 17,500 rupiahs per trip could achive the target of reduction ratio of 10% to 30%. ERP charge of 15,000 rupiahs per trip could achive the target of reduction ratio of 20% on daily average.

The revenue can be maximized in the case where ERP charge is 15,000 Rupiahs per trip and amounts to 782,855 milion Rupiahs per year.

ERP Charge : IDR 15,000/ trip (Average of a day)

Table7-3-2 Traffic Demand by ERP Charge

(Traffic Volume : PCU/16h, ERP Charge : IDR/Trip)

	Location	Traffic Demand by Case of ERP Charge															
		Existing		Case1		Case2		Case3		Case4		Case5		Case6		Case7	
		-		5,000		7,500		10,000		12,500		15,000		17,500		20,000	
		To North	To South	To North	To South	To North	To South	To North	To South	To North	To South	To North	To South	To North	To South	To North	To South
1	Masjid Agung Station	19,058	22,238	18,143	21,171	17,507	20,421	16,868	19,672	15,802	18,418	14,734	17,163	13,791	16,058	12,846	14,953
2	GBK Station	69,334	68,030	66,042	64,716	63,738	62,396	61,435	60,073	57,581	56,189	53,725	52,302	50,321	48,877	46,919	45,450
3	Benhil Station	72,425	72,548	68,786	68,930	66,227	66,391	63,670	63,852	59,389	59,601	55,107	55,349	51,340	51,607	47,570	47,864
4	Setiabudi Station	75,799	73,617	71,994	70,070	69,325	67,585	66,658	65,101	62,193	60,942	57,725	56,783	53,790	53,114	49,854	49,446
5	Tosari Station	66,555	61,526	63,404	58,779	61,200	56,858	58,994	54,935	55,303	51,717	51,613	48,499	48,357	45,658	45,101	42,820
6	Sarinah Station	40,112	43,306	38,309	41,314	37,049	39,917	35,791	38,523	33,682	36,186	31,576	33,849	29,714	31,789	27,851	29,729
7	JPO Indosat Monas	30,067	46,343	28,672	44,196	27,702	42,693	26,730	41,194	25,103	38,682	23,477	36,169	22,039	33,951	20,599	31,733
8	Harmoni Station	42,277	33,724	40,176	32,118	38,745	31,022	37,314	29,926	34,916	28,089	32,516	26,252	30,368	24,607	28,218	22,963
9	Olimo Station	40,175	40,546	38,369	38,618	37,203	37,397	36,037	36,178	34,078	34,127	32,120	32,076	30,309	30,157	28,497	28,237
10	Deptan Station	12,396	16,315	11,657	15,532	11,296	15,146	10,934	14,762	10,372	14,163	9,808	13,566	9,165	12,897	8,523	12,227
11	SMKN 57	23,622	24,902	22,274	23,547	21,608	22,879	20,945	22,209	19,917	21,176	18,887	20,141	17,736	18,986	16,584	17,831
12	Pejaten Philips Station	27,734	23,892	25,904	22,282	25,007	21,493	24,110	20,700	22,714	19,474	21,319	18,247	19,741	16,865	18,161	15,484
13	Duren Tiga Station	27,478	28,465	25,885	26,865	25,101	26,081	24,317	25,295	23,104	24,075	21,888	22,854	20,524	21,478	19,160	20,103
14	JPO Tendean	31,674	32,982	29,749	31,001	28,808	30,029	27,865	29,059	26,398	27,547	24,932	26,036	23,268	24,320	21,605	22,604
15	Kuningan Timur Station	43,449	28,524	40,596	26,577	39,200	25,625	37,805	24,673	35,629	23,188	33,453	21,703	30,973	20,007	28,492	18,311
16	Setiabudi Aini Station	62,627	54,203	58,471	50,318	56,443	48,420	54,412	46,525	51,247	43,564	48,078	40,604	44,442	37,208	40,807	33,814
17	Halte BBD	19,587	9,114	18,333	8,567	17,724	8,301	17,114	8,036	16,159	7,620	15,204	7,202	14,103	6,722	12,999	6,242

Chapter 8. Preliminary Design of ERP System

8.1. Overview of the ERP system

8.1.1 Technology used for ERP

Electronic Road Pricing System (ERP) is a system which aims to mitigate traffic congestions by imposing congestion charge on vehicles which are passing the designated area or roads. The major difference between Electronic Toll Collection System (ETC), which is commonly installed on toll roads, is ERP is a Multi-Lane-Free-Flow system (MLFF) and ETC system is Single-Lane-Barrier system (SLB). A MLFF is a system which enables to charge from multiple vehicles on multiple lanes that are running freely without any barrier to stop them. SLB is a system which charges toll from a single vehicle on a single lane. The charging is done one by one and usually has Lane-Barrier to stop vehicles in case of charging failure.


Figure 8-1-1 Single-Lane-Barrier and Multi-Lane-Free-Flow System

There are mainly two types of MLFF system. One is a system using On-Board-Unit (OBU) for charging purpose and using Automatic Number Plate Recognition camera for enforcement purpose. The other is a system using Automatic Number Plate Recognition camera alone and charges from the image of number plate by linking to its registered account. If the number plate is not registered the vehicle is considered as violators and invoice will be sent. The MLFF system using OBU is adopted in Singapore and the latter MLFF system using only camera is adopted in London and Stockholm.

The MLFF system using OBU or the Singapore type ERP is costly for the first implementation compared to MLFF system using only Camera or the London Stockholm type ERP. While Singapore type ERP requires installation of OBU on vehicles and numbers of roadside equipment for communicating with OBU, camera is the only necessary equipment for London Stockholm type ERP. Although the initial implementation cost is higher, the daily operation for Singapore type ERP is easier because charging is fully automated through radio communication of OBU. On the contrary, London Stockholm type ERP requires more effort to deduct ERP charge when matching the number plate and vehicle ownership for every transaction. Some of the number plates require human observation and correction more manual transaction is necessary. Jakarta Provincial Government has already decided to adopt an ERP System similar to Singapore in consideration of its heavy

traffic and number plate database which still needs improvement.

In Singapore type ERP, the system needs to deal with two separate results which come from separate equipment. One is the communication result taken from Roadside equipment and OBU and the other is the captured image of Number Plate taken by camera. Consequently the controlling technology to match these two results and link to the proper vehicle is utmost important. In Singapore, ERP system maintains its high standard operation by utilizing high level controlling technology and also utilizing one of the highest quality devices for OBUs, sensors, and cameras.

8.1.2 Main operational functions of the ERP system

Until now, Diverse types of ERP system have been introduced in Singapore and several Cities in Europe. Althouht the detail specification of each system differs to eachother, it is possible to say that the six operational fucntions of ERP are common, which are Charging, Enforcement, OBU management, Information management, Traffic management, and Operation & Maintenance.

The Outline of the six operational functions are shown in Figure 8-1-2 and Table 8-1-1.

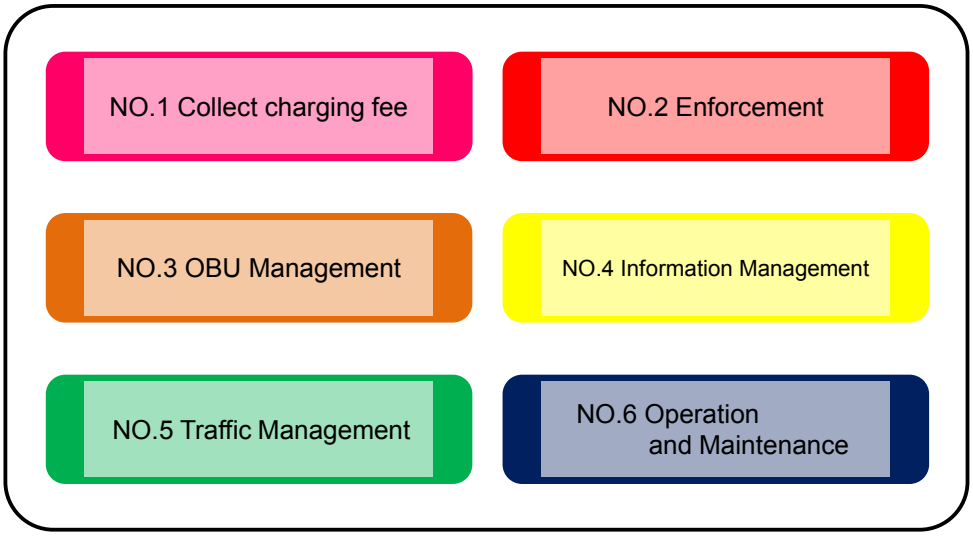


Figure 8-1-2 Six operational functions of ERP system

Table 8-1-1 Outline of six operational functions of ERP system

No.	Operational Function	Outline
1	Collect ERP charge	Function to Collect ERP charge from users
2	Enforcement	Function to control violators of ERP
3	OBU Management	Function to manage authorized OBU for ERP
4	Information Management	Function to manage all kinds of necessary information for ERP
5	Traffic Management	Function to monitor the traffic condition and evaluate the effect of

		ERP.
6	Operation and Maintenance	Function to operate and maintain ERP

8.1.3 Target road of ERP system

As a targeted route/area for the aforesaid corridor road pricing, corridor 1 and corridor 6are selected as targeted for charging.

8.2. Operational policy of ERP system

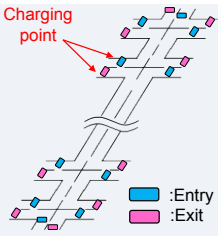
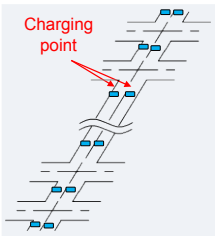
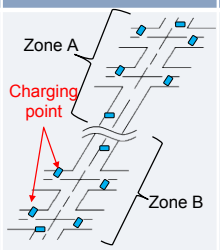
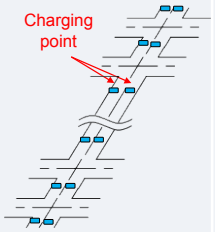
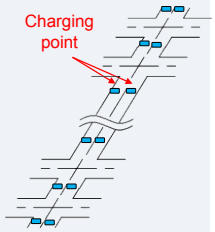
8.2.1 Charging

8.2.1.1 Methodology of Charging

There are two major charging methodologies of Corridor based ERP system which are distance based charging and trip based charging. Distance based is a variable payment based on the distance traveled on ERP corridor and Trip based charging method is a fixed based on number of trips made.

The Charging methodology of the ERP system is shown in Table 8-2-1.

Table 8-2-1 Methodology of Charging

Item	Charging Methodology				
	Distance based Charging		Trip based Charging		
	Flexible Charging based on distance between entry and exit	Fixed Charging at each charging point (Gantry)	Fixed Charging at entry of each zone	Fixed Charging per certain hours	Fixed Charging per day
Location of charging points (Gantry)	 Locations of charging point(gantry) are all possible entries and exits of corridor	 Locations of charging point (gantry) are near the main inflow intersections	 Locations of charging points (gantry) are all possible entries of each zone	 Locations of charging points (gantry) are near the main inflow intersections	 Locations of charging points (gantry) are near the main inflow Intersections
Timing of Charging	After passing the exit gantry.	Every time passing through charging point (gantry)	Every time passing through charging point (gantry)	Every first time passing through charging points (gantry) per certain hour	Every first time passing through charging points (gantry) per 24 hours(one day)

In order to decide suitable methodolgy of charging in Jakarta, typical traffic condition and behaviour of motorist needs to be considered. The following are some of the traffic conditions based on the survey conducted in corridor 1 and 6. The study results of the optimal charging method in consideration of such factors are shown in the following Table.

Table 8.2-2 Comparison of Methodology of Charging

Item	Methodology of Charging				
	Charging based on mileage		Charging based on trip		
	Charging based on mileage between entry and exit	Charging at each charging point (Gantry)	Charging at entry of each zone	Charging based on usage time (per time)	Charging based on usage day (per day)
Inflow restrain of corridor	○	○	○	○	○
Restrain the traffic inside the corridor	×	○	×	○	×
Easy understanding	×	◎	◎	○	◎
Number of needed charging points (Gantry)	× (more than 200 gantries)	○ (About 60 gantries)	× (more than 100 gantries)	○ (About 60 gantries)	○ (About 60 gantries)
Income of charging fee	◎	◎	○	○	×
Risk of loophole	◎	○	◎	○	○
Tolerance of driving behavior (U turn)	×	×	○	○	○

8.2.1.2 Payment method

Either prepaid or post-pay can be applied for payment method of ERP. Prepaid scheme is commonly used for public transportation such as Transjakarta and typical post-pay is credit cards. Each payment method is shown in the following Figures.

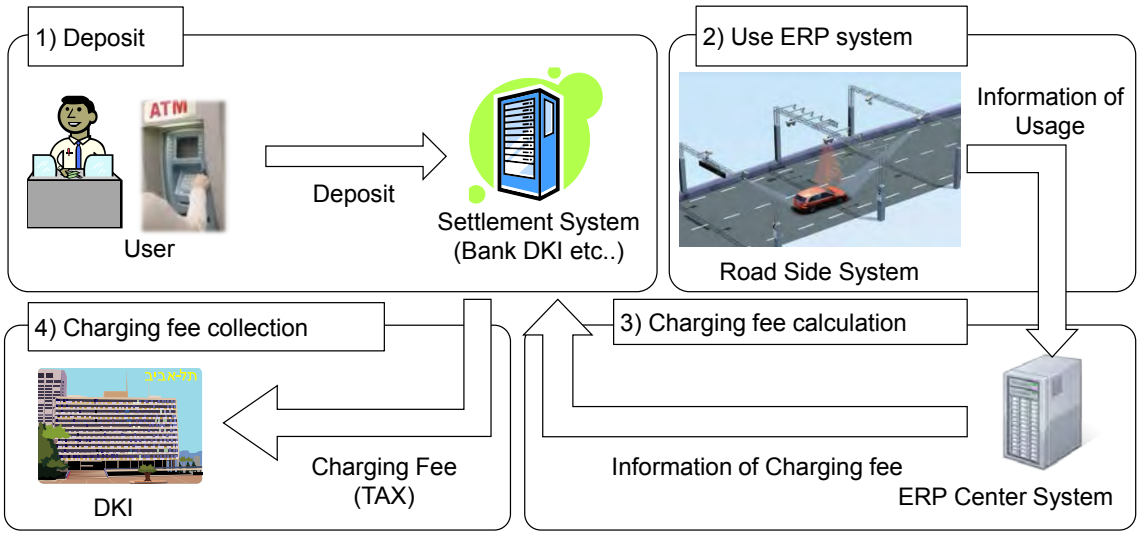


Figure 8-2-1 prepaid method

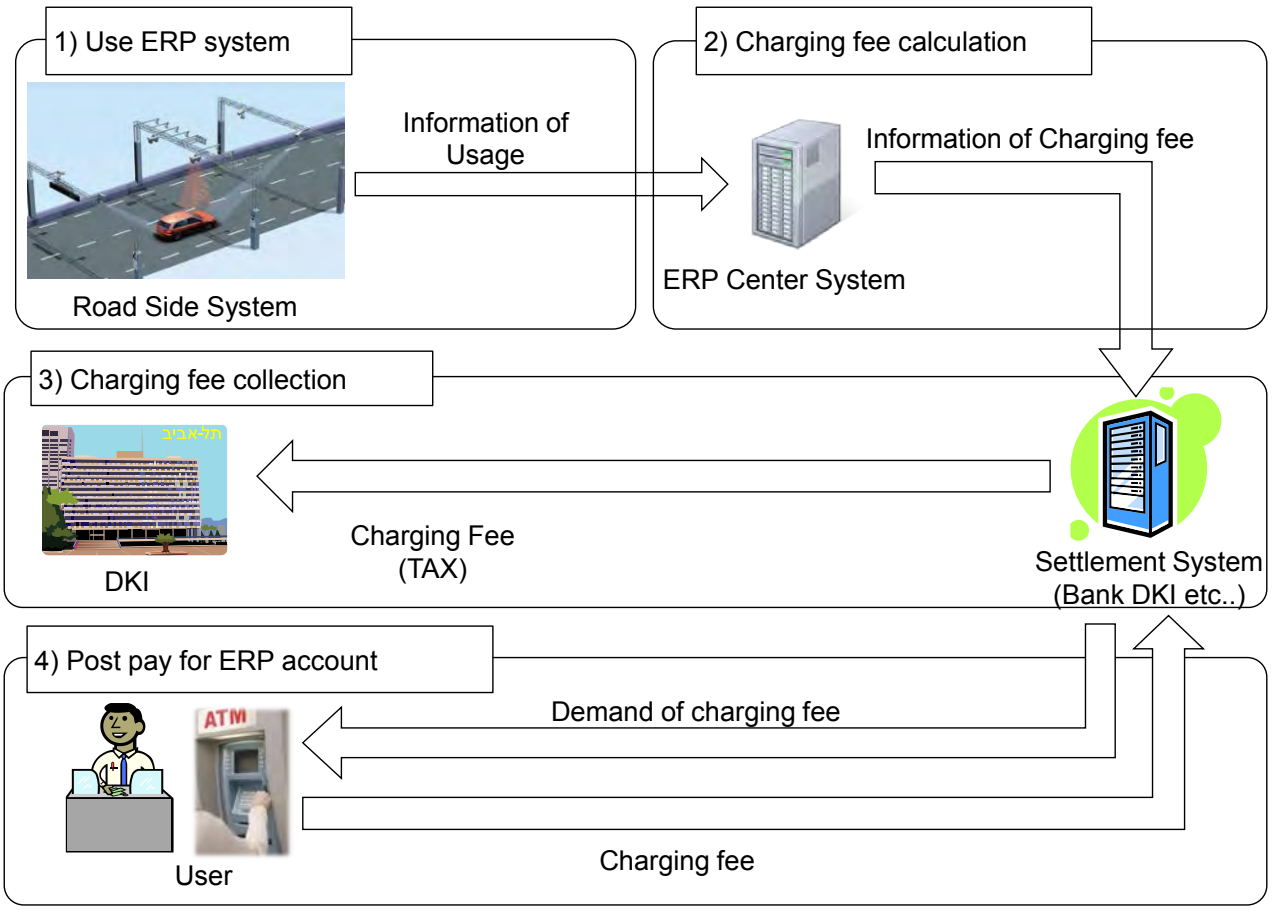


Figure 8-2-2 post-pay method

8.2.1.3 Charging flow

The optimal charging flow in Jakarta using the Trip based charging method (per certain hours) by prepaid method is shown in Figure 8-2-3.

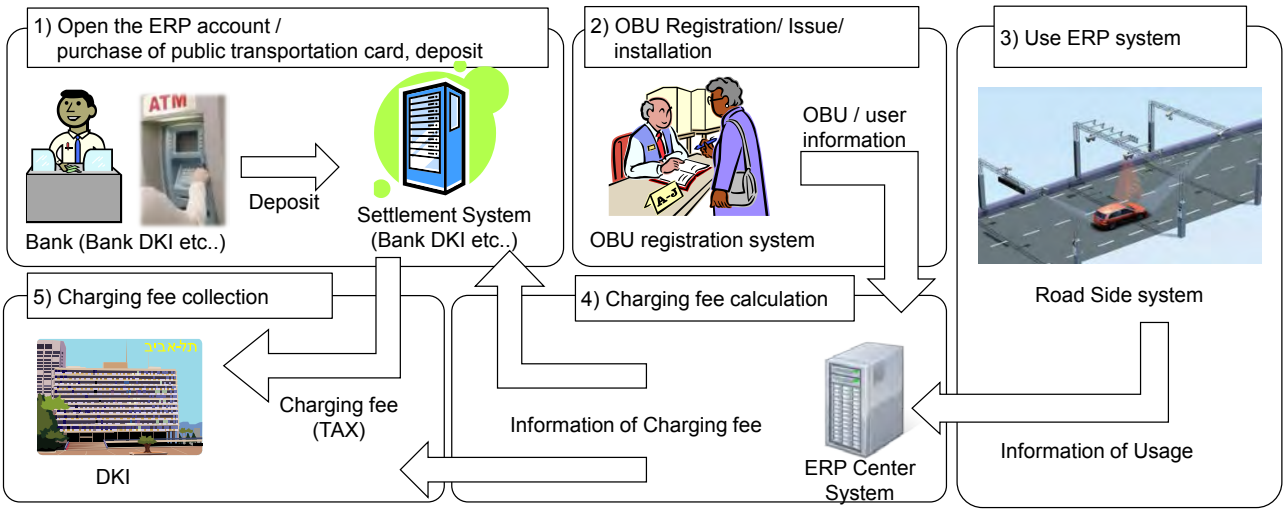


Figure 8-2-3 Charging flow

8.2.2 Violation detection

8.2.2.1 Definition of violation

The definition of violations in the ERP system is shown in Table 8-2-3.

Table 8-2-3 Definition of violation

NO	Violation	Definition
1	Usage without OBU	Usage of ERP system by using the vehicle without OBU
2	Usage of altered OBU	Usage of ERP system by using the vehicle that is equipped with OBU which is altered the registered inherent information such as serial number of OBU
3	Usage of illegal OBU	Usage of ERP system by using the vehicle that is equipped with OBU which is made by illegal manufacture
4	Usage of stolen OBU	Usage of ERP system by using the vehicle that is equipped with OBU which is stolen from another vehicle
5	Usage of swapped OBU	Usage of ERP system by using the vehicle that is swapped with OBU which another vehicle is equipped
6	Usage of OBU with low or zero balance	Usage of ERP system by using the vehicle that is equipped with OBU which balance is insufficient
7	Usage of illegal vehicle	Usage of ERP system by using the vehicle with illegal License Plate

8.2.3 OBU management

8.2.3.1 Objective of OBU management

It is necessary to be able to identify whether the information of the vehicle installation device which is provided when a user used an ERP system and vehicle information are authorized to realize detection of the violation and the control based on a definition of the violation. Therefore, when OBU is distributed, regular user information and vehicle information are registered.

8.2.3.2 OBU management flow

(1)New registration of user and vehicle

User and vehicle information at the time of new registration flow shown in Figure 8-2-4 is advanced in the following steps.

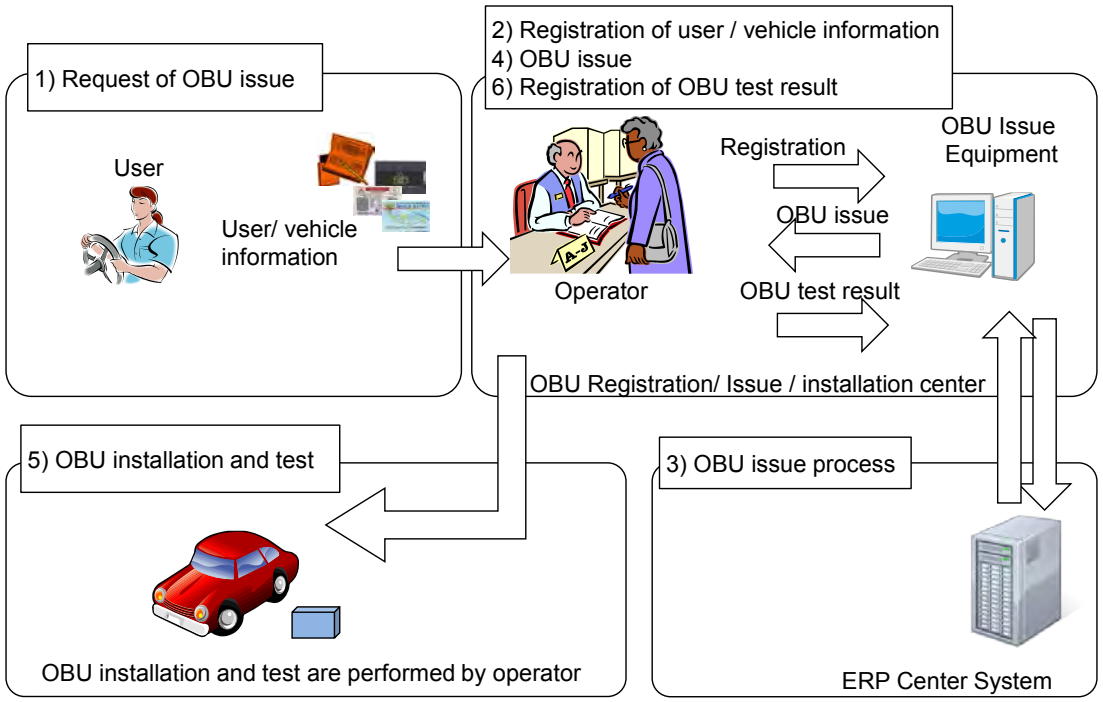


Figure 8-2-4 The flow of registration of new user and vehicle

(2) Change of registered contents

User and vehicle information when changing flow shown in Figure 8-2-5 proceed with the following steps.

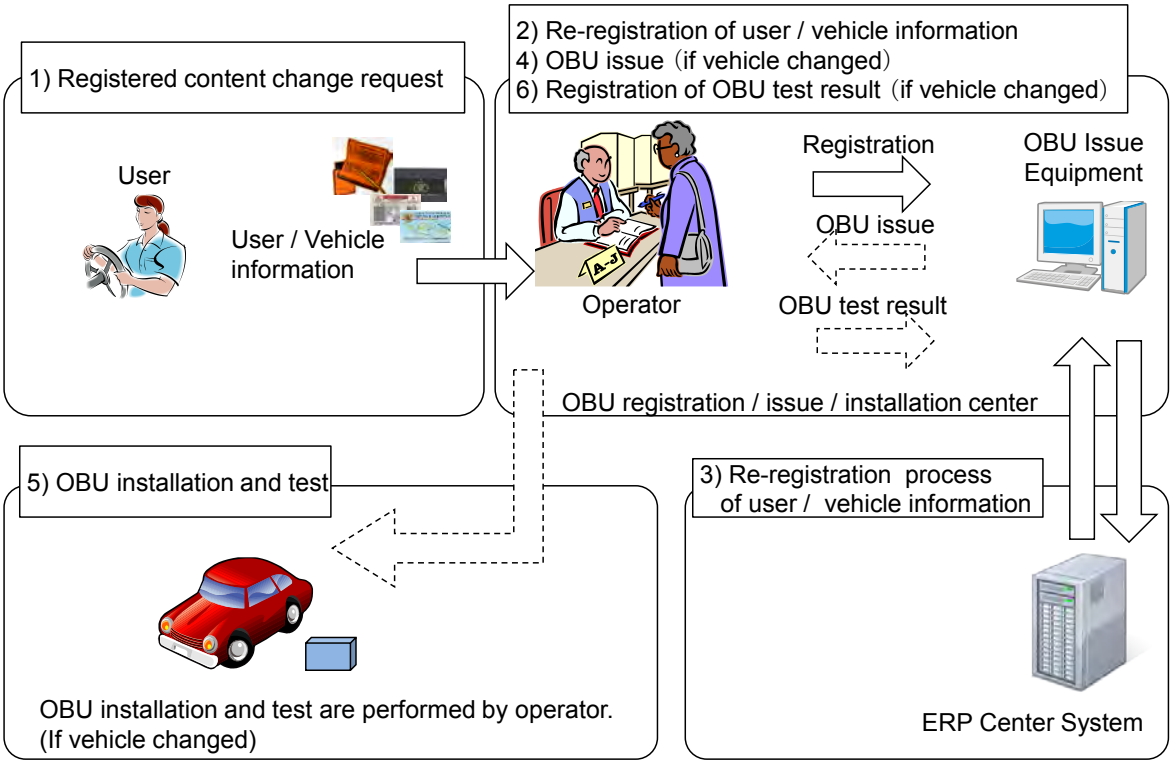


Figure 8-2-5 The flow of change of registered contents

(3)Delete of registered contents

User and vehicle information when deleting the flow shown in Figure 8-2-6 is advanced in the following steps.

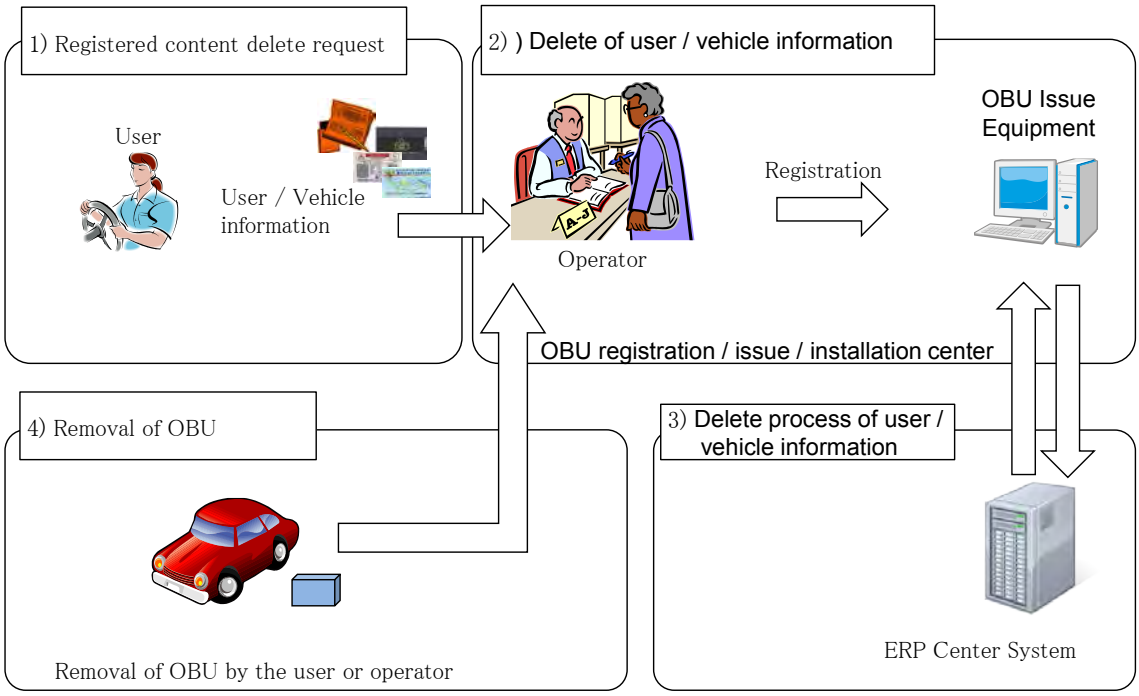


Figure 8-2-6 The flow of delete of registered contents

8.2.4 Information management

8.2.4.1 Objective of information management

As described in Section 8.1, ERP system is billing function, violation enforcement function, in order to have a vehicle device management functions, etc., to handle the personal information of information and ERP user related to money, such as Charge amount setting information.

Such as Charge amount setting information falsification and data loss is likely to inhibit the normal operation of the ERP system, also, such as leakage of personal information, not only the ERP system, incorrect personal information in such other systems could lead to use.

ERP system performing information management in order to tampering or loss of information handled the risk of such outflow of information with the minimum.

8.2.4.2 Information management flow

Information management of the flow shown in Figure8-2-7 is advanced by the following procedure.

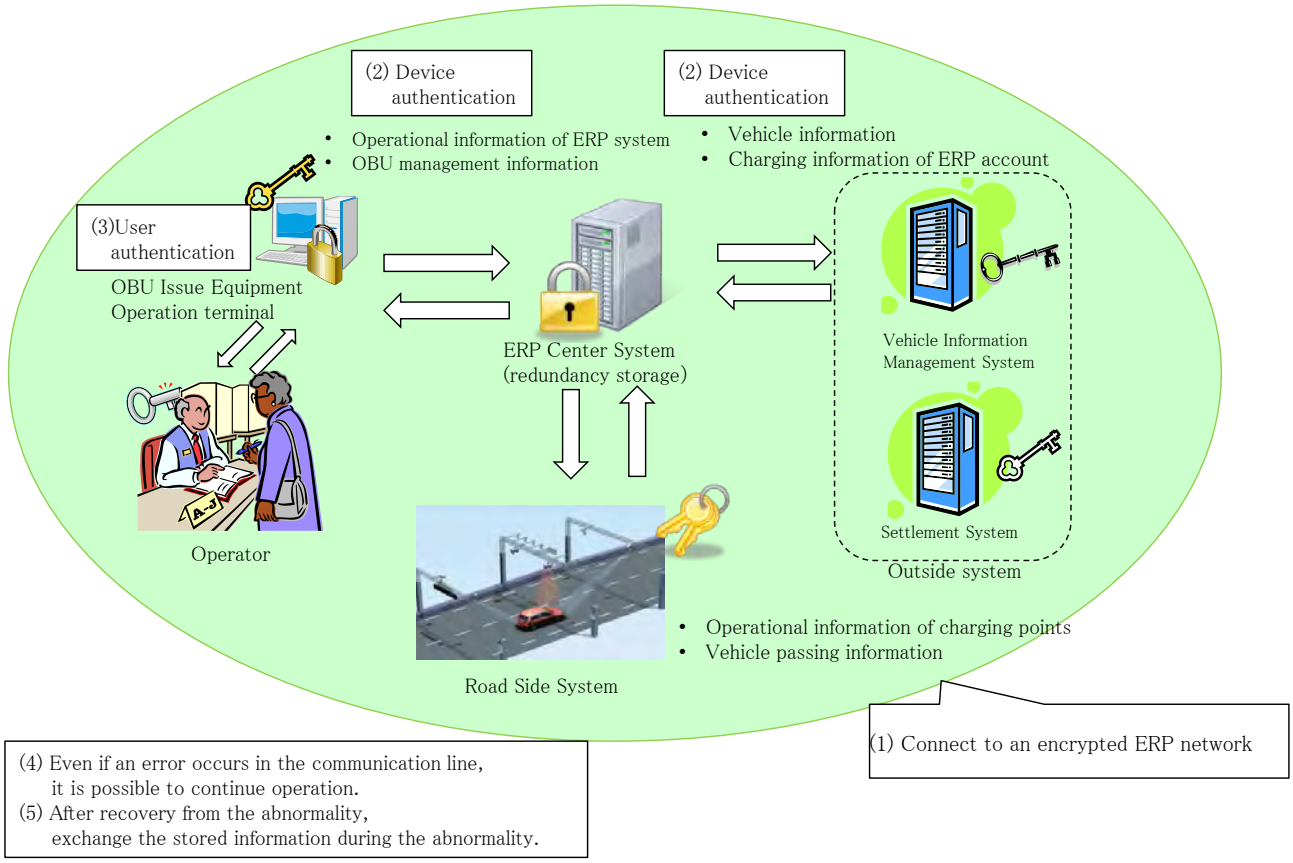


Figure 8-2-7 Information management flow

8.2.5 Traffic management

8.2.5.1 Objective of traffic management

ERP system, by monitoring the number of vehicles passing through the roadside system (charging point), is possible to determine the traffic conditions of each charge point, by using the traffic effects analysis function, the effect of introducing ERP system analyze. The analysis of the traffic affects the analysis of the traffic situation using the passage number and the passing time information of the vehicle at the charging point is detected by the vehicle detection. Day of the week, time of day, by analyzing the traffic conditions, such as by charging amount, by using the data, it is possible to formulate an optimal ERP system operation policy according to the situation. In addition, from the data, it is possible to grasp the relatively high location of the traffic flow in the ERP target road it becomes possible to plan for expanding the charge point. In addition, in helping you understand the effect of the ERP target road, and change of Charge amount, it becomes possible to effectively expand into new ERP target road.

8.3. Configuration of the ERP system

8.3.1 System configuration

The system configuration of the ERP system is shown in Figure 8-3-1.

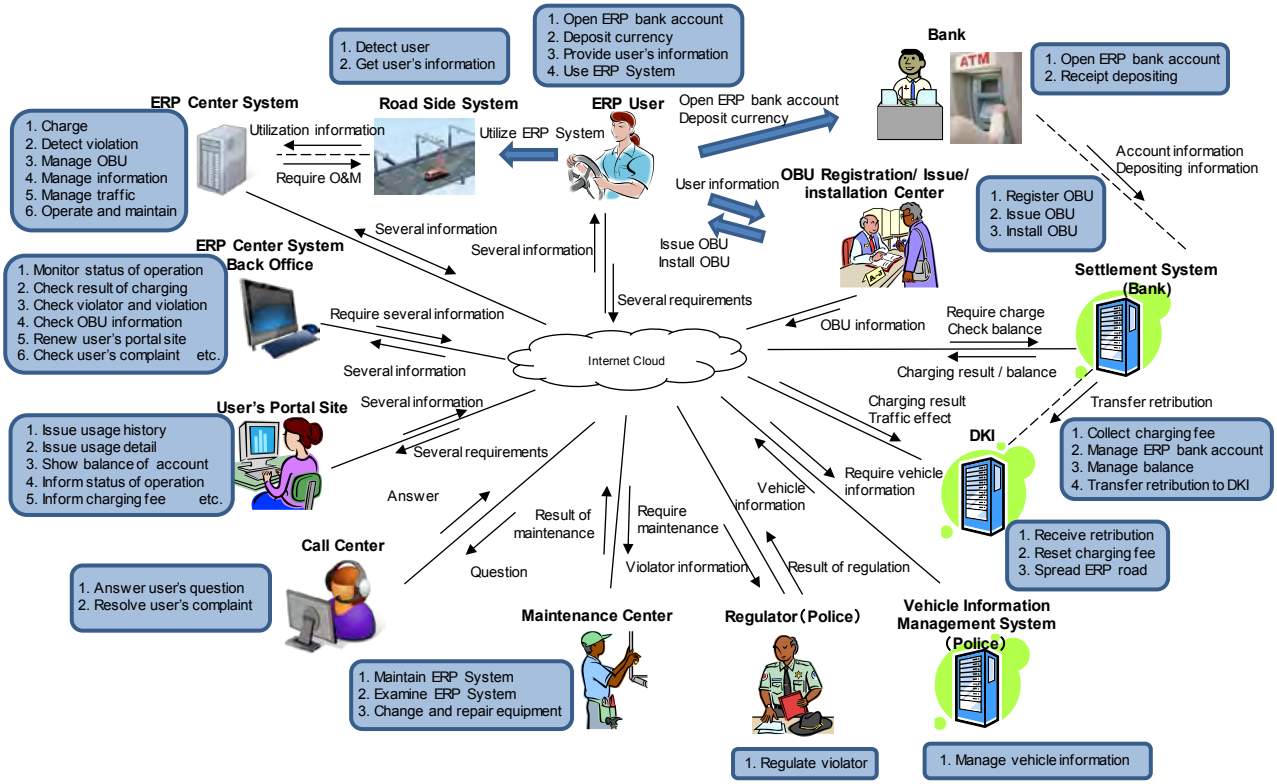


Figure 8-3-1 System configuration

Chapter 9. Operation and Management of ERP

9.1. Estimate of ERP Project Cost

We have estimated the Project Cost as below:

Project Cost (Implementation): 1.3 trillion Rupiah

Operation & Maintenance: 130 billion Rupiah

The details of Project cost are described in Table 9-1-1.

Table 9-1-1 Items for Revenue Estimation

(Billion Rupiah)

	Items	Origin	Amount	Note
	Back-end System	Japan	293.3	
	Roadside System	Japan/Others	372.6	32 Charging Point
	On-Board-Unit	Japan	78.2	4million units for free
	Sub Total		744.1	
	Project Management	Japan	3.9	
	Development	Japan	7.8	
	Super Vising	Indonesia	27.4	
	Installation	Indonesia	20.0	
	Travel Expense	Indonesia	9.8	390days
	Insurance	Japan	39.1	
	Others	Indonesia	7.6	
	Sub Total		115.6	
A	Direct Cost	-	859.7	
	Duty & Customs	Indonesia	32.0	Overseas Cost
	Contingency	-	171.9	A×20%
	Provision Sum	Indonesia	106.4	10%(Excluding VAT)
B	Indirect Cost		310.3	
	Project Cost	-	1,170.0	A+B
	VAT		117.0	(A+B)×10%
C	Total		1,287.0	

9.2. Revenue of ERP Project

The Revenue of ERP Project will be estimated in consideration with the items below.

Table 9-2-1 Items for Revenue Estimation

Items	General Conditions
Corridor	Corridor1,Corridor 6
Hour	6:00-22:00 Weekdays
Charge	20,000 Rupiah
Vehicle	All excluding Motorbikes and Emergency Vehicles
Charging Point	Under work in progress
Traffic Volume	Under work in progress
Volume	Under work in progres
Project Length	Ten years

9.3. Financing Plan for Public and Private Sector

ERP Charge is considered as revenue of the Jakarta Provincial Government when applying Unitary Payment Scheme（BTO）.The Jakarta Provincial Government will pay SPC the necessary amount of money from its budget for the construction, and operation and maintenance. The payment for the construction will not be done in a single year but by payments in installment during the project period. The merit of applying this scheme is that neither Jakarta Provincial Government does not need to allocate big budget for implementation of ERP in the beginning nor in a single year which allows fast and easier introduction of the ERP project. In this section, we will conduct a study on the project finance option for SPC and examine the alleviation effect to the government expenditure based on the total expense mentioned in section 7.2.

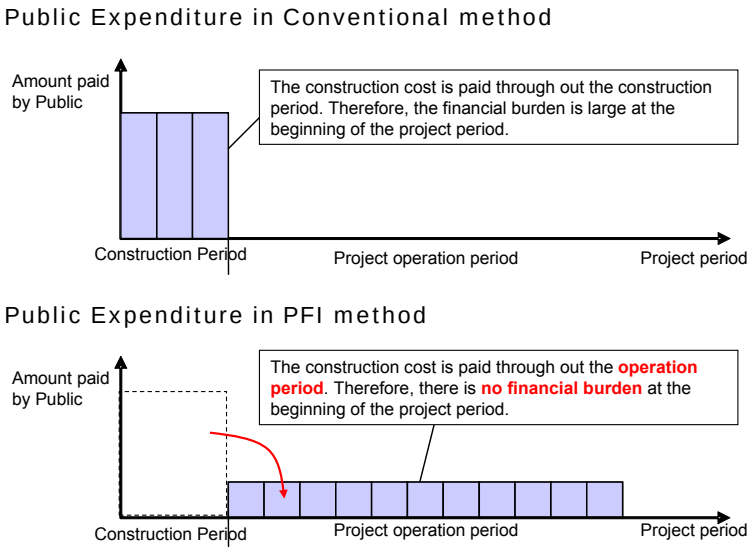


Figure 9-3-1 Image of the alleviation of Public Expenditure

9.4. Financial Analysis

In this section, we confirm the feasibility of the project implementation plan as described above, from a financial point of view. SPC, the implementation organization is the subject of financial analysis. To this end, we evaluate the financial feasibility of the project by calculating financial internal rate of return (FIRR)[1] based on the cash flows in real terms. We further calculate equity IRR, project IRR[2], and debt service coverage ratio (DSCR) based on the cash flows in nominal terms.

9.4.1 Preconditions

9.4.1.1 Project Period

Regarding the project period, we considered the construction period of one year, and the operation period of 5 years, 10 years (as a standard) and 15 years.

Table 9-4-1 Cases for financial analysis

Case		Project Period	Repayment Period for International Development Finance (Grace Period)	Revenue of SPC (Case 3,5,and 7 correspond to the case number)
Base Case		10 years	10 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)
Sensitivity Analysis for Project Period	Case 1-1	5 years	5 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)
	Case 1-2	15 years	5 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)
Sensitivity Analysis for Fare	Case 2-1	10 years	10 years (Construction Period)	50% of revenue of Case3 (10,000IDR/trip)
	Case 2-2	10 years	10 years (Construction Period)	50% of revenue of Case7 (20,000IDR/trip)
Sensitivity Analysis for DKI's Payment to SPC	Case 3-1	10 years	10 years (Construction Period)	35% of revenue of Case5 (15,000IDR/trip)
	Case 3-2	10 years	10 years (Construction Period)	40% of revenue of Case5 (15,000IDR/trip)
	Case 3-3	10 years	10 years (Construction Period)	45% of revenue of Case5 (15,000IDR/trip)
	Case 3-4	10 years	10 years (Construction Period)	75% of revenue of Case5 (15,000IDR/trip)
	Case 3-5	10 years	10 years (Construction Period)	100% of revenue of Case5 (15,000IDR/trip)

[1] FIRR in this study is used as an index in order to confirm whether that can cover the project cost in general (initial cost + operating costs) by the business revenue.

[2] Project IRR is an indicator of the recovery situation of revenue for the entire project cost, including interest cost, etc., is an indication of the order to verify the efficiency of the entire business. In the case of business carried out by 100% of equity, equity IRR and project IRR is equivalent.

9.4.2 Financial Analysis

9.4.2.1 Base Case

We calculated the FIRR for the base case of 10 years project periods with 50% payment arising from Case 5 income (15,000 IDR/trip). The resultant FIRR was 20.32%. In this case, the financial feasibility of this project is considered to be fine.

Table 9-4-2 Cash Flow for FIRR (Base Case, Unit: billion IDR)

Year	Revenue (Without Inflation)	Initial (including tax)	O&M (Without Inflation)	FIRR(20.32%)
0	0	-1,287	0	-1,287
1	391	0	-81	310
2	391	0	-81	310
3	391	0	-81	310
4	391	0	-81	310
5	391	0	-81	310
6	391	0	-81	310
7	391	0	-81	310
8	391	0	-81	310
9	391	0	-81	310
10	391	0	-81	310
Total	3,914	-1,287	-811	1,816

9.5. Economic Analysis

9.5.1 Result

With aforementioned preconditions we derived economic-analysis-related indexes in the case of 15,000IDR fare. With EIRR of 103.34%, NPV of 5.5 trillion Rupiah and B/C being 6.25, we can find that the economic viability of the project is sufficient.

Table 9-5-1 Cash Flow for Economic Analysis (Base Case, Unit: billion IDR)

Year	Benefit	Initial (Without tax)	O&M (Without inflation)	EIRR(103.34%)	Discounted Benefit	Discounted Cost	NPV
0	0	-1,138	0	-1,138	0	-1,138	-1,138
1	1,258	0	-81	1,177	1,123	0	1,051
2	1,258	0	-81	1,177	1,003	0	938
3	1,258	0	-81	1,177	895	0	838
4	1,258	0	-81	1,177	800	0	748
5	1,258	0	-81	1,177	714	0	668
6	1,258	0	-81	1,177	637	0	596
7	1,258	0	-81	1,177	569	0	532
8	1,258	0	-81	1,177	508	0	475

Year	Benefit	Initial (Without tax)	O&M (Without inflation)	EIRR(103.34%)	Discounted Benefit	Discounted Cost	NPV
9	1,258	0	-81	1,177	454	0	424
10	1,258	0	-81	1,177	405	0	379
Total	12,581	-1,138	-811	10,631	7,108	-1,138	5,512
EIRR	103.34%	NPV	5,512	B/C	6.25		

9.6. Project Schedule

The project schedule is described as below.

Table 9-6-1 Project Schedule

	Year1	Year2	Year3	Year4	Year5	Year14
Bidding Preparation						
Bidding & Evaluation						
Design & Manufacturing						
Installation & Testing						
Pre-Operation ➢ OBU diffusion ➢ Test Operation						
Operation & Maintenance						
Unitary Payment						
(a) Preparation of SPC						
(b) Preparation for Loan Contract						
(c) Loan Contract						
(d) Repayment						

9.7. Environmental and Social Considerations

9.7.1 Components affecting Environmental and Social Impacts

The roadside systems will be installed in this project. Table9-7-1 indicates components affecting environmental and social impacts. The gantries will be installed on sidewalk, and pipes for power supply cables and information and communication cables will be buried. The street trees are partly needed to be cut to install the gantries and to operate these systems.

Table 9-7-1 Components affecting environmental and social impacts

Corridor	Component	Number of Gantry
Corridor 1	Gantries	15
Corridor 6	Gantries	16

Source: JICA Study Team

9.7.2 Result of Survey

According to the TOR, environmental and social consideration survey was implemented. The survey result is shown Table9-7-2.

Table 9-7-2 Result of Survey

Category	Survey Item	Survey Method
Consideration of Options	Consideration of construction method	The construction of gantry installation consists of field survey, foundation work, pole construction, power and communication distribution work and testing. The construction including field survey will be implemented during the night (11 p.m. to 6 a.m. next morning) based on traffic regulation of Corridor 1 and 6. The construction work will be implemented 20 days per month excluding Saturdays and Sundays. The excavation for foundation work and pole construction will be implemented one by one based on one side traffic regulation instead of both side traffic regulation.
Air Quality	Confirmation of environmental standards	The environmental standards for SO2, CO, O3, HC, PM10, PM2.5, TSP, Pb, Dust fall, Total Fluoride, Chlorine & Chlorine Dioxide, Sulfur Index etc. are identified based on Government Regulation No.41/1994 Concerning on Air Pollution Control.
	Assess of air quality	The air quality such as TSP、NO2、SO2、Pb、PM10、CO along Corridor 1 and 6 are less than environmental standards according to Report on Regional Environment Status of DKI Jakarta Province in 2012. The air quality such as O3 exceeds the allowable limit.
	Confirmation of traffic volume increase in service phase	The rate of current users shifting from cars to public transportation due to introduction of ERP is19% on Corridor 1 and 21% on Corridor 6 in the case of 15,000 RP./trip of charging fee. The rate of current users shifting from cars to motorcycles due to introduction of ERP is 7% on Corridor 1 and 14% on Corridor 6 in the case of 15,000 RP./trip of charging fee. The average rider in one car is 2.3 persons. There are 2.3 motorcycle increase by one car reduction. As a result, air quality will be improved due to good fuel efficiency of motorcycle.

Category	Survey Item	Survey Method
		On the other hand, usage of diversionary channel and changing destination will be attributive, 8% of current users on Corridor 1 and 3% on Corridor 6. Hence, no air quality deterioration will be expected.
	Confirmation of residences, schools and hospitals in the project site and the surrounding area	The medical facilities, schools and residence area are identified along Corridor 1 and 6, 1km each side. There are 14 medical (see Table9-7-9) facilities and 47 schools (see Table9-7-10) along Corridor 1 and 6 medical facilities (see Table9-7-9) and 30 schools (see Table9-7-10) along Corridor 6. There so many residence area along both corridor.
	Impacts during construction	The construction of gantry installation consists of field survey, foundation work, pole construction, power and communication distribution work and testing. ●Field survey: 2 days each site Boring investigation will be implemented each site. ●Foundation work: 10 days each site 1 backhoe, 1 truck and 1 rough terrain crane for tree cutting, if necessary. 1 backhoe and 1 truck for excavation 1 vibrohammer, 1 rough terrain crane (9.9t), 1 truck (10t) and 1 auger for piling 1 truck and 1 concrete mixer truck for formwork, reinforcing steel and blinding concrete 1 concrete mixer truck for depositing concrete ●Pole construction: 6 days each site 1 rough terrain crane (9.9t) and 1 truck (10t) for pole construction 1 rough terrain crane (9.9t), 1 truck (10t) and 2 lift type for joist construction 1 lift type for other construction ●Power and communication distribution work: 5 days each site 1 lift type and 1 unique vehicle (4t) ●Testing: 5 days each site There is no necessity to prepare construction vehicles. Air quality deterioration such as NO2, CO, CO2, HC and PM will be expected because of exhaust gases from construction vehicles.
Waste	Disposal method for construction waste soil and scrap wood	The construction waste soil, waste concrete and scrap wood are needed to discard according to regulation of DKI Jakarta.
Soil Contamination	Measures to prevent soil contamination due to spill of fuel oil and lubrication oil from construction vehicles during construction	The construction vehicles will not park on the soil to prevent soil contamination
Noise and Vibration	Confirmation of environmental standards	The noise level is stipulated according to KEP-48/MENLH/11/1996 as follows; Residential zone: 55 dB Office building: 65 dB Medical facility: 55 dB School :55 dB The vibration level is stipulated according to

Category	Survey Item	Survey Method
		KEP-49/MENLH/11/1996. Old building: 92 dB Building with clack on the wall: 100 dB Good condition Building with small damage: 106 dB Well-built building: 118 dB
	Distance from source origin to residences, schools and hospitals	The minimum distance from construction site is as follows; Medical facility : 50 m, See Table9-7-9, 1-9 Business hours: 09:00-17:00 Monday-Friday 70m, See Table9-7-9 , 6-3 Business hours: 24 hours School : 50m, See Table9-7-10, 6-30 Operation time: 08:00-21:00 Residential zone: 50m, Especially Kota area
	Impacts during construction	The construction including field survey will be implemented during the night (11 p.m. to 6 a.m. next morning) based on traffic regulation of Corridor 1 and 6. The construction work will be implemented 20 days per month excluding Saturdays and Sundays. The construction of gantry installation consists of field survey, foundation work, pole construction, power and communication distribution work and testing. ●Field survey: 2 days each site Boring investigation will be implemented each site. ●Foundation work: 10 days each site 1 backhoe, 1 truck and 1 rough terrain crane for tree cutting, if necessary. 1 backhoe and 1 truck for excavation 1 vibrohammer, 1 rough terrain crane (9.9t), 1 truck (10t) and 1 auger for piling 1 truck and 1 concrete mixer truck for formwork, reinforcing steel and blinding concrete 1 concrete mixer truck for depositing concrete ●Pole construction: 6 days each site 1 rough terrain crane (9.9t) and 1 truck (10t) for pole construction 1 rough terrain crane (9.9t), 1 truck (10t) and 2 lift type for joist construction 1 lift type for other construction ●Power and communication distribution work: 5 days each site 1 lift type and 1 unique vehicle (4t) ●Testing: 5 days each site There is no necessity to prepare construction vehicles. The maximum noise level at the construction site will be 87 dB by breaker and the maximum vibration level will be 103 dB by backhoe. The noise level at 50m form construction site will be 53dB and vibration level will be 73 dB. As a result, noise level at 50m from construction site will be below the environmental standards. The low noise and vibration vehicles will be selected and low noise and vibration construction method will be applied to reduce

Category	Survey Item	Survey Method
		noise and vibration level.
Living and livelihood	Income survey of Jockey based on the 3 in 1 policy	The monthly income of Jockey based on the interview survey,144 respondents, is as follows; Less than 500,000 RP. : 10% Over 500,000 RP. , Less than 1,000,000 RP. : 32% Over 1,000,000 RP. , Less than 1,500,000 RP.:40% Over 1,500,000 RP. , Less than 2,000,000 RP.: 9% Over 2,000,000 RP. , Less than 2,500,000 RP.: 8% Over 3,000,000 RP. , Less than 3,500,000 RP.: 2% The income of Jockey will be zero due to abolishment of 3 in 1 policy by installing ERP system.
	Economic burden increase of low income households owning car by introducing ERP system	The monthly income of household based on the interview survey is as follows; Less than 2,500,000 RP. : 10% Over 2,500,000 RP. , Less than 5,000,000 RP. : 17% Over 5,000,000 RP. , Less than 7,500,000 RP. : 21% Over 7,500,000 RP. , Less than 10,000,000 RP.: 15% Over 10,000,000 RP. , Less than12,500,000 RP.: 15% Over 12,500,000 RP. , Less than 15,000,000 RP.: 6% Over 15,000,000 RP. , Less than 17,500,000 RP.: 6% Over 17,500,000 RP. , Less than 20,000,000 RP.: 2% Over 20,000,000 RP. , Less than 30,000,000 RP.: 4% Over 30,000,000 RP. : 4% The rate of modal shift from car to public transportation is about 30% by charging 15,000 RP. per trip. Economic burden for households less than 5,000,000 RP. of monthly income will be increased by spending increase of public transportation fare The rate of current users shifting from cars to motorcycles due to introduction of ERP is 7% on Corridor 1 and 14% on Corridor 6 in the case of 15,000 RP./trip of charging fee. The average rider in one car is 2.3 persons. Economic burden will increase by purchasing motorcycle.
	Economic burden and migration time increase by shifting to public transportation etc.	Based on the interview survey, the reason holding back from using public transportation, especially Trans Jakarta, is as follows; ・Traffic congestion ・No punctuality / low frequency ・Traveling time increase The main reason is inconvenience of public transportation instead of economic burden increase.
Land Use and Utilization of Local Resources	Approximation of cutting trees	Cutting trees will be needed at 9 sites on Corridor 1, and 8 sites on Corridor 6. The number of average cutting tree is 6 trees at each sites, therefore the total to be cut is 102 trees.
	Relevant regulations	According to DKI Jakarta Decree No.09/2002: Landscape and Cemetery, tree planting is required in designated area by DKI Jakarta if cutting tree will be needed. 10 trees planting per one cutting tree is required.
Existing Social Infrastructure and Services	Confirmation of residences, schools and hospitals in the project site and the surrounding area	The medical facilities, schools and residence area are identified along Corridor 1 and 6, 1km each side. There are 14 medical facilities and 47 schools along Corridor 1 and 6 medical facilities and 30 schools along Corridor 6. There so many residence area along both corridor.

Category	Survey Item	Survey Method
	Impacts during construction	The construction including field survey will be implemented during the night (11 p.m. to 6 a.m. next morning) based on traffic regulation of Corridor 1 and 6. The construction work will be implemented 20 days per month excluding Saturdays and Sundays. Hence, the impacts during construction will not be expected.
Gender	Confirmation of traffic volume increase in service phase	Usage of diversionary channel and changing destination will be attributive, 8% of current users on Corridor 1 and 3% on Corridor 6. Hence, the impacts for gender will not be expected by traffic congestion increase.
	Impacts of modal shift	Based on the interview survey, the reason holding back from using public transportation, especially Trans Jakarta, is as follows; ・Traffic congestion ・No punctuality / low frequency ・Traveling time increase The impacts for gender will be expected because of traveling time increase by using public transportation. The rate of current users changing from cars to motorcycles due to introduction of ERP is 7% on Corridor 1 and 14% on Corridor 6. The average rider in one car is 2.3 persons. The impacts for gender will be expected because of economic burden increase by buying motorcycle.
Infection including HIV/AIDS and Others	Disease rate of HIV/AIDS in the project site and the surrounding area.	According to Ministry of Health, number of disease for HIV/AIDS in DKI Jakarta as of 2013 was as follows; DKI Jakarta Indonesia HIV 28,790 127,416 AIDS 7,477 52,348 The rate of disease in DKI Jakarta is calculated as follows; HIV : 0.3% AIDS: 0.08%
	Organization conducting Related activities	The policy of DKI Jakarta to prevent transmission of disease is as follows; ・Institution of No.5/2008 ・Prevention measure is consist of 12 components ・Voluntary Counseling Test (VCT) is implemented in corporation with NGO
Working Conditions	Safety measures for labor	The below items will be conducted as safety measures for labor. ・Obeying Indonesian laws and regulations ・Preparing implementation plan including accident prevention and safety management ・Safety institution to workers ・Pre maintenance of construction vehicles ・Fall prevention of construction vehicles by wind speed monitoring ・Nasty fall prevention of workers ・Prevention of heat stroke

Source: JICA study team

9.7.3 Evaluation of Survey result

Based on the survey result, Table9-7-11, scoping and survey result is prepared by evaluating environmental and social impacts. The environmental items evaluated as A, B or C as of scoping phase are reevaluated and the reason for reevaluated environmental items as D is clarified.

Table 9-7-3 Scoping and Survey result

Category	No.	Environmental Items	Evaluation as of scoping		Evaluation based on survey result		Reason of Evaluation
			Before and During Construction	In Service	Before and During Construction	In Service	
Pollution Control	1	Air Quality	B-	C-	B-	B+	DC: The environment deterioration of air quality will be expected by operation of construction vehicles during the night（from 11 p.m. to 6 a.m. next morning） DO: The modal shift and shift from cars to motorcycles will be expected by ERP systems installation, charging 15,000 RP. /trip. This shift rate is totally about 30% of current users. On the other hand, usage of diversionary channel and changing destination will be attributive, 8% of current users. Hence, air quality improvement will be expected .
	2	Waste	B-	D	B-	D	DC: Construction waste soil and scrap wood generation will be expected due to ERP system installation. DO: No construction waste soil and scrap wood generation will be expected.
	3	Soil Contamination	B-	D	D	D	DC: Soil contamination will not be expected due to placement of construction vehicles outside soil. DO: Soil contamination will not be expected.
	4	Noise and Vibration	B-	C-	B-	D	DC: The noise level for medical facilities, schools and residential area is 55 dB. Some medical facilities and residential area are located within 50m from construction site .The impacts will be limited due to damping of noise level with enough distance between construction site and medical facilities and/or residential area. The impacts of vibration will be attributive due to 73 dB less than regulation level. Do: The usage of diversionary channel and changing destination will be attributive. Hence, noise and vibration deterioration will not be expected .
Social Environment	5	Living and livelihood	D	C-	D	B-	DC: The impacts will not be expected. DO: The major monthly income of Jockey is between 1,000,000 Rp. and 1,500,000 Rp. The 3 in 1 policy will repeal at the same time as installation of ERP

Category	No.	Environmental Items	Evaluation as of scoping		Evaluation based on survey result		Reason of Evaluation
			Before and During Construction	In Service	Before and During Construction	In Service	
							system. The poverty group such as Jockey will be affected because of joblessness. On the other hand, households getting monthly income less than 5,000,000 Rp. is about 30%. The living and livelihood impacts for car users of above low income households will be expected depending on the ERP fee. In addition, economic burden such as buying motorcycles and payments of public transportation fee as well as increase of traveling time will be increased by ERP system installation and modal shift.
	6	Land Use and Utilization of Local Resources	B-	D	B-	D	DC: About 100 cutting trees will be required to install ERP systems. DO: No impacts will be expected.
	7	Existing Social Infrastructure and Services	B-	B-	D	D	DC: Small impact will be expected by ERP construction during the night （from 11 p.m. to 6 a.m. next morning）and 20 construction days per month. DO: The environment deterioration of noise and vibration will not be expected by attributive usage of diversionary channel and few changing destination.
	8	Gender	D	C-	D	B-	DC: There is no impact to gender. DO: By ERP system installation and modal shift, it is assumed for gender to increase traveling time.
	9	Infection including HIV/AIDS and Others	B-	D	B-	D	DC: There will be possibility of HIV/AIDS transmission because of construction workers influx. DO: There will be no possibility of HIV/AIDS transmission.
	10	Working Conditions	B-	D	B-	D	DC: It is needed to pay attention to working conditions for construction workers.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.

Source: JICA study team

Affected peoples by the ERP project is shown in Table9-7-12.

表9.7-1 Affected Peoples by the ERP Project

No.	Category		Effect
1	Low income car users	Shift to public transportation	●Spending increase of public transportation fare There is a possibility to reduce economic burden due to saving gas money of car. ●Transportation time increase
		Shift to motorcycle	●Purchase of motorcycle

			There is a possibility to reduce economic burden due to saving gas money.
2	Gender	Shift to public transportation	●Spending increase of public transportation fare ●Traveling time increase
		Shift to motorcycle	Spending increase of purchasing motorcycle.
3	Jockey		No income due to abolishment of 3 in 1policy.
4	Existing public transportation users including gender		Congestion of public transportation due to modal shift.

Source: JICA study team

Preface Background and Aim of the Study

Pre.1. Study Background

(1) Challenges and Achievements (as of today) of Urban Transport Sector in Republic of Indonesia

The population of Jakarta metropolitan area (hereafter JABODETABEK area) in Republic of Indonesia has extended to approximately 1.6-fold in the last 20 years that is to say the growth was approximately 28 million people in 2010 from about 17 million in 1990. JABODETABEK area is a economoic growth center, in which population accounts for about 10% of the entire Indonesia, the size of the economy reaches about 30% of GDP and 40% of foreign investment has been concentrated.

With the economic growth and population growth, vehicle registration number in JABODETABEK area has soared to almost 5 times to about 14 million units in 2012 from about 3 million units in 2000. On the other hand, since road infrastructure is not keeping up with the rappid increase of the number of vehicle, there is serious traffic congestion in JABODETABEK area, and it has caused major economic loss. In particular, congestion of morning and evening commuting hours is occurring regularly in the 13 km section, which is located in the heart of JABODETABEK area, between Block-M as a business and resdidential area in the southern Jakarta, and Kota as an business destrict and old town in the northern half. In order to improve the above-mentioned situation, the Provicnial Government of DKI Jakarta (hereafter refered as DKI Jakarta Gov.) has introduced a Bus Rapid Transport system (hereafter refered as BRT or Transjakarta). In addition, the Government of DKI Jakarta introduced a policy so-called as “3 in 1” regulation, which is vehicle less than 3 passengers per car are not allowed to pass in the certain road in morning and evening rush hour in order to suppress the flow of vehicles to the city. However, there are people called “Jockey” on the street who are available when the the number of passenger is less than 3 that will help to avoid the restrciton of “3 in 1” regulation. Therefore, the effect of the regulation is remained to be limited, and further measures for the traffic congestion in necessary.

(2) Positioning of this Project and Development Policy of Urban Transport Sector in Republic of Indonesia

According to DKI Jakarta ordinance (Regional Regulation No.12/2002and Governor Regulation No.103/2007), aiming toward the easing of road traffic congestion in Jakarta metropolitan area, implementation of Electronic Road Pricing (ERP) policy utiliing Intelligent Transport Systems (ITS) is planned as an alternative to “3 in 1” regulation, in addition to such policy implementation as the development of mass transit system including the construction of the subway, the strengthening of traffic regulations and the expansion of the road network. By implementing the ERP, the inflow restriction of the vehicle into the city is expected to be strengthened. Furthermore, by encouraging simultaneous shift to public transport such as a BRT or subway which is now being constructed, further effcte of easing traffic congestion can be expected. The ITS project including introdction of ERP system to be introduced in the

seriously congested roads for restriction of inflow traffic into the city along the above-menthioned ordinance and easing traffic congestion, was positioned as the prioritized project which is to be completed by 2020 under the agreement between Japan Government and Indonesian Government in MPA in December in 2010.。

(3) Aid Policy of Japan and JICA for Urban Transport Sector

In the JICA country analysis paper for Republic of Indonesia, it is analyzed that support of strengthening of transportation through public-private partnership, and major metropolitan transportation development with a focus on the JABODETABEK area is a prioritized issue. Moreover, support for further economic growth as a prioritized support field and support for improvement of business and investment environment through infrastructure development around JABODETABEK area are specified in the aid policy for Republic of Indonesia published in April in 2012.

Pre.2. Purpose of the Study

The purpose of this study is to conduct feasibility study on implementation of the investment to be done by Japanese enterprises in the field of ITS and ERP, which can be considered one of the efficient measures to ease traffic congestion in DKI Jakarta and formulate the proper business plan based on the public-private-partnership including application of the JICA PSIF financial scheme.

Pre.3. Outline of the Project

(1) Study Target

Study target area is “JABODETABEK area” in Republic of Indonesia. Target area for project implementation is DKI (Daerah Khusus Ibukota) Jakarta. Furthermore, ERP introductory target routes are Corridor 1 (between Blok M and Kota), and Corridor 6 (between Ragunan and Bundaran HI).

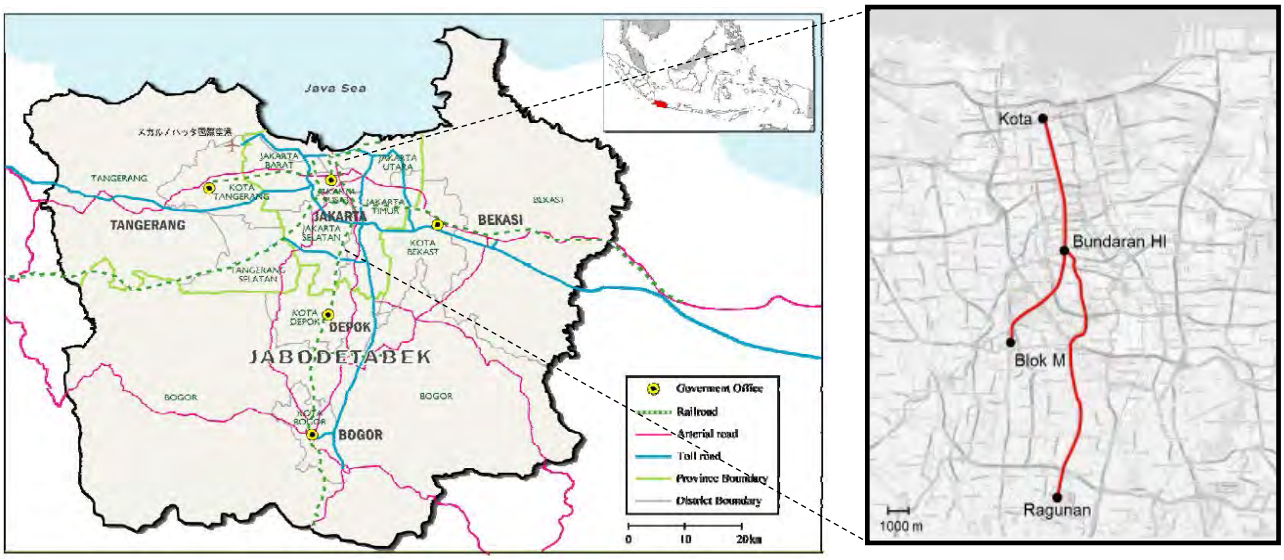


Figure Pre.-1 Study target area

Pre.4. Administrative organization having jurisdiction over the transportation sector

(1) Study Counterparts

The main counterpart for this study is Provincail Governement of DKI Jakarta and BAPPENAS.

Provincail Governement of DKI Jakarta or DKI Jakarta Gov. is the implementation agency of ERP Project and BAPPENAS has jurisdiction over the development plan in Indonesia and DKI Jakarta.

- DKI Jakarta Gov.
  - Regional Planning and Development Board (BAPPEDA) : jurisdiction over the development plan in DKI Jakarta.
  - Deputy Governor for Industry, Trade and Transportation : jurisdiction over a special assignment from the governor matters related to ERP
  - Assitant Secretary for Ecnomic Affairs : jurisdiction over transport administration, including the ERP economic activity in general including transport administration
  - Head of Transportation Agency : jurisdiction over transport administration, including ERP
  - Advisor for Vice Governor : Vice Governors transport policy adviser

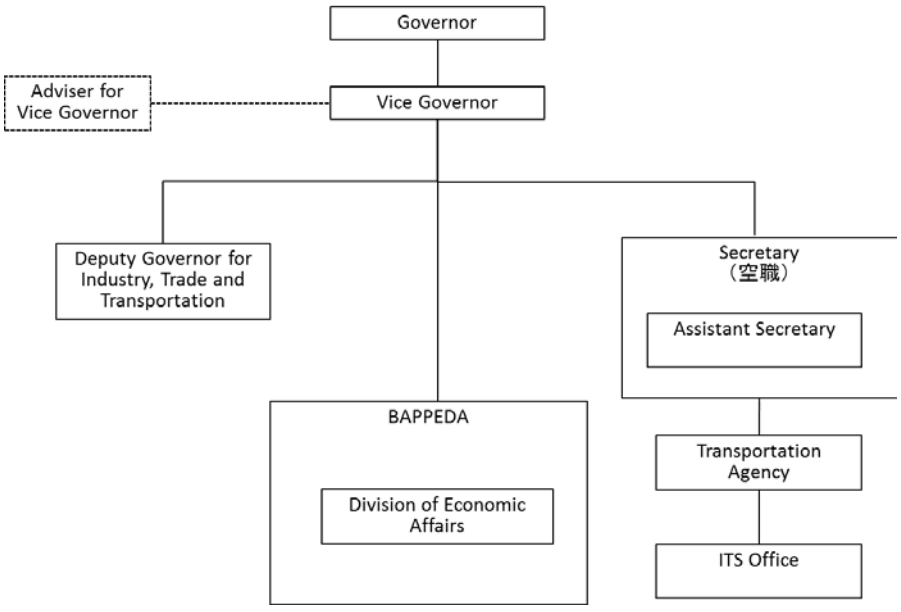


Figure Pre.-2 Counterparts in DKI Jakarta

- BAPPENAS
  - Directorate of Transportation : jurisdiction over transportation-related matters

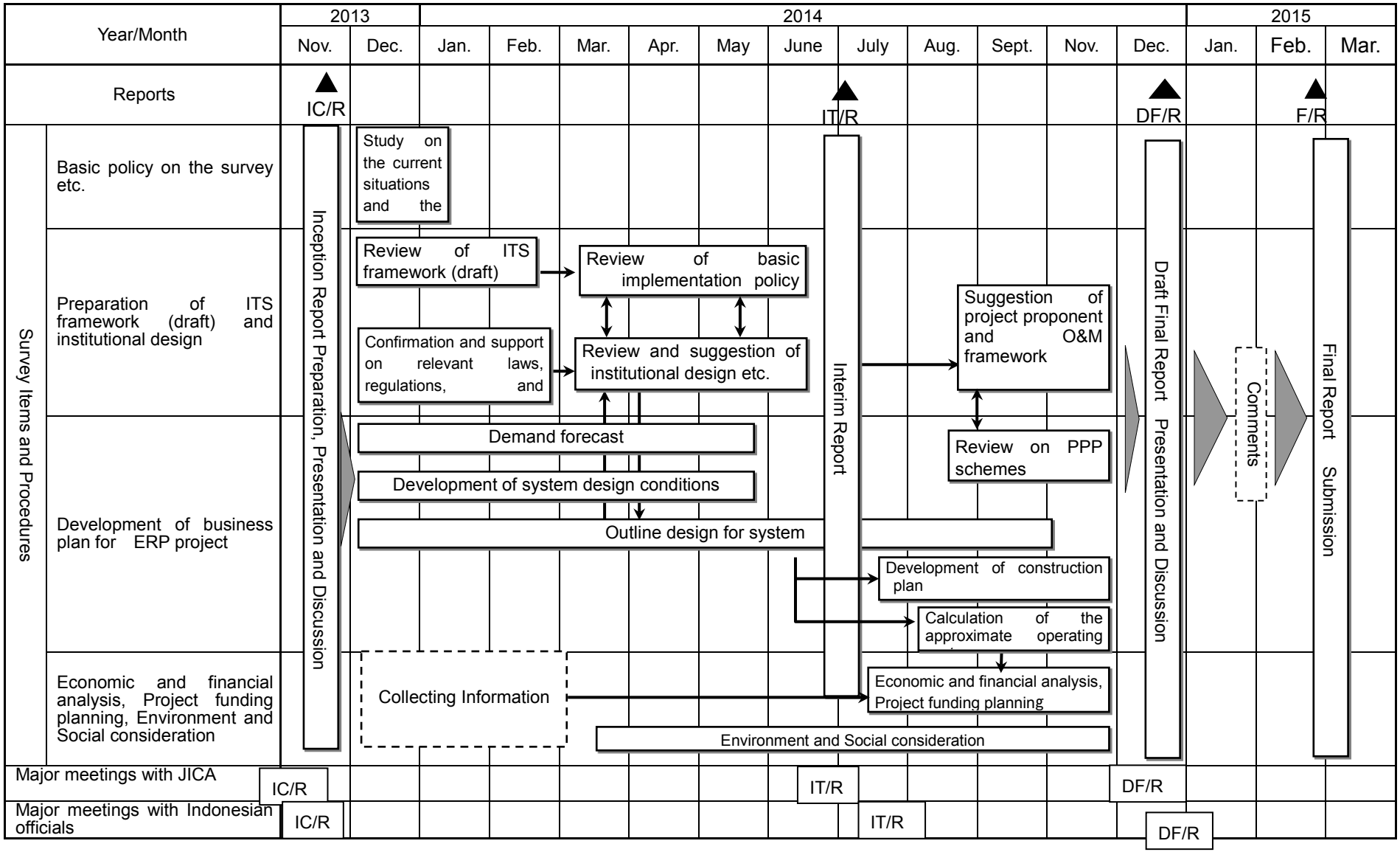
In addition to the above-mentioned main counterparts, the following organizations are collaborating as supporting organizations in the study.

- Ministry of Transport：jurisdiction over transportation related institutions and policies
  - -Directorate of Urban Transportation System Development, Directorate General of Land Transportation：jurisdiction over transportation related policies
  - - Research and Development Agency：jurisdiction over transportation related laboratories
- BAPPENAS
  - - Directorate of Public Private Partnership Development：jurisdiction over Public-Private-Partnership in Indonesia
- Ministry of Finance
  - - Directorate of Local Taxes and Regional Retribution : jurisdiction over charging business by local government

Pre.5. Flowchart of the Study

Flowchart of the study is shown as below.

Table Pre.-1 Study Flowchart



Chapter 1. Overview of Socioeconomic Condition of DKI Jakarta

1.1 Demography

Population in JABODETABEK area has grown; in 1990 it was approximated 17 million, increasing to 23 million by 2000, 27 million by 2010, and 28 million by 2012. The surface ratio of JABODETABEK area in the whole country is 0.3% but the population ratio reaches around 10%.

The average growth rate in year 1990-2000 was around 3.1% per annum, in year 2000-2010 was around 1.4%, and in year 2010-2012 was around 2.5% while the national average growth rate in the same periods was 1.4 % per annum.

The surface ratio of DKI Jakarta in JABODETABEK area is around 10%, but the population in DKI Jakarta in 2012 is around 10 million, meaning that the population ratio in JABODETABEK area in 2012 is around 36%. Although the DKI Jakarta's population has increased from 1990, the population ratio of DKI Jakarta in JABODETABEK area has decreased due to the increasing population outside DKI Jakarta.

Table1-1-1 Demography of the JABODETABEK Area

	Regency/ Municipality	Land Area (km2)	Population (,000)						Population Growth Rate (% p.a)			Population Density (,000./km2)		
			1990	2000	2005	2010	2011	2012	90-'00	00-'10	10-'12	2000	2010	2012
JABODETABEK	DKI Jakarta	664	8,259	8,389	8,839	9,608	9,892	9,992	0.2	1.4	2.0	12.6	14.5	15.0
	%	10.0%	48.2%	36.1%	37.4%	36.0%	36.1%	35.7%						
	Bogor Municipality	112	272	751	891	950	967	987	6.3	0.1	2.3	2.2	2.3	2.4
	Bogor Regency	2,997	3,737	5,509	3,829	4,772	4,858	4,990						
	Depok Municipality	200	NA	1,143	1,375	1,739	1,770	1,836						
	Tangerang Municipality	154	922	1,326	1,452	1,799	1,870	1,919	4.0	1.2	3.6	3.5	4.0	4.3
	Tangerang Regency	1,012	1,844	2,781	3,259	2,834	2,960	3,051						
	Bekasi Municipality	214	NA	1,664	1,993	2,335	2,377	2,448	4.7	4.1	2.7	2.2	3.3	3.5
	Bekasi Regency	1,270	2,104	1,668	1,984	2,630	2,678	2,787						
	Total	6,622	17,138	23,232	23,623	26,667	27,371	28,010	3.1	1.4	2.5	3.5	4.0	4.2
Indonesia		1,910,931	179,379	206,265	218,869	237,641	-	-	1.4	1.4	-	0.1	0.1	-
% of nation		0.3%	9.6%	11.3%	10.8%	11.2%	-	-	-	-	-	-	-	-

Source: Central Statistic Agency of DKI Jakarta, Jawa Barat and Banten based on Census Result

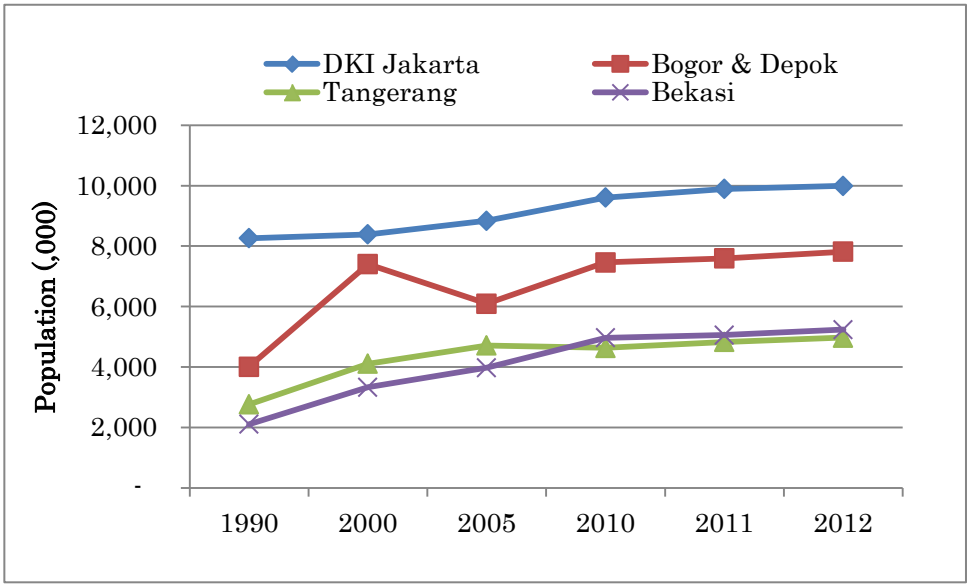


Figure1-1-1 Population Growth in the JABODETABEK Area 1990-2012

Source: Central Statistic Agency of DKI Jakarta, Jawa Barat and Banten based on Census Result

1.2 Economy

1.2.1 GRDP (Gross Regional Domestic Product)

The GRDP in year 2000 constant price of JABODETABEK area is shown as below. The GRDP in JABODETABEK area has doubled from 335 trillion Rupiah in 2001 to 633 trillion Rupiah in 2012. The growth rate is around 6%.

The GRDP in year 2000 constant price of DKI Jakarta has doubled as well. The ratio of DKI Jakarta in total JABODETABEK is around 70% and the growth rate in DKI Jakarta is almost the same as JABODETABEK.

Table1-2-1 GRDP of the JABODETABEK Area

YEAR	GRDP at 2000 constant price (Trillions of Rupiah)					Growth Rate (% p.a)		
	2001	2005	2010	2011	2012	01-05	05-10	10-12
DKI Jakarta	239	295	396	422	450	5.5%	6.0%	6.6%
%	71.1%	70.6%	70.9%	71.0%	71.0%			
Bogor Municipality	3	4	5	5	5	7.0%	5.6%	6.1%
Bogor Regency	19	25	33	34	37			
Depok Municipality	4	5	7	7	7			
Tangerang Municipality	17	22	29	31	33	5.5%	6.8%	6.6%
Tangerang Regency	13	15	18	20	21			
Bekasi Municipality	10	12	15	17	18	6.2%	5.8%	6.4%
Bekasi Regency	32	41	55	58	62			
Total JABODETABEK	335	418	558	595	633	5.7%	5.9%	6.6%

Source: Central Statistic Agency (BPS) of DKI Jakarta, Central Statistic Agency (BPS) of Banten, Central Statistic Agency (BPS) of Jawa Barat

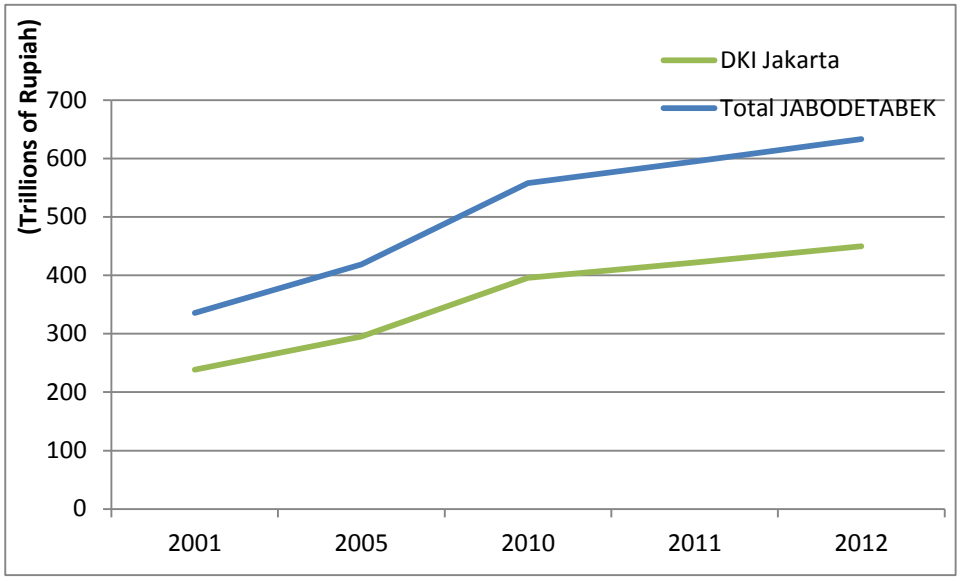


Figure1-2-1 GRDP at 2000 constant price of the JABODETABEK Area

Source: Central Statistic Agency (BPS) of DKI Jakarta, Central Statistic Agency (BPS) of Banten, Central Statistic Agency (BPS) of Jawa Barat

The GRDP per capita at year 2000 constant price of JABODETABEK area is shown as below. The GRDP per capita of DKI Jakarta has increased from 28 million Rupiah in 2001 to 45 million Rupiah in 2012. The GRDP per capita of JABODETABEK has increased from 14 million Rupiah in 2001 to 23 million Rupiah in 2012. The GRDP per capita of Bekasi is the second highest after DKI Jakarta of JABODETABEK area.

Table1-2-2 GRDP per capita of the JABODETABEK Area

YEAR	GRDP per capita at 2000 constant price (millions of Rupiah)				
	2001*	2005	2010	2011	2012
DKI Jakarta	28.1	33.4	41.2	42.7	45.0
Bogor & Depok	3.4	5.5	5.9	6.1	6.3
Tangerang	7.2	7.8	10.3	10.6	10.9
Bekasi	12.0	13.3	14.2	14.8	15.2
Total JABODETABEK	14.3	17.7	20.9	21.7	22.6

Note: Population in 2001 is estimated based on the growth rates as given in Table 1.1.1

Source: Estimation Based on Central Statistic Agency (BPS) of DKI Jakarta, Central Statistic Agency (BPS) of Banten, Central Statistic Agency (BPS) of Jawa Barat

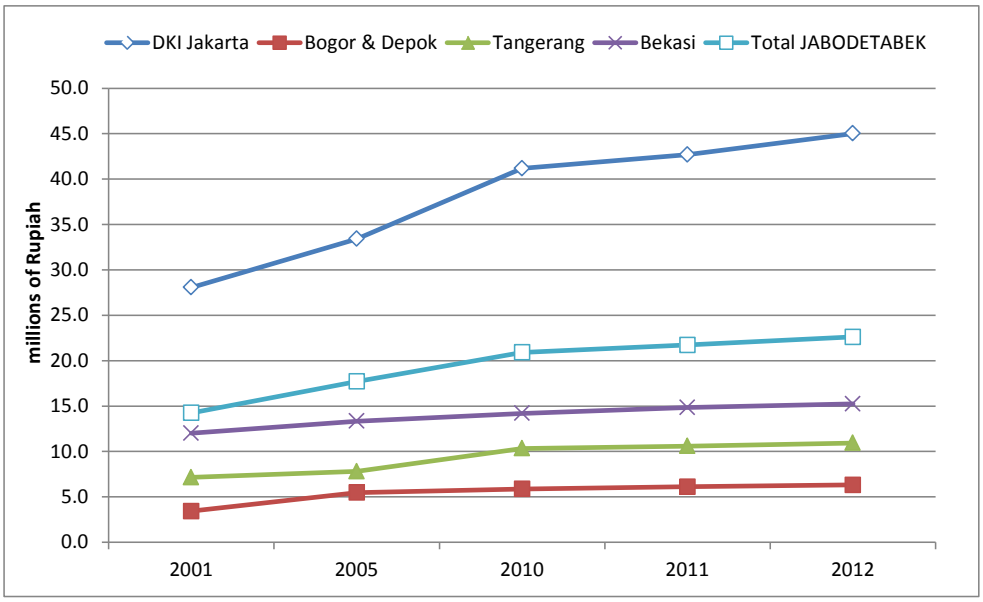


Figure1-2-2 GRDP per capita of the JABODETABEK Area

Note: Population in 2001 is estimated based on the growth rates as given in Table 1.1.1

Source: Estimation Based on Central Statistic Agency (BPS) of DKI Jakarta, Central Statistic Agency (BPS) of Banten, Central Statistic Agency (BPS) of Jawa Barat

1.2.2 Consumer Price Index

The transition of Consumer Price Index (CPI) in DKI Jakarta and Indonesia is shown as below. The CPI in DKI Jakarta has increased at average annual growth rate of 6.3% from 2007 to 2013. The average annual growth rate (6.6%) of CPI in Indonesia is almost the same as DKI Jakarta.

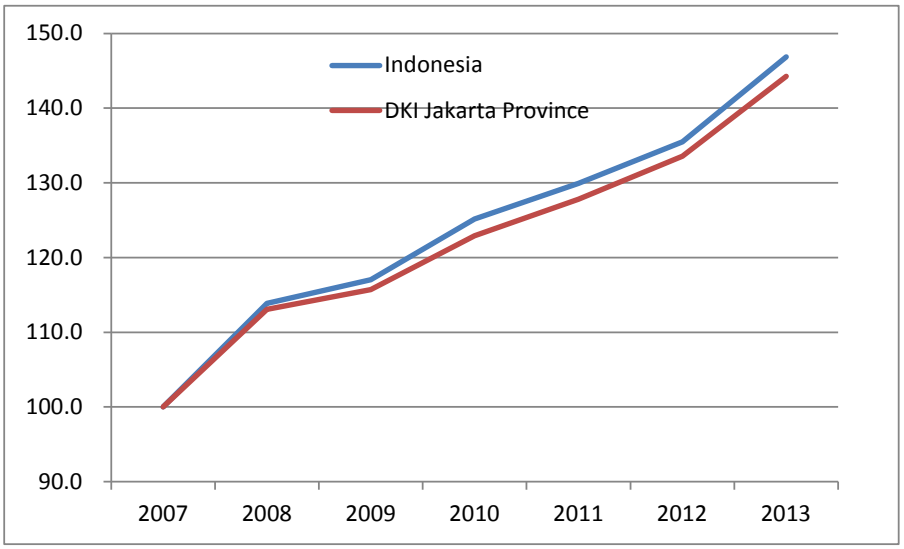


Figure1-2-3 Consumer Price Index (in December of each year, 2007 = 100)

Source: BPS Indonesia

1.2.3 Exchange rate

Due to the impact of Asian Financial Crisis, the exchange rate of Indonesian rupiah has greatly changed in 1998 (the depreciation of Rupiah). It fluctuated between 8,000 – 10,000 Rupiah per US dollar with the standard of around 9,000 Rupiah per US dollar after the year. For Rupiah per Japanese yen hovered around 8,000 Rupiah per 100 Japanese yen before 2007and since Rupiah has kept weakening after 2009, now it exceeds the level of 10,000 Rupiah per 100 Yen.

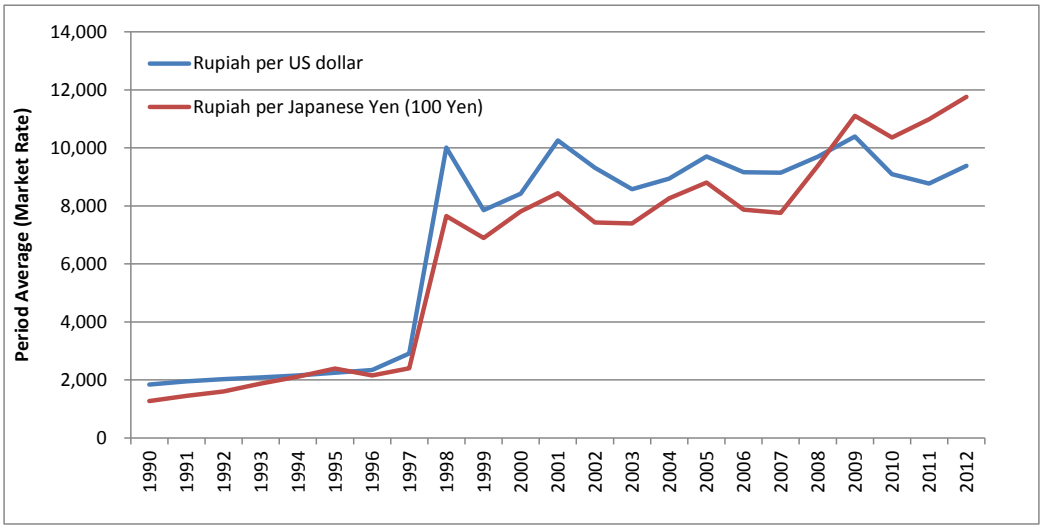


Figure1-2-4 Exchange Rate of Indonesia Rupiah

Source: Based on International Financial Statistics Yearbook 2001, 2013

1.3 Transportation

1.3.1 Public Transportation

1.3.1.1 Bus and taxi

The number of buses of Transjakarta Busway is shown in the table below. The number of buses has increased up to 565 in 2012.

Table1-3-1 Number of Buses (Transjakarta Busway)

	2008	2009	2010	2011	2012
Number of Buses (Transjakarta Busway)	426	456	404	545	565

Source: PT. Trans Jakarta

The number of taxies and other buses in DKI Jakarta is shown as below. The number of taxies is around 25,000, and the number of bus of intercity and interprovincial is around 3,000.

Table1-3-2 Number of Other Public Transportations, 2008 – 2012

Year	2008	2009	2010	2011
Taxi	24,324	24,529	24,759	24,724
Bus AKAP (Bus of Intercity and Interprovincial)	3,587	3,340	3,169	3,279

Source: Dinas Perhubungan DKI Jakarta Province

The revenue and the number of passengers of Transjakarta are shown in the table below. Both the revenue and the passengers have increased about 1.5 times from 2008 to 2012. In 2012, the annual revenue is around 364 billion Rupiah and the annual passengers reached 111 million people.

Table1-3-3 Passengers and Revenue of Trans Jakarta

	2008	2009	2010	2011	2012
Revenue (Billion Rupiah)	248	275	289	379	364
Passenger (Million People)	75	82	87	115	111

Source: Central Statistic Agency (BPS) of DKI Jakarta

1.3.1.2 Railway

The number of railway passengers in JABODETABEK area is shown as below. We can see that the ratio of travel ranging from inside DKI Jakarta and outside DKI Jakarta (Bogor, Depok, Tangeran, Bekasi area) is overwhelmingly high. The number of passengers in the above section is about 130 million and accounts for 84% of annual passengers in 2012 which is 160 million.

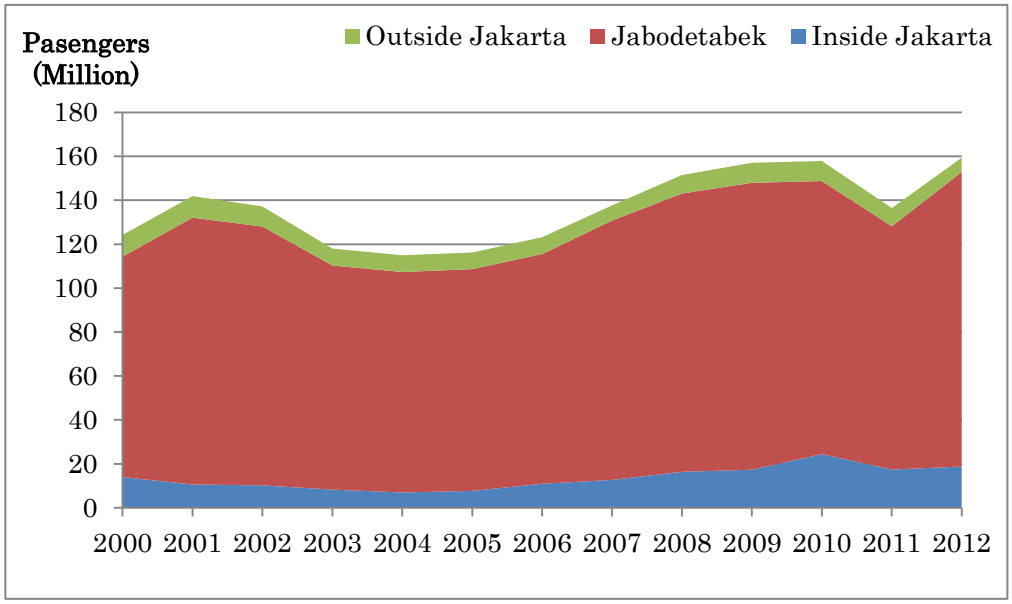


Figure1-3-1 Number of Railway Passengers by Year and Region of Destination

Source: PT KAI, Jakarta Branch

1.3.2 Number of Registered Motor Vehicles

The number of registered motor vehicles in DKI Jakarta is shown as below. The total number has increased 5 times from 3 million in 2000 to 14 million in 2012. The growth of motor cycles is prominent and the number of motor cycles has increased from 1.6 million in 2000 to 10.8 million in 2012. The average annual growth rate is around 17.2%. However, the average annual growth rate tends to decrease from around 23.5% of year 2000-2005, to 13.5% of year 2005-2010 to 11.1% of year 2010 -2012.

The number of registered motor vehicles in DKI Jakarta has increased 2.6 times from1.05 million in 2000 to 2.74 million in 2012. The average annual growth rate is 8.3%.

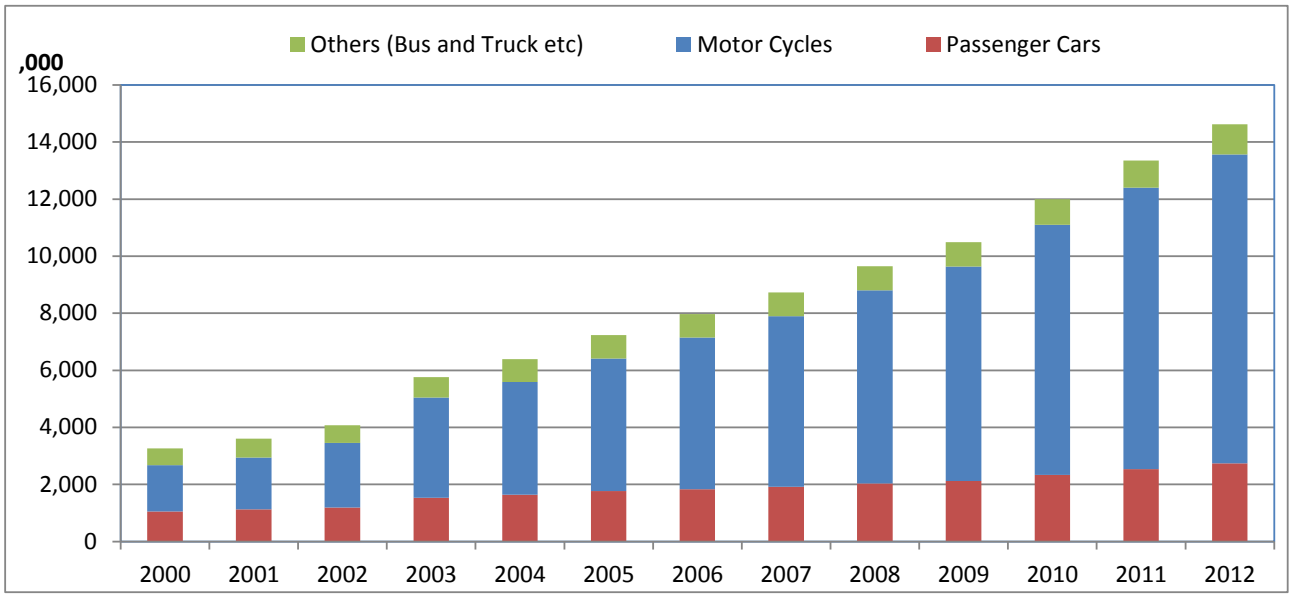


Figure1-3-2 Number of Registered Motor Vehicles by Kind of Type Motor Vehicles in DKI Jakarta

Note: Excluding Army, Police and CD

Source: Ditlantas Polda Metro Jaya

1.3.3 Current Status of Road Development

The paved road length and area of 2012 in DKI Jakarta is shown as below. The total road length is 6,955.8km and the total road area is 48.5km2 in 2012. The road area is nearly equivalent to 7.3% of the total area of DKI Jakarta. The growth rate of the paved road length is 0.01% per year which indicates slow pace for improvement. The DKI Jakarta's road length per population (,000) is 0.7km and the area per population (,000) is 0.005km^2. In comparison with the data of Tokyo as of the end of 2012, the level is less than half those of Tokyo. The DKI Jakarta's road length per number of vehicle (excluding motor cycle) (,000) is 1.8km and the area per number of vehicle (excluding motor cycle) (,000) is 0.013km^2. As compared to the data of Tokyo as of the end of 2012, the level is equivalent to one-quarter of those of Tokyo and the paved road length does not reach an adequate level.

Table1-3-4 Length, Area and Status by Kind of Roads, 2012

Type of Roads		Length (km)	Area (km2)
1.Toll		123.7	3.00
2.National	2-1. Primary Arterial	128.9	2.48
	2-2. Primary Collector	23.7	0.27
3. Province	3-1. Secondary Arterial	535.3	8.80
	3-2. Secondary Collector	1,027.0	7.33
4. Municipality		5,117.3	26.63
Total		6,955.8	48.50
per population (,000)		0.7	0.005
	Ref. Tokyo (2013.3)	1.8	0.014
per number of vehicle (,000) (excld motor cycle)		1.8	0.013
	Ref. Tokyo (2013.3)	6.2	0.047

Source: Created based on the data of Sub Dinas Bina Program, Dinas Pekerjaan Umum Provinsi DKI Jakarta, MLIT(Japan) and Tokyo Metropolitan Government

Existing road network in DKI Jakarta is shown in the following figure.

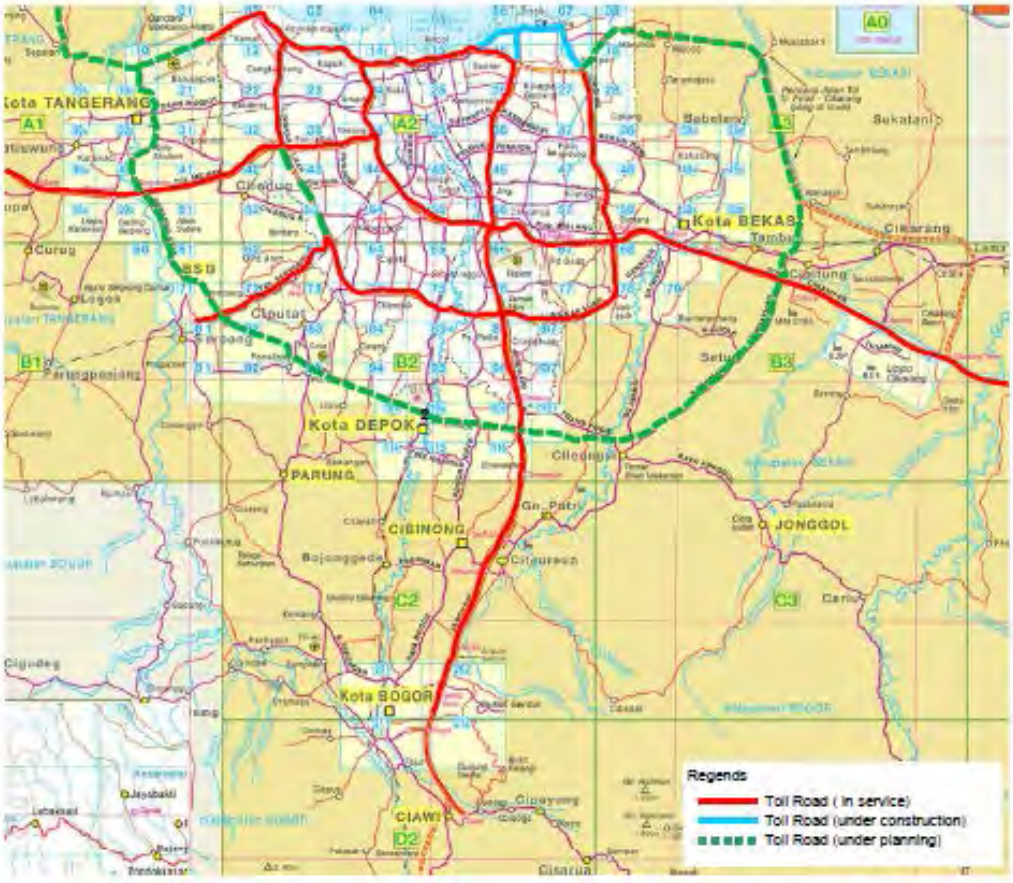


Figure1-3-3 Existing and planned road network in DKI Jakarta

Source: JICA, "Jakarta traffic congestion seminar", November, 2011

Regional road network, including arterial road and toll-highway is in place inDKI Jakarta. Moreover, Jakarta Outer Ring Road or JORR, and Jakarta Outer Ring Road-2 or , JORR-2 are in place in DKI Jakarta. The road network is extending radially wtih toll-highway and arterial road to the surrounding area. In recent years, BOT contracts with the private sector is being promoted for the development of theJORR and JORR-2. Since new land acquisition is difficult in DKI Jakarta region, road with underpass or elevated road is partly in place.Road length inJABODETABE area is shown as the following table.

Table1-3-5 Road length in JABODETABEK area (2009)

	Road length (km)				
	Expressway	National Road	Provincial Road	Local Road	Total
DKI Jakarta	113.0	169.7	1,304.4	5,621.5	7,208.5
Bogor	-	155.7	156.7	2,183.7	2,496.1
Depok	-	14.3	19.2	469.8	503.2
Tangerang	-	53.3	182.2	2,415.8	2,651.3
Bekasi	23.7	43.3	39.4	1,239.3	1,345.6

Source : METI, "Road traffic information study in Jakarta", 2012

1.3.5 Present Status of Road Traffic

Traffic demand is exceeding the supply of transportation services in the DKI Jakarta and since the public transportion is still under development, car dependency ratio is very high. As it can be seen in the folowing table, the ratio of private passenger vehicles in DKI Jakarta has risenup to 96.5%. We can say that road traffic congestion is chronic and extremely serious issue in the main road ofDKI Jakarta.

Table1-3-6 Traffic demand and modal share in DKI Jakarta (2012)

Item	Contents
Number of trips	25.7 million tripns per day
Modal share	Private passenger car :96.5%, Public transport (Buses and Jabodetabek railway) : 3.5%

Source: DISHUB

The following figure shows a comparison of the road area of DKI Jakarta and the road area occupied by the car. Rate of growth in car ownership exceeds the speed of the road development. As a result, road area occupied by the car may surpass the area of constructed road in 2014, the typical phenomenon namely "Gridlock"

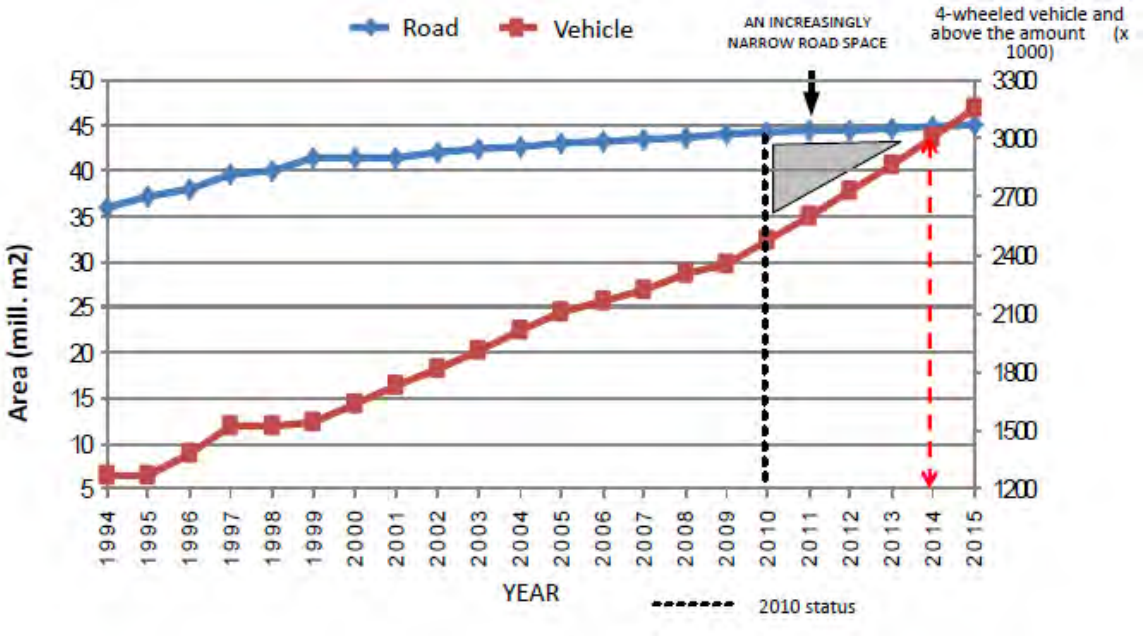


Figure1-3-4 A comparison of the road area of DKI Jakarta and the road area occupied by the car

Source : DISHUB

As seen in the figure, the car usage ratio is extremely high in DKI Jakarta. Accodingly, the automobile traffic demand is higher than the road capacity. As a result, road traffic congestion has steadily intensified. In order to drastically improve the road traffic congestion in DKI Jakarta, implementation of the following two measures are an urgent issue, namely 1) the proper management of automobile traffic demand, and 2) reduction of car utilization rate based on improvement of public transport services.

1.3.6 Present Status of Road Traffic Management and Regulation

(1) Traffic signal control

There are more than 600 major intersections in DKI Jakarta and 287 intersections are signalized. We can say that signalization of the intersections is still low when considiring a city with heavy traffics.

In the region, three types of area traffic control system (ATC) have been introduced by Sainco company of Spain, Siemens Corporation of Germany and AWA of Australia.

(2) One way regulation

In the heart of DKI Jakarta region, there are several one-way road network. It contributes to increase the road traffic capacity and smoothing the right or left turn traffic at the intersections. On the other hand, the default is the increare in distance to the destination. For the public transportation users the access to the bus stops becomes longer and are forced to inconvenience.

(3) Car-pool regulation (3 in 1)

In DKI Jakarta, car-pool regulation called “3 in 1” regulatiton has been introduced since early 1990s. On the basis of the regulation, use and entry into the main road in the center is no longer allowed unless a vehicle has three passengers or more. The regulation is applied to Sudirman road, MH.Thamrin road, and JG. Subroto road, of which riad section between Rasuna Said road and G. Pemuda road, from Monday to Friday, from 7:00 am to 10:00am、and from 16:30pm to 19:00pm. Public transportation and taxi are excluded.

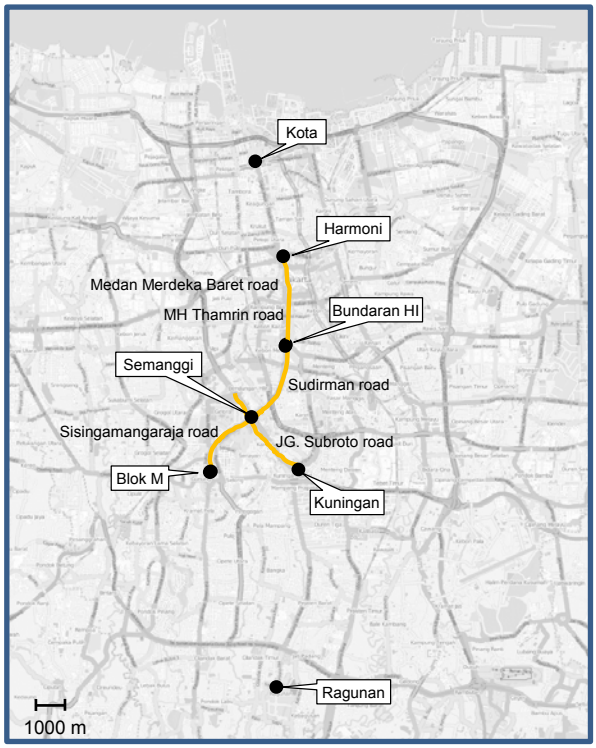


Figure1-3-5 “3in1” regulation road section (orange colored section in the above figure)

Source: Created by JICA Study Team based on various materials

(4) Trucks regulation

There are several kinds of regulations for trucks as follows:

1) Heavy trucks which weighs 5.5 tons or more are not allowed to enter into Sudirman road and Thamrin road.

2)Trucks which weighs less than 5.5 tons and buses and motorcycles are allowed to use only leftmost lane in Sisingamangaraja road, Sudirman road and Thamrin road.

3)Trucks in general are allowed to use first lane or second lane from the left on Medan Merdeka Baret road, Majapahit road, GajahMada road, Hayam Wuruk road, Pintu Besar Selatan road and Pintu Besar Utara road.

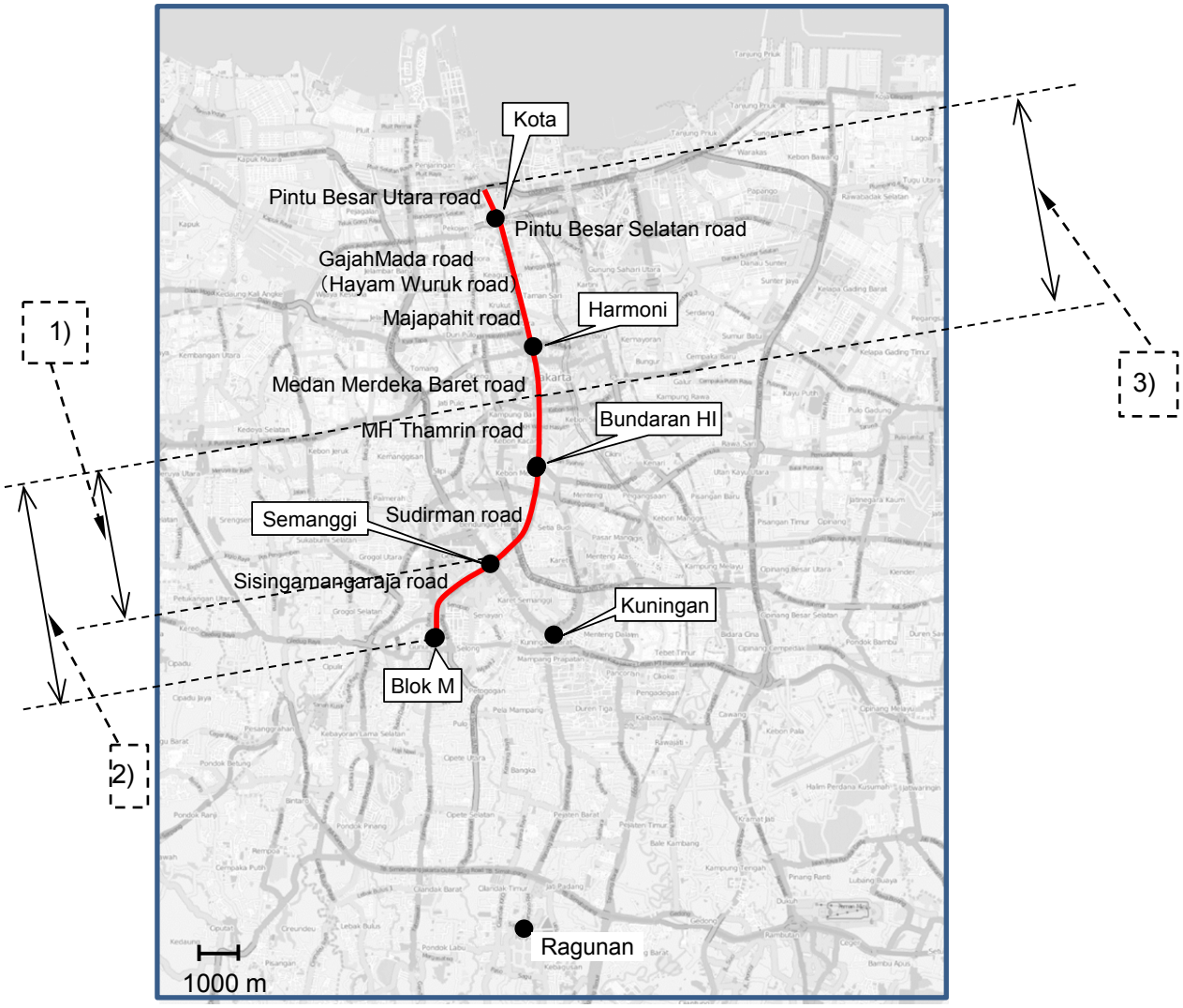


Figure1-3-6 Trucks regulation road sections

Source: Created by JICA Study Team based on various materials

1.3.7 Public Transport Network

1.3.7.1 Present status of public transport

There are various kinds of road based public transport systems in JABODETABEK area. Namely, TransJakarta in DKI Jakarta, transPakuan in Bogor and so forth. Big buses with more than 50 seats such as Patas AC, Patas Non-AC and Regular buses, midium-sized buses with 24 seats like Metro Mini and Kopaja, mini-buses with 9 to 14 seats like Microlet, Angkot, are in operation. Taxi, bajaj and bike-taxi (ojek) are serving individual transport service. Tricycle such as Beca is a short-distance traffic measues, which has not been allowed in operation in DKI Jakarta since 1990s, because it causes traffic congestion.

Bus-way system in DKI Jakarta is called TransJakarta and it is supervised by DISHUB. TransJakarta started to be in operation in early 2000s. Service on Corridor 1 connecting Blok M and Kota has started in 2004 and up to now, the total length has extended to 184 km, with 15 routes and 208 stations which are now in operation.

Figure1-3-7 Transjakarta network

Source：Transjakarta web site

1.3.7.2 Public Transport Planning

(1)Mass Rapid Transit (MRT)

Multiple MRT routes are being planned. Most prioritized route is Jakarta north-south line connecting to Lebak Bulus, Dukuh Atas and Kota. Now basic design between LebakBulus and Dukuh Atas has been prepared. As for MRT east-west line in JABODETABEK region, 5 alternative roytes are being considered, namely, alternative route 1B and 2 in Balaraja and Cikarang, alternative route 3 in Roxy and Pondok Kopi, and alternative route 4 in Balaraja and Setu.

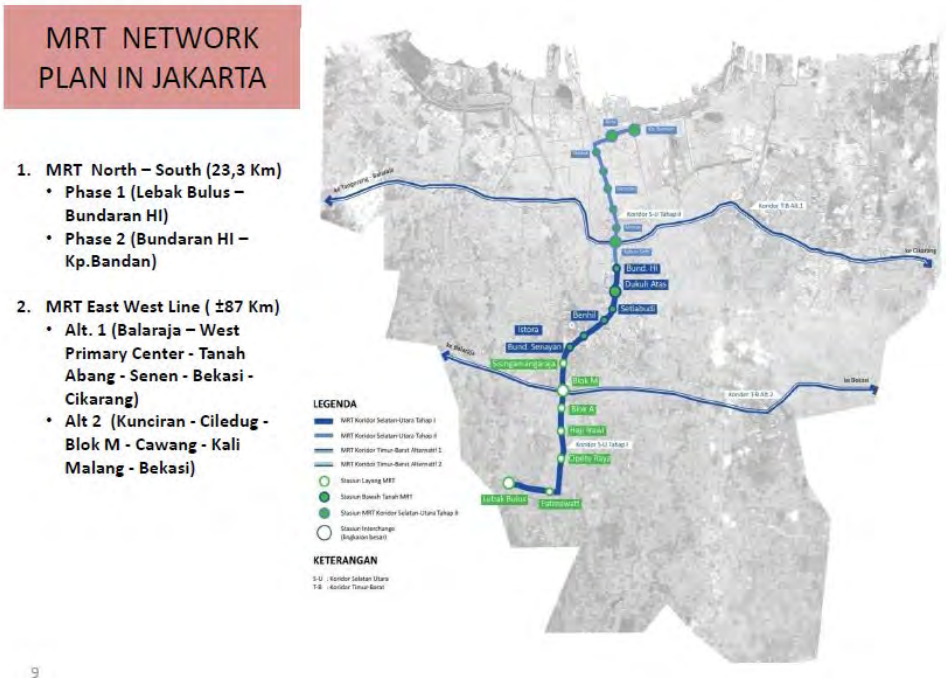


Figure1-3-8 MRT planned routes

Source : BAPPEDA

	Phase 1 Lb.Bulus – Bundaran HI	Phase 2 Bundaran HI – Kp. Bandan
Length	15.2 km (10.2 km elevated & 5 km underground)	8.1 km
Number of Stations	13 (7 elevated, 6 underground)	8 underground
Travel Time	28 minutes	50 minutes
Transit time in station	40 – 60 seconds	40 – 60 seconds
Distance between stations	0.8 – 2.2 km	0.8 – 2.2 km
Headway	4.5 minutes (2017)	3.5 minutes (2020)
Passengers/day	340,000 (2017)	400,000 (2020)
Rolling stock 1 set = 6 cars	17 train set (102 cars)	39 train set (234 cars)
Electric power required	35-40 MVA	50 MVA
Depo capacity	Lb.Bulus (102 cars)	Additional capacity in Station Kota

Figure1-3-9 MRT planned routes (specifications)
Source : BAPPEDA

(2)Mono-rail

Total length of jakarta mono-rail is about 30km, and total project cost is 3 trillion 730 billion Rupiah (30.8 billion yen). Green-line as a loop line in Senayan area of which length is 14.5 km and Blue-line as a connecting line to eastern and western area of which length is 15.5 km are being planned. Commencement year of service provisio of Green-line is 2015, while Blue-line is 2016. The project was stopped in 2008 due to shortage of finance. Construction was started again in 2013.

The mono-rail is planned to have 200 passenger capacity per veihicle and 4-cartrain. Number of users are expected to be about 77.5 thousand per day.

Figure1-3-10 Mono-rail planned routes

Source : DKI Jakarta

(2) JABODETABEK railway

In addition to the above urban railway, JABODETABEK railway, of which length is 150 km, is covering JABODETABEK area. JABODETABEK railway has been almost electrified. The railway consists of central line, Bogor line, Bekasi line, east line, west line, Tangerang line and Tanjyun Priok line. The line was constructed and managed by MOT, and operated by PT KAI Commuter JABODETABEK. Now no plans of new line construction and extention.

Summary of the planning of public transport is in the following table.

Table1-3-7 Current State and Plan of Public Transportation in Capital Region of Jakarta

Name	Overview
BRT(in operation)	Began operation in 2004. As of 2014, 12 lines are under operation. 3 more lines will be added by 2015. The operator was BLU. Transjakarta, a part of DKI but changed to BUMD. Transjakarta because PT Jakarta Propertindo (Jakpro) has invested 1% (99% by DKI) since March of 2014. With adopting management perspective of a private company, it pursues the goal of service improvement and subsidy reduction.
JABODETABEK (in operation)	Approx. 150-km rail network. “Directorate General of Railways, Ministry of Transportation” is responsible for construction and facility management. PT KAI Commuter JABODETABEK is in charge of operation management.

Name	Overview
MRT (in progress)	The construction of South North Line Phase 1 (Lb.Bulus – Bundaran HI : 15.2 km) has begun and it is scheduled to be completed in 2017. The construction of South North Line Phase 2 (Bundaran HI – Kp. Bandan : 8.1km) will start after that. For East West Line, 2 plans are under review.
Monorail (in progress)	Have 2 lines: the loop line "Green Line" (14.3 km with 16 stops) and the East West line "Blue Line" (13.7km with 14 stops). Green Line is predicted to open in 2016.The first construction has started in 2004 but was abandoned in 2008 due to financial problems. The project revived by investment of Singaporean capital in 2013.

Source: Created by JICA Study Team based on various materials

1.4 Necessity of the introduction of ERP in DKI Jakarta

As discussed in prior, macroeconomic indicators and population are shown and socio-economic status of DKI Jakarta, maintenance plans, current status of transport, transport infrastructure and the like were described. Further deepening on the road traffic congestion in DKI Jakarta can be envisaged in the future even by looking at any of them. One strategy to halt the further deepening of these road traffic congestion is the expansion of public transportation, including the city bus and train. Urban development projects to encourage commuting patterns of peoples behavior that does not depend on the car is also important. In addition, in order to alleviate road traffic congestion, which currently become obvious already, the introduction of appropriate automobile traffic management measures is also important.

Another measures to encourage these traffic measures is the reduction of economic policy incentives for car. Namely raising the economic compensation for vehicle use can be a measure to reduce the relative attractiveness of motor vehicle. ERP can be positioned in such category of measures. In addition to this, as a measure to induce a higher cost that occurs with vehicle use, increase of the parking tarrif and raising the price of gasoline are also placed on the same level of ERP.

By the increase in cost measures associated with vehicle use and raising measures of public transport service levels being operated concurrently, road traffic congestion in DKI Jakarta will be managed properly. It can be said that in this context, for the alleviation of serious road traffic congestion in DKI Jakarta today, introduction of ERP is an essential measure.

In Chapter 2 of this report, of which main topic is the overall urban road traffic congestion measures, the above discussion will be discussed in more detail.

Chapter 2. Comprehensive Urban Transport Planning

2.1 Framework of the Comprehensive Urban Transport Planning

(1) Basic principle

The ERP can be considered a tool aiming at urban road traffic congestion mitigation. On the other hand, ERP alone cannot be expected to sufficiently work as a tool to mitigate urban road traffic congestion. Similarly ITS alone also cannot be expected to be enough measure to alleviate urban road traffic congestion.

Measures contributing to alleviation of urban road traffic congestion need to be combined with various measures to be comprehensive. They are, for instance: 1) land-use adjustment policy which maintains proper level of trip generation based on wide range and long term perspective, 2) economic disincentive policy for road users, 3) raise of level of service of public transport.

ITS can be positioned as part of these comprehensive measures, and ERP can be positioned as one of the antivirus component in the ITS measures. As for such study procedure, DKI Jakarta Gov. officials have expressed strong request to the JICA study team, such that when studying the ERP, research from a comprehensive perspective including public transport use promotion policies and land-use policies, even taking into account of the ITS viewpoint should be performed.

On the basis of the above-mentoned requests, not only ERP measure alone but also comprehensive urban road traffic congestion mitigation measures including ITS will be investigated. The position of ERP and ITS will be clarified therein.

In the following sections, figure 2-1-1 shows the positioning of ITS and ERP in an integrated transport planning for urban road traffic congestion mitigation in DKI Jakarta. In the figure 2-1-2, previous figure 2-1-1 is broken down into step by step procedures including trip generation, modal shift and road traffic. In addition, by focusing on the importance of modal shift measures, a detailed discussion on measures to shift from automobile traffic to public transport has been developed.

In promoting modal shift policy, the figure 2-2-1 shows more detailed modal shift measures. Measures to lessen the attractiveness of motor vehicles by raising the motor vehicle usage cost, and measures to improve public transport services are shown respectively. That is, in order to achieve mitigation of traffic congestion through modal shift measure, a suppression of automobile traffic and providing a properly functioning public transport absorbing the converted user needs to be done simultaneously. Figure 2-2-4 shows the review flow in this survey based on the above mentioned idea.

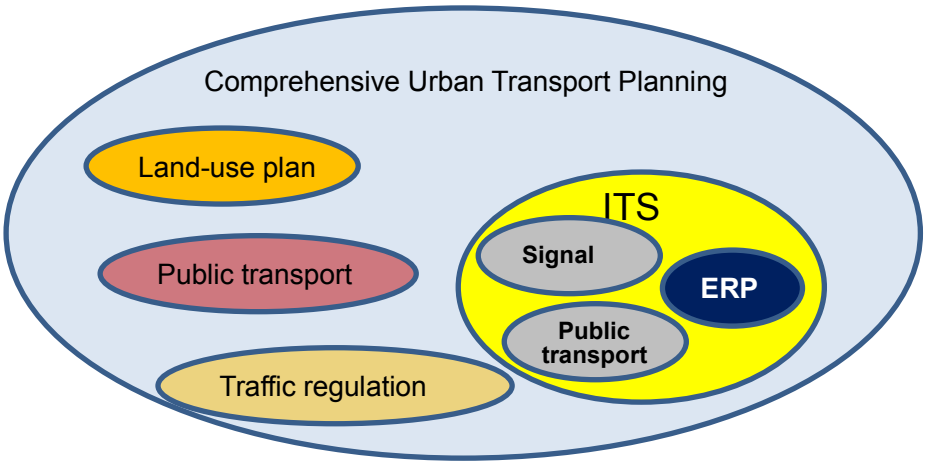


Figure2-1-1 Positioning of ITS and ERP in comprehensive urban transport planning

(2) Framework of the Comprehensive Urban Transport Planning

The Comprehensive Urban Transport Plan has a management plan for each of different stages such as the trip generation, modal split, and road traffic flow. At the stage of trip generation, measures to restrain total trip can be considered. These measures include inhibit growth management policy, city formation and urban development with small commuting traffic load and urban growth control policy.

In modal split transport management measures, both of measures to restrain motor vehicle trip and to promote usage of public transport has to be properly implemented. For one thing, measures aiming at reducing attractiveness of motor vehicle usage such as raising gasoline price and parking tariff will be a typical policy measure to promote the reduction of motor vehicle usage. For other thing, improvement of level of service of public transport will be a measure to promote attractiveness of public transport. Through these two measures, a modal shift from motor vehicles to public transport is achieved. For motor vehicle traffic, smooth traffic flow will be promoted through proper traffic management and traffic control policy.

The above-mentioned framework of the comprehensive urban transport planning is shown in the following figure.

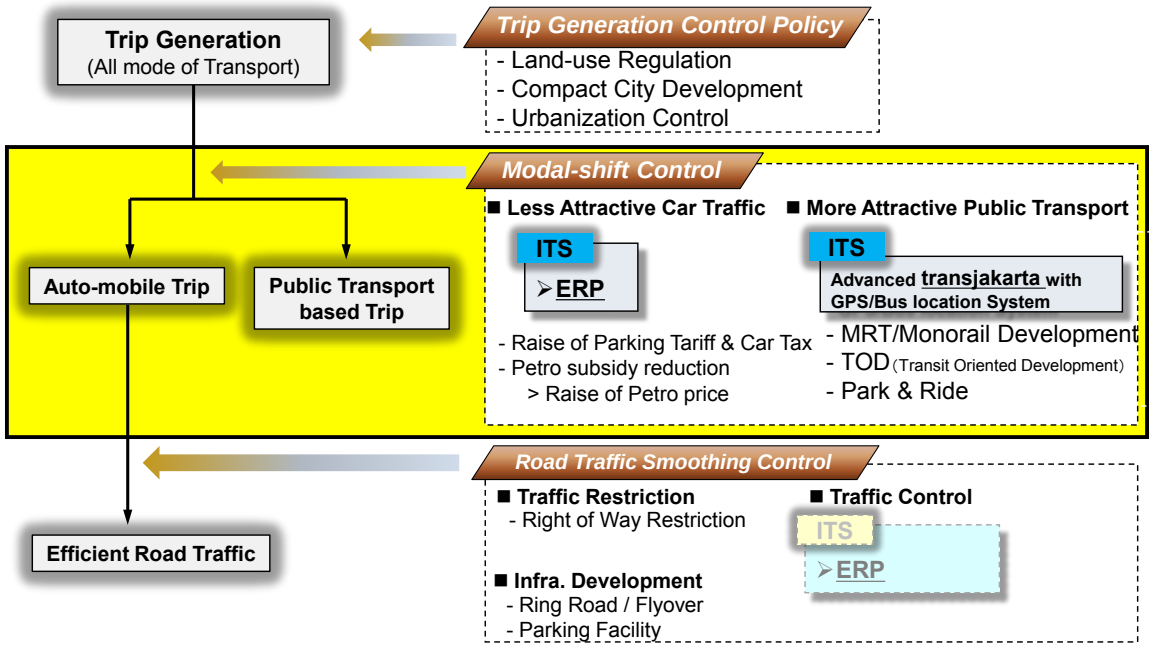


Figure2-1-2 Framework of the comprehensive urban transport planning

In JABODETABEK area which has serious motor vehicle traffic congestion, modal shift measures to promote reduction of motor vehicle traffic through facilitation of public transport usage are important. In the following part of the chapter, the discussion of modal shift measures will be focused as most efficient urban transport planning measure.

2.2 Basic Policy on Modal Shift

2.2.1 Basic Idea on Modal Shift Policy

A measure to make car users switch to public transport is needed to realize modal shift, and ERP contributes to promotion of modal shift in cooperation with other public transport measures as shown in Figure 2-2-1.

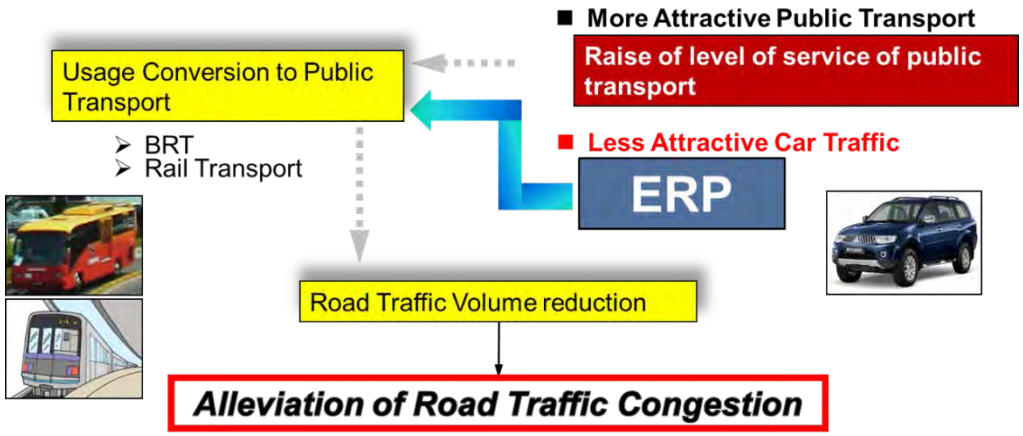


Figure2-2-1 Overview of modal shift

Source: JICA Survey Team

2.2.2 Roads under ERP and Public Transport

2.2.2.1 Targeted Roads for ERP

The targeted roads or corridor to implement ERP are shown in Figure 2-2-2. According to DKI Jakarta, Corridor I and Corridor VI are planned in the ERP roads.

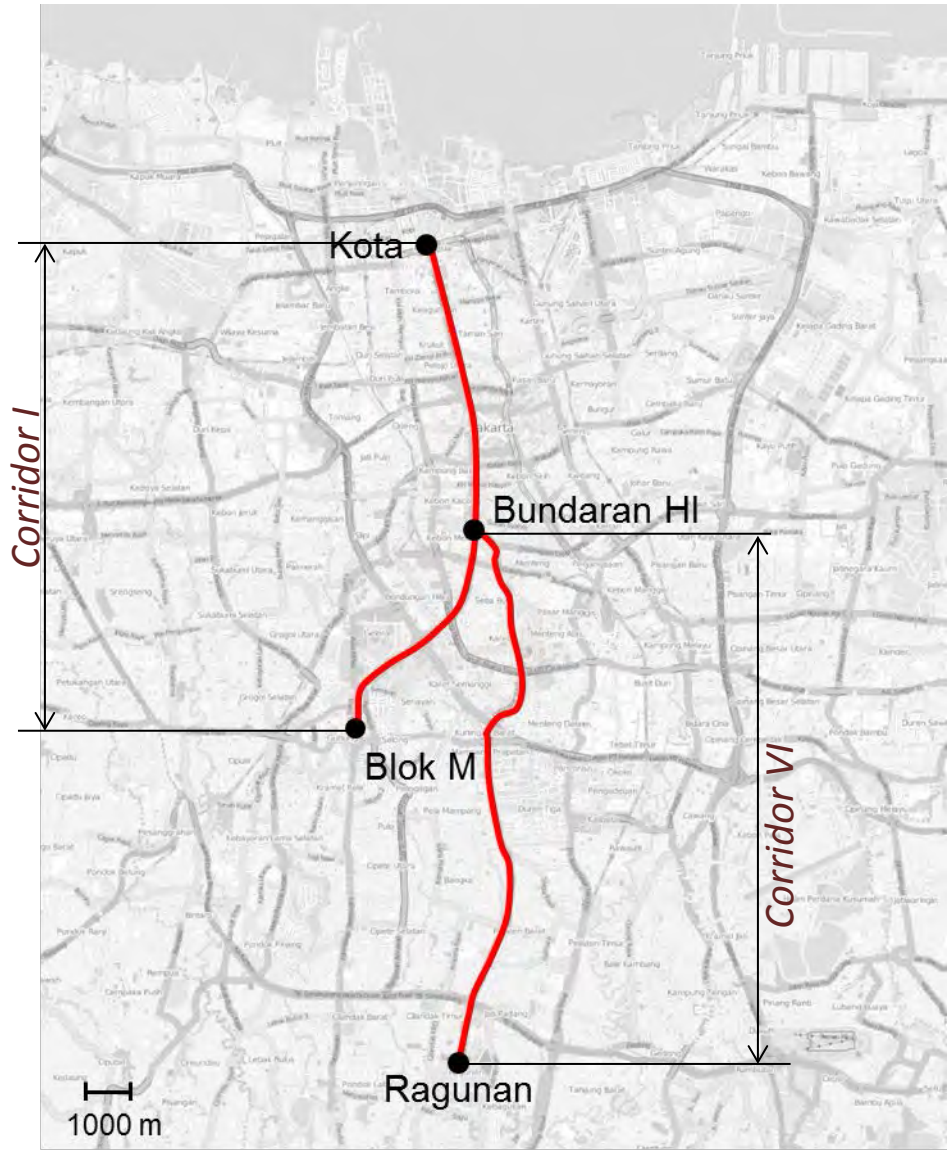


Figure2-2-2 Roads under ERP

Source: JICA Study Team

2.2.2.2 Current State and Plan of Public Transport

Figure 2-2-3 shows the current status and plan of public transport with roads under ERP. Table 2-2-1 also shows the summary of the current status and plan of public transport in DKI Jakarta. In Corridor I, the transport capacity of public transport will be significantly enhanced by development of MRT between Bundaran HI and Blok M in addition to BRT. The phase-2 development of MRT South North line will also improve the transport capacity between Kota and Bundran HI. On the other hand, significant enhancement of transport capacity like MRT cannot be expected in Corridor VI and only BRT can be a recipient of modal shift.

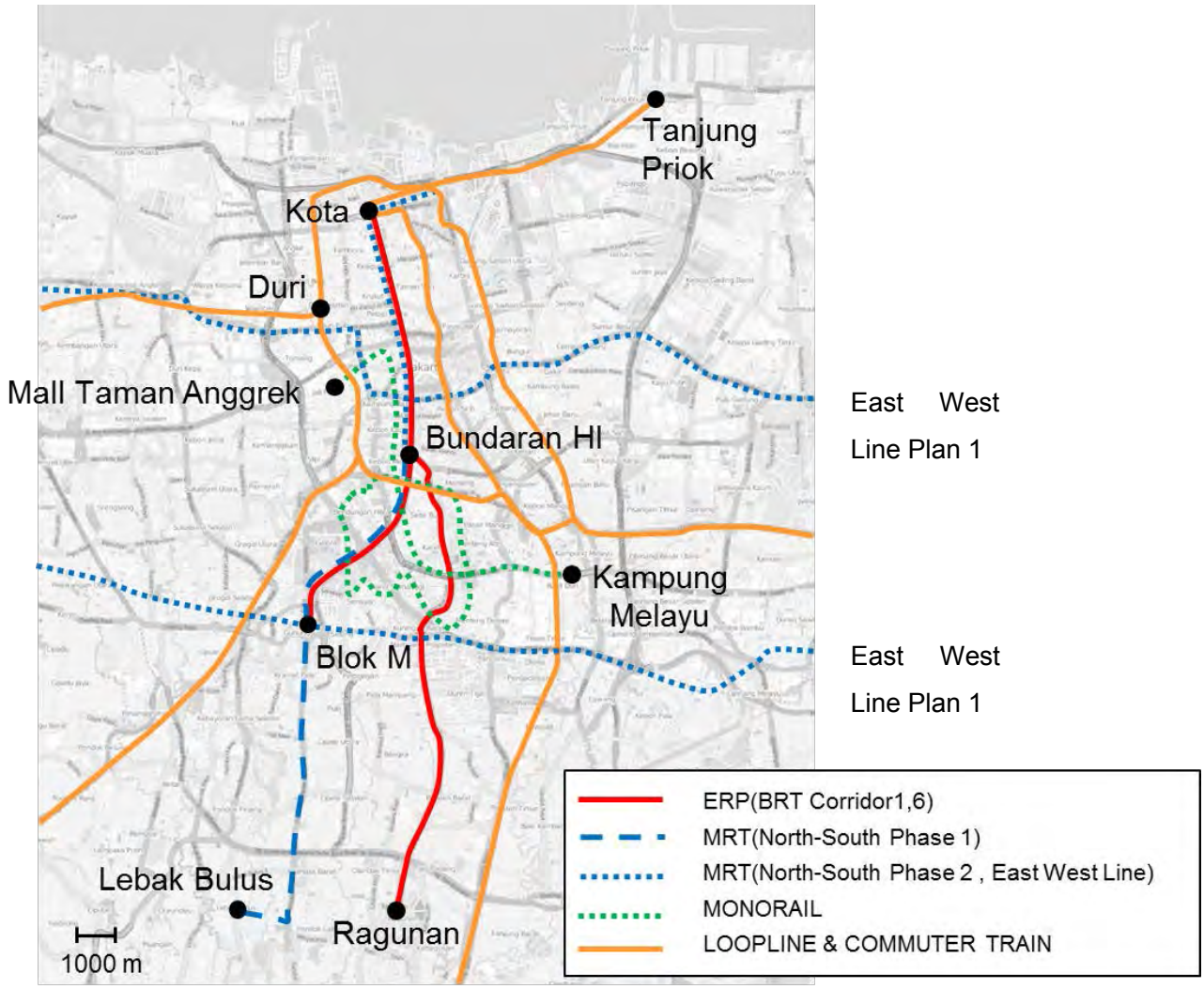


Figure2-2-3 Roads under ERP and public transport (including plan)

Source: Created by JICA Study Team based on various materials

Table2-2-1 Current status and plan of public transport in capital region of Jakarta

Name	Overview
BRT(in operation)	Began operation in 2004. As of 2014, 12 lines are under operation. 3 more lines will be added by 2015. The operator was BLU. Transjakarta, a part of DKI Jakarta Gov. but changed to BUMD PT. Transjakarta to lessen the public expenditure. BUMD PT Jakarta Propertindo (Jakpro) has invested 1% (99% by DKI Jakarta Gov.) since March of 2014. With adopting management perspective of a private company, it pursues the goal of service improvement and subsidy reduction.
JABODETABEK railway (in operation)	Approx. 150-km railway network. “Directorate General of Railways, Ministry of Transport” is responsible for construction and facility management. PT KAI Commuter Jabodetabek is in charge of operation management.
MRT (in progress）	The construction of South North Line Phase 1 (Lb.Bulus – Bundaran HI：15.2 km) has begun and itis scheduled to be completed in 2017. The construction of South North Line Phase 2 (Bundaran HI – Kp. Bandan：8.1km） will start after that. For East West Line, 2 plans are under review.
Monorail (in progress)	Has 2 lines: the loop line “Green Line”(14.3 km with 16 stops) and the East West line “Blue Line”(13.7km with 14 stops). Green Line is predicted to open in 2016.The first construction has started in 2004 but was abandoned in 2008 due to financial problems. The project revived by investment of Singaporean capital in 2013.

Source: Created by JICA Study Team based on various materials

2.2.3 Process of Reviews on Modal Shift

The process of reviews on modal shift is shown in Figure 2-2-4. First of all, current service standards such as operational frequency, speed and congestion situation in Corridor I and VI are grasped. Then, the amount of modal shift in ERP is estimated on a basis of each survey result and demand absorption of route bus and BRT is considered. Finally, improvement items of public transport service which are important to promote modal shift are organized.

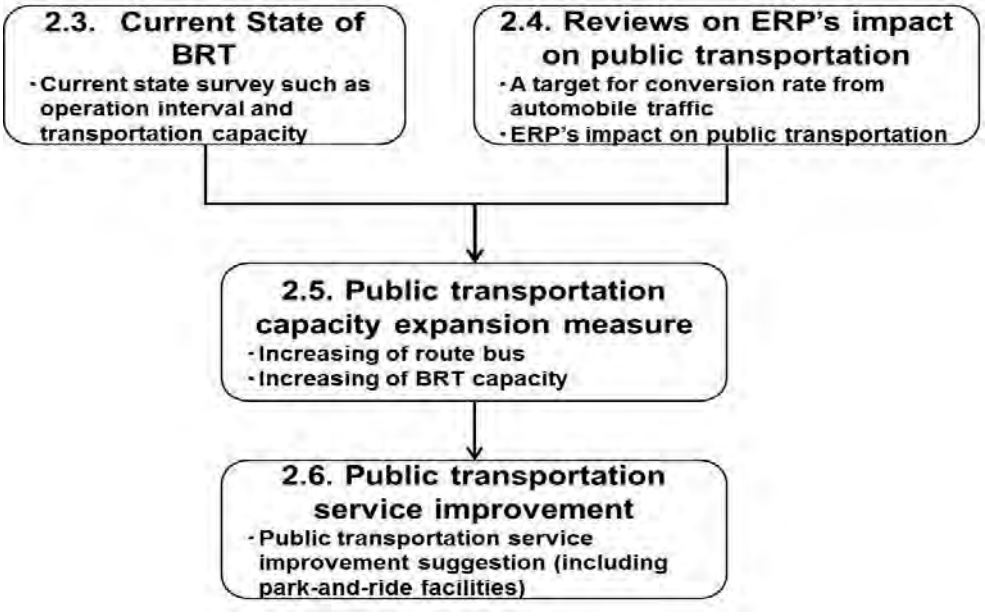


Figure2-2-4 Overview of review flow on modal shift

Source: JICA Study Team

2.3 Current Status Survey of BRT

2.3.1 Overview of Existing Survey

The BRT system in DKI Jakarta are operated by TransJakarta and widely used by people as a critical system of road-type public transport connecting to main areas in Jakarta. 12 lines are in operation and 3 more lines will be added. According to announcement of TransJakarta, the planned average speed of each line is 18km/h.

Table2-3-1 Average speed of BRT (Planned)

Corridor		Opened	Length (km)	No. of Stops	Travel Time (min.)	Station Interval (km)	Ave. Speed (km/h)
1	Block M – Kota	1-Feb-2004	12.9	20	43	0.68	18
2	Pulo Gadung – Harmoni	15-Jan-2006	14.3	23	48	0.65	18
3	Kalideres – Harmoni	15-Jan-2006	19.0	14	63	1.46	18
4	Pulo Gadung – Dukuh Atas	27-Jan-2007	11.5	15	38	0.82	18
5	Ancol – Kp. Melayu	27-Jan-2007	13.5	15	45	0.96	18
6	Ragunan – Kuningan	27-Jan-2007	13.3	19	44	0.74	18
7	Kp. Rambutan – Kp. Melayu	27-Jan-2007	12.8	14	43	0.98	18
8	Lebak Bulus – Harmoni	21-Jan-2009	26.6	23	89	1.21	18
9	Pluit – Pinang Ranti	31-Dec-2010	28.8	29	96	1.03	18
10	Tanjung Priok – Cililitan PCG	31-Dec-2010	19.4	20	65	1.02	18
11	Kampung Melayu – Pulo Gebang	28-Dec-2011	12.0	16	50	0.75	18
Total Operational Network in 2012		**1-Jan-2012**	**184.1**	**208**	**-**	**0.89**	**-**

Source : Final Report of Project for the Study on JABODETABEK Public Transport Policy Implementation Strategy by JICA (May 2012)

On the other hand, various surveys have been conducted with respect to BRT service level. Table2-3-2 shows the result of travele speed survey conducted in the past. The table indicates that average speed tends to be slower in morning and evening rush hour and there are many lines, which do not reach the planned average speed of 18km/h.

Table2-3-2 Traveling speed of BRT (survey result in previous fiscal year)

No	Type	Route No	Origin	Destination	Average travel speed (km/h)			Average board and alight passengers		
					Morning peak	Off-peak	Evening peak	Morning peak	Off-peak	Evening peak
1	Busway	Corridor 1	Blok M	Kota	16.7	17.4	16.2	208	165	159
			Kota	Blok M	17.2	18.3	18.2	227	173	253
2		Corridor 2	Pulo Gadung	Harmoni	16.0	18.3	16.2	206	155	195
			Harmoni	Pulo Gadung	17.2	14.9	16.6	173	130	201
3		Corridor 3	Kalideres	Harmoni	19.1	20.9	22.3	129	143	137
			Harmoni	Kalideres	18.8	22.6	19.8	191	85	198
4		Corridor 4	Dukuh Atas	Pulo Gadung	18.7	20.9	13.0	199	139	224
			Pulo Gadung	Dukuh Atas	14.3	15.6	14.4	143	70	171
5		Corridor 5	Kp.Melayu	Ancol	19.5	19.4	17.4	215	195	295
			Ancol	Kp. Melayu	16.5	15.2	11.5	155	187	250
6		Corridor 6	Ragunan	Dukuh Atas	21.8	26.7	18.3	215	118	147
			Dukuh Atas	Ragunan	21.7	28.4	21.1	182	128	137
7		Corridor 7	Kp. Rambutan	Kp.Melayu	12.3	16.0	-	130	151	-
			Kp. Melayu	Kp. Rambutan	17.4	17.4	16.9	239	123	193
8		Corridor 8	Lebak Bulus	Harmoni	13.6	18.9	18.9	212	219	217
			Harmoni	Lebak Bulus	21.0	21.3	14.3	186	89	205
9		Corridor 9	Pinang Ranti	Pluit	21.4	26.4	19.8	295	248	349
			Pluit	Pinang Ranti	21.1	17.8	13.4	217	228	446
10		Corridor10	Tj Priok	Cililitan	19.9	21.6	19.5	239	220	265
			Cililitan	Tj. Priok	16.8	18.2	13.2	193	181	344

Source : Final Report of Project for the Study on JABODETABEK Public Transport Policy Implementation Strategy by JICA (May 2012)

As discussed in this manner, although BRT is pervasive among residents in Jakarta as a part of their lifestyle, it is also expected to be a recipient of switching demands by modal shit from cars to public transport when “traffic control measure” such as ERP is conducted to mitigate traffic congestion in special capital region of Jakarta.

Therefore, the receptivity for switching demands through a field survey of current BRT operation will be discussed in the next section. The targets are Corridor I and Corridor VI, which are the candidate corridor for ERP implementation.

Table2-3-3 Stop name of TransJakarta

Corridor I

No.	Stops	Distance (m)
1	Blok M	0
2	Masjid Agung	1.075
3	Bunderan Senayan	918
4	Gelora Bung Karno	772
5	POLDA	440
6	Bundungan Hilir	635
7	Karet	274
8	Setia Budi	723
9	Dukuh Atas	586
10	Tosari	743
11	Bunderan H.I.	479
12	Sarinah	674
13	Bank Indonesia	586
14	Monas	674
15	Harmoni	1.153
16	Sawah Besar	655
17	Mangga Besar	1.075
18	Olimo	393
19	Glodok	420
20	Kota	625
	Total	12.900

Corridor VI

No.	Stops	Distance (m)
1	Ragunan	0
2	Dep. Pertanian	1.326
3	SMK 57	390
4	Jati Padang	711
5	Pejaten	900
6	Buncit Indah	451
7	Warung Jati	1.217
8	Imigrasi	852
9	Duren Tiga	527
10	Mampang Prapatan	1.154
11	Kuningan Timur	1.874
12	Patra Kuningan	508
13	DEPKES	575
14	GOR Sumantri	938
15	Karet Kuningan	308
16	Kuningan Madya	631
17	Setiabudi Aini	409
18	Latuharhari	823
19	Halimun	882
20	Dukuh Atas	1.322
	Total	15.798

Source: TransJakarta

2.3.2 Traveling Speed Survey of BRT

2.3.2.1 Overview of Survey

The overview of survey is as follows.

Table2-3-4 Overview of survey

	Overview
Goal	Grasping the travele time and the bottleneck points of BRT
Survey Date and Place	3/25/2014 (TUE) 6:30-9:00AM Corridor1(Blok M-Kota, Kota-Blok M) 3/26/2014 (WED) 7:00-9:30AM Corridor6 (Ragunan-Dukuh Atas2, Dukuh Atas2-Ragunan)
Survey Methodology	GPS measurement, visual confirmation and photo shooting at each place

2.3.2.2 Result of Survey

As for the travel speed and major bottleneck spots of Corridor I and VI within rush hour, the result of survey, which was done through GPS measuring equipment, is shown in Table 2-3-5 and Table 2-3-6.

The survey result of the weekday rush hour shows 15-19km/h for Corridor I and 13-19km/h for Corridor VI. Through the survey, the fact that their speed is below the planned travel speed: 18km/h is confirmed, which was similar to the result of past survey (Table 2-3-2). Especially for Corridor VI, the survey result shows the travel speed is below 20km/h despite the average speed was a little over 21km/h in morning rush hour both for North and South bound in the past result (Table 2-3-2).

According to analysis of time history response waves of travel speed, the causes of the low travel speed can be described as over-1-minute stops occurring at signalized intersections and rotary intersections in Corridor I and at signalized intersections and rail crossing intersection in Corridor VI.

BRT system has its own exclusive bus lane on most of the open roads. However junctions, which include intersection and rotary and specific points like rail crossing, diminish the travel speed and act as bottleneck. As shown in Table 2-3-7, the situation occurring at bottleneck points consumes times resulting in unpunctual public service.

Table2-3-5 Travel speed measuring result with GPS measurement equipment（Corridor1）

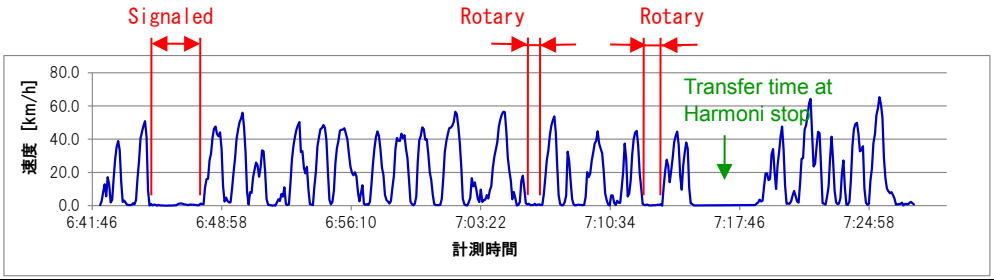
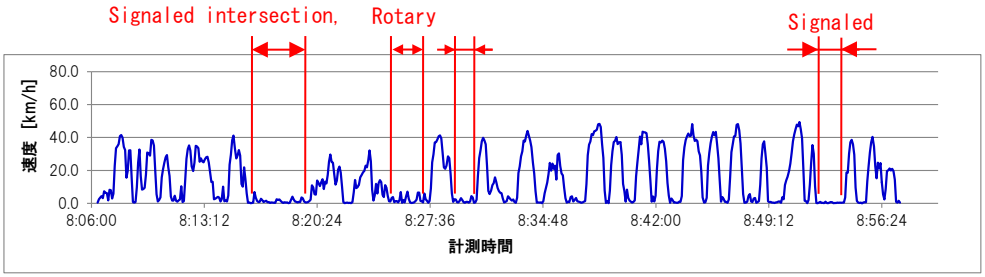
Corridor1			Date		Tue. 3/25/2014	
North bound		Stop name	Time	Trip time	Route length	Scheduled speed
	First stop	Blok M	6:42	43 min (excluding transfer time at Harmoni stop)	12.9km	18.5km/h
	Last stop	Kota	7:27			
	Bottleneck	Signaled intersection, Rotary intersection				
	Data					
South bound		Stop name	Time	Trip time	Route length	Scheduled speed
	First stop	Kota	8:06	51 min	12.9km	15.1km/h
	Last stop	Blok M	8:57			
	Bottleneck	Signaled intersection, U-turn slot, Rotary intersection				
	Data					

Table2-3-6 Travel speed measuring result with GPS measurement equipment（Corridor6）

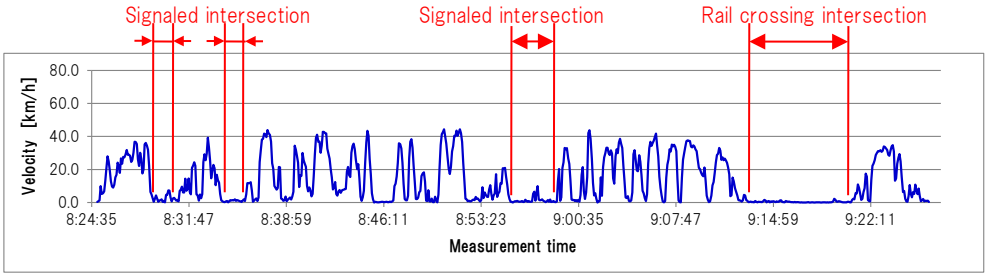
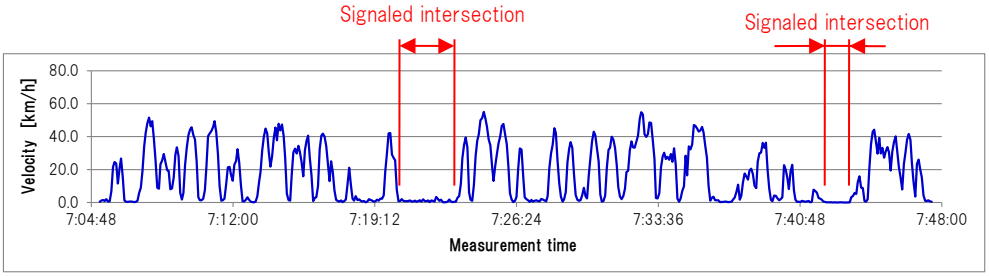
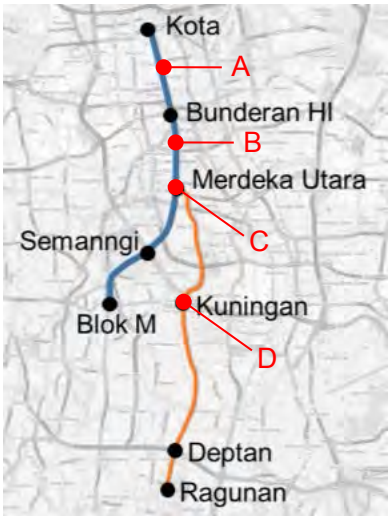
Corridor6			Data	Wed. 3/26/2014		
North bound		Stop name	Time	Trip time	Route length	Scheduled speed
	First stop	Ragunan	8:25	1 hour 1 min	13.3km	13.0km/h
	Last stop	Dukuh Atas2	9:26			
	Bottleneck					
	Data					
South bound		Stop name	Time	Trip time	Route length	Scheduled speed
	First stop	Dukuh Atas2	7:05	42 min	13.3km	18.9km/h
	Last stop	Ragunan	7:47			
	Bottleneck					
	Data					

Table2-3-7 Major Bottleneck spots on BRT Corridor

Major Bottleneck Spots	A . U-turn slot	B . Rotary intersection
	 South of Kota: 1-min stop	 Near Monas: 1-min stop
	C . Rail crossing intersection	D . Signaled intersection
	 Near Halimun: 8-min stop	 Near Kuningan: 3-min stop

2.3.3 Survey of Stop Usage

2.3.3.1 Overview of Survey

The survey overview is as follows.

Table2-3-8 Overview of survey

	Overview
Goal	Grasping the operation interval of BRT and congested situation at stops and on bus
Survey Date and Place	3/25/2014(TUE) 6:30 Bloc M Stop, 8:00Kota Stop(Corridor1) 3/26/2014(WED) 7:00 Dukuh Atas2 Stop, 8:15 Ragunan Stop (Corridor2） 3/27/2014(THUR) 16:45-18:15 Tosari, Dukuh Atas1(Corridor1), Dukuh Atas2(Corridor6)
Survey Methodology	Visual confirmation and photo shooting at each spots

2.3.3.2 Overview of Survey Result

The survey was narrowed down morning and evening rush hour of weekday which was expected to be the highest usage of BRT. The survey result is shown in Table 2-3-9 and the survey situations are shown in Figure2-3-1 and Figure 2-3-2. , 2 corridors show the common tendency as below.

- Congestion in evening rush hour is prominent when making comparison between morning and evening rush hour. This is because people make choice of going home at close of business at the same time.
- Stops are extremely congested in evening rush hour and load factor of BRT reaches almost 100%. On the other hand, BRT runs once every 2-3 minutes so passengers can get on second or third bus and the waiting time is only 10 minutes.

As above, the demand and supply of transport capacity of Corridor I and VI in rush hour are almost balanced despite people have to wait for a little time at a bus stop.

Table2-3-9 BRT operation in rush hour (Corridor1&6)

		Morning Rush Hour AM 6:30-9:00	Evening Rush Hour PM 17:00-19:00
Corridor1	Bus type/Capacity	Articulated bus 125 persons (37 seats)	
	Operation interval[*1]	Every 3 minutes	Every 2-3 minutes
	Waiting line at stop	A few waiting lines	Congested(10minutes)
	Load factor	60-80%	100%
Corridor6	Bus type/Capacity	Non-articulated bus 85 persons(30 seats）	
	Operation interval[*1]	Every 3 minutes	
	Waiting line at stop	A few waiting lines	Congested(10minutes)
	Load factor	100%	Over 100%

Figure2-3-1 Overview of Corridor I

Operation		
	Only articulated bus runs in Corridor I.	APTB and Kopaja Executive also run on BRT-specific road but the load factor is very low.
Morning Rush Hour		
	This is Kota stop, the first station for south bound at 8:00AM. No significant congestion and no passengers left behind after BRT's arrival.	This is on the bus after departure of busy Harmoni stop for south bound. The number of passengers at 8:20AM is 97 and the load factor is about 80%.
Evening Rush Hour		
	This is Dukuh Atas1 stop at 5:45PM, which is surrounded by office buildings and congested in evening. The stop is crowded.	The BRT's bus coming to Dukuh Atas1 stop is already congested and 15 persons per row are left behind. However, they can get on next BRT bus. There are some passengers who voluntarily wait for next one since operation frequency is high.

Figure2-3-2 Overview of Corridor VI

Operation		
	Only single bus runs in Corridor VI.	Kopaja Executive also runs on BRT-specific road. Most of passengers seem to be wealthy.
Morning Rush Hour		
	This is Ragunan stop, the first station for north bound at 8:25AM. No passengers left behind after BRT arrival.	This is on the bus after departure of busy Kuningan stop for north bound. The number of passengers is 84 and the load factor is about 100% at 9:00AM.
Evening Rush Hour		
	This is Dukuh Atas2 stop, the first station for south bound at 6:00PM, which is surrounded by office buildings and congested in evening. The stop is very crowded.	This is Dukuh Atas2 stop. The passengers exceed the capacity and there are also 20 persons per row left behind.

2.3.4 Survey Result of BRT operation interval

2.3.4.1 Survey Location

The survey location and date are shown in Table 2-3-10. The details of the survey are shown in the attachment of the report. Survey time was 16 hours from 6:00 to 22:00.

Table2-3-10 Traffic volume survey location

Corridor	Survey Location		Distance (km)	Survey Date	
				Day 1	Day 2
1	1	Masjid Agung Station	1.21	11-Mar-2014	12-Mar-2014
1	2	GBK Station	1.80	11-Mar-2014	12-Mar-2014
1	3	Benhil Station	0.85	11-Mar-2014	12-Mar-2014
1	4	Setiabudi Station	1.44	11-Mar-2014	12-Mar-2014
1	5	Tosari Station	0.85	11-Mar-2014	12-Mar-2014
1	6	Sarinah Station	1.59	11-Mar-2014	12-Mar-2014
1	7	JPO Indosat Monas	1.56	11-Mar-2014	12-Mar-2014
1	8	Harmoni Station	2.00	11-Mar-2014	12-Mar-2014
1	9	Olimo Station	1.30	11-Mar-2014	12-Mar-2014
1	Total		12.60		
6	10	Deptan Station	1.35	11-Mar-2014	12-Mar-2014
6	11	SMKN 57	1.71	11-Mar-2014	12-Mar-2014
6	12	Pejaten Philips Station	2.36	11-Mar-2014	12-Mar-2014
6	13	Duren Tiga Station	2.15	11-Mar-2014	12-Mar-2014
6	14	JPO Tendean	0.41	11-Mar-2014	12-Mar-2014
6	15	Kuningan Timur Station	1.50	11-Mar-2014	12-Mar-2014
6	16	Setiabudi Aini Station	2.99	11-Mar-2014	12-Mar-2014
6	17	Halte BBD	0.73	11-Mar-2014	12-Mar-2014
6	Total		13.20		

2.3.4.2 Survey Result

The survey result is shown as below. Survey location and date are shown in Table 2-3-10. The details of the survey are shown in the attachment of the report. The operation interval of TransJakarta BRT is 2.2 minutes in Corridor I, and 3 minutes in Corridor VI in average. When vehicles taking exclusive lanes such as APTB and Kopaja are added to them, the interval is 1.5 to 2 minutes.

Table2-3-11 Survey result of BRT traffic volume and operation interval

To North

Survey Date and Location			Traffic volume (veh/16h)			Headway(min)				
			Legal			Trans Jakarta			APTB/B KTB/Kopaja AC Avg	*Total Avg*
			Trans Jakarta	APTB/B KTB/Kopaja AC	*Total*	Avg (16h)	Min (1h-avg)	Max (1h-avg)		
Average	1	Masjid Agung Station	326	103	*429*	2.9	2.3	3.8	9.3	*2.2*
	2	GBK Station	418	127	*545*	2.3	2.0	2.9	7.6	*1.8*
	3	Benhil Station	425	357	*782*	2.3	1.7	3.6	2.7	*1.2*
	4	Setiabudi Station	424	227	*651*	2.3	1.6	4.6	4.2	*1.5*
	5	Tosari Station	451	331	*782*	2.1	1.4	3.3	2.9	*1.2*
	6	Sarinah Station	482	297	*779*	2.0	1.8	2.7	3.2	*1.2*
	7	JPO Indosat Monas	497	208	*705*	1.9	1.5	2.8	4.6	*1.4*
	8	Harmoni Station	1,225	49	*1,274*	0.8	0.7	1.0	19.6	*0.8*
	9	Olimo Station	294	57	*351*	3.3	2.4	8.6	16.8	*2.7*
	10	Deptan Station	309	178	*487*	3.1	2.5	4.8	5.4	*2.0*
	11	SMKN 57	323	255	*578*	3.0	1.7	6.0	3.8	*1.7*
	12	Pejaten Philips Station	288	272	*560*	3.3	2.5	8.0	3.5	*1.7*
	13	Duren Tiga Station	280	286	*566*	3.4	2.8	4.8	3.4	*1.7*
	14	JPO Tendean	284	214	*498*	3.4	2.3	8.0	4.5	*1.9*
	15	Kuningan Timur Station	285	160	*445*	3.4	2.2	4.8	6.0	*2.2*
	16	Setiabudi Aini Station	284	150	*434*	3.4	2.5	4.4	6.4	*2.2*
	17	Halte BBD	0	0	*0*					

To South

Survey Date and Location			Traffic volume (veh/16h)			Headway(min)				
			Legal			Trans Jakarta			APTB/B KTB/Kopaja AC Avg	*Total Avg*
			Trans Jakarta	APTB/B KTB/Kopaja AC	*Total*	Avg (16h)	Min (1h-avg)	Max (1h-avg)		
Average	1	Masjid Agung Station	328	123	*451*	2.9	2.0	5.5	7.8	*2.1*
	2	GBK Station	398	133	*531*	2.4	1.3	3.6	7.2	*1.8*
	3	Benhil Station	383	322	*705*	2.5	1.9	4.3	3.0	*1.4*
	4	Setiabudi Station	439	339	*778*	2.2	1.8	4.4	2.8	*1.2*
	5	Tosari Station	420	333	*753*	2.3	1.8	3.2	2.9	*1.3*
	6	Sarinah Station	434	251	*685*	2.2	1.6	3.6	3.8	*1.4*
	7	JPO Indosat Monas	746	259	*1,005*	1.3	1.0	1.6	3.7	*1.0*
	8	Harmoni Station	1,100	95	*1,195*	0.9	0.7	1.1	10.1	*0.8*
	9	Olimo Station	325	59	*384*	3.0	2.4	4.8	16.3	*2.5*
	10	Deptan Station	303	185	*488*	3.2	2.1	5.2	5.2	*2.0*
	11	SMKN 57	331	199	*530*	2.9	1.8	10.0	4.8	*1.8*
	12	Pejaten Philips Station	371	264	*635*	2.6	1.8	4.6	3.6	*1.5*
	13	Duren Tiga Station	309	308	*617*	3.1	2.5	4.6	3.1	*1.6*
	14	JPO Tendean	288	313	*601*	3.3	2.7	6.3	3.1	*1.6*
	15	Kuningan Timur Station	270	167	*437*	3.6	2.4	5.0	5.7	*2.2*
	16	Setiabudi Aini Station	378	190	*568*	2.5	1.4	4.4	5.1	*1.7*
	17	Halte BBD	0	0	*0*					

Table2-3-12 Summary of BRT operation interval

	Trans Jakarta		Total	
	To North	To South	To North	To South
Corridor1	2.2	2.2	1.6	1.5
Corridor6	3.3	3.0	1.9	1.8

2.3.5 Summary of Survey Result

This section describes the survey result with respect to current operation, especially Corridor I and VI. The result has withdrawn the following conclusion;

- More transport capacity is required to accept switching transport volume by “traffic control measure”, because BRT’s transport capacity is equal to its actual supply in rush hour.
- BRT has an issue of un-punctuality due to bottleneck spots on the corridor. An improvement policy should be properly introduced to the bottleneck spots, because public transport has to be made more attractive for achievement of the proper modal shift.

In addition to BRT, which “TransJakarta” is now operating, single-type buses such as “APTR” and “Kopaja Executive” run in the BRT-specific corridor. The operation frequency is 1.5 minutes based on combined calculation of all buses. This study also confirmed the fact that “ARTB” and “Kopaja Executive” ran with low load factor in rush hour.

In this situation, DKI Jakarta transferred the operation body of Transjakarta to the public corporation of state (BUMD) “Transjakarta” (99% and 1% invested by state government and PT Jakarta Propertindo (Jakpro) respectively) established in 2014. Public buses such as APTB and Kopaja will be integrated into single service to promote effective operation.

The average transport capacity of BRT is as follows: Corridor1 : 3,375 persons and Corridor6 : 1,700 persons (See Table 2-3-13).

Table2-3-13 Transport capacity of BRT (*1: Person per peak-hour per direction)

Corridor	Operation Interval	The number of running buses per 1 hour	Bus Capacity	Transport Capacity	Road Factor
	Min.	-	Person	PPPPD[*1]	%
1	2.2	27	125	3,375	100
6	3.0	20	85	1,700	100

2.4 Reviews on Impact on Public Transport by ERP

2.4.1 Targeted Conversion Rate from Automobile Traffic

Traffic congestion can be decreased significantly through traffic action change of 10% car drivers in general time, and 30% in rush hour. Thus, the targeted conversion rate from automobile traffic is set as 20% to 30%.

2.4.2 Impact on Public Transport by ERP

In this section, increasing volume of public transport users in Corridor I and VI will be estimated.

2.4.2.1 Traffic Volume Targeted for Shift

Traffic volume targeted for shift (in average per day) as distance weighted average of traffic volume of charged vehicles (excluding taxi, bus, truck and motorcycles) is calculated based on the result of the traffic volume survey in 7.2. Corridor I is 1,799 cars per hour and Corridor VI is 1,249 cars per hour.

Table2-4-1 Traffic Volume Targeted for Shift

Corridor		Survey Location	Distance (km)	Traffic Volume (Private Car)									
				Exsting(/16h)			Average(/1h)			Vehicle-km (veh*km/1h)			
				To North	To South	Total	To North	To South	Total	To North	To South	Average	
1	1	Masjid Agung Station	1.21	11,212	13,284	24,496	701	830	1,531	848	1,005	926	
1	2	GBK Station	1.80	40,721	41,114	81,835	2,545	2,570	5,115	4,581	4,625	4,603	
1	3	Benhil Station	0.85	45,474	45,072	90,546	2,842	2,817	5,659	2,416	2,394	2,405	
1	4	Setiabudi Station	1.44	47,300	43,976	91,276	2,956	2,749	5,705	4,257	3,958	4,107	
1	5	Tosari Station	0.85	38,972	33,993	72,965	2,436	2,125	4,560	2,070	1,806	1,938	
1	6	Sarinah Station	1.59	22,220	24,704	46,924	1,389	1,544	2,933	2,208	2,455	2,332	
1	7	JPO Indosat Monas	1.56	17,084	26,510	43,594	1,068	1,657	2,725	1,666	2,585	2,125	
1	8	Harmoni Station	2.00	24,509	18,799	43,308	1,532	1,175	2,707	3,064	2,350	2,707	
1	9	Olimo Station	1.30	18,641	18,940	37,581	1,165	1,184	2,349	1,515	1,539	1,527	1,799
6	10	Deptan Station	1.35	7,028	7,147	14,175	439	447	886	593	603	598	
6	11	SMKN 57	1.71	12,276	12,277	24,553	767	767	1,535	1,312	1,312	1,312	
6	12	Pejaten Philips Station	2.36	17,082	14,826	31,908	1,068	927	1,994	2,520	2,187	2,353	
6	13	Duren Tiga Station	2.15	14,579	14,808	29,387	911	926	1,837	1,959	1,990	1,974	
6	14	JPO Tendean	0.41	18,037	18,633	36,670	1,127	1,165	2,292	462	477	470	
6	15	Kuningan Timur Station	1.50	27,113	18,585	45,698	1,695	1,162	2,856	2,542	1,742	2,142	
6	16	Setiabudi Aini Station	2.99	40,049	37,341	77,390	2,503	2,334	4,837	7,484	6,978	7,231	
6	17	Halte BBD	0.73	12,243	5,333	17,576	765	333	1,099	559	243	401	1,249

2.4.2.2 Corridor1

1) Based on the questionnaire survey, modal shift rate was set as 20 %.
2) Current traffic volume on Corridor I is estimated as 1,799 cars per hour and 2.06 persons per one car based on the result of the traffic volume survey in 7.2.
3) As a result, 1,799×0.2x2.06=741 persons per hour will possibly shift from motor vehicle to public transport.

2.4.2.3 Corridor6

1) Based on the questionnaire survey, modal shift rate was set as 20%.
2) Current traffic volume on Corridor VI is estimated as 1,249 cars per hour and 2.41 persons per one car based on the result of the traffic volume survey in 7.2.
3) As a result, 1,249x0.2x2.41=602 persons per hour will possibly shift from motor vehicle to public transport.

Table2-4-2 Prediction of modal shift from car to public transport

Item	Corridor1	Corridor6	Source
Sfifting factor (Shifting from motor vehicles)	20%	20%	Impact Survey (JICA ERP Study Team)
Current traffic volume	1,799 vehicle/hour	1,249 vehicle/hour	Traffic volume Survey (JICA ERP Study Team)
Shifted traffic volume (Additional BRT passengers)	741 person/hour	602 person/hour	***2.06,**2.41person/vehicle** (JICA ERP Study Team)

2.5 Plan for increase of public transport capacity

2.5.1 Increase of Route Bus

1) 741 persons per hour will possibly shift to public transport in Corridor I and 602 persons per hour in Corridor VI.
2) The increasing number of BRT or bus which absorb the above demand is shown below. Note: In calculation, the number of passengers is set as follows: 125 (articulated bus) on Corridor I and 85 on Corridor VI in BRT and 50 on bus.

Table2-5-1 The number of BRT/Bus needed for modal shift

(veh/1h)

Corridor	Public transport	
	BRT	Bus
1	5.9	14.8
6	7.1	12.0

3) Assuming bus conversion factor of private car as 2.0, and comparing traffic volume before shifting: 2,569 cars per hour on Corridor 1 and 1,587 cars per hour on Corridor VI, and after shifting, then it can be said that increase of traffic volume of bus after modal shift is only 1.2 – 1.5%.
4) Therefore, increase of route bus can absorb the shifted demand from motor vehicle to public transport on the road, and it ensures smooth traffic.

2.5.2 Increase of BRT Capacity

2.5.2.1 Improvement measures on Corridor I

1) Main measure on corridor 1 is to shorten the bus headway. The bus headway is shortened to 1.8 minutes per unit to meet the shifted demand.
2) As a result, the number of bus unit per hour increases from 27 to 33.
3) Additional transport capacity will be 125 persons per unit x 6 units per hour = 750 persons per hour and surpass the demand after the modal shift, 741 persons per hour.

4) However, coordination of the number of APTB and Kopaja and confirmation of possibility of shuttle movement at the terminal stations such as Blok M and Kota are needed in order to realize this measure.

2.5.2.2 Improvement measures on Corridor VI

1) Main measure on corridor 6 is to shorten bus headway and increase of the capacity.
2) The bus headway is shortened to 2 minutes per unit to meet the shifted demand.
3) As a result, the number of bus unit per hour increases from 20 to 30.
4) Additional transport capacity will be 85 persons per unit x 10 units per hour = 850 persons per hour and surpass the demand after the modal shift, 602 persons per hour.
5) Introduction of articulated BRT increase transport capacity per unit by 40 persons. Then the capacity will be 40 persons per unit x 20 units per hour = 800 persons and also surpass the demand after the modal shift, 602 persons per hour. However, improvement in the bottleneck is needed in this case and the measure is shown as follows.

Table2-5-2 BRT headway and transport capacity for each corridor

Corridor	Headway (Frequency per hour)	BRT Capacity
1	2.5 Min->2Min. (24->30)	3000->3750
6	3Min→2Min （20→30）	1700->2550
	BRT vehicle Capacity	BRT Capacity
	85->125persons	1700→2500

2.5.3 Improvement of the intersections

In this section, the measures on road infrastructures aiming at the improvement of the headway on corridor 6 will be discussed. Fig. 2.5-1 shows the places which need to improve the geometric design.

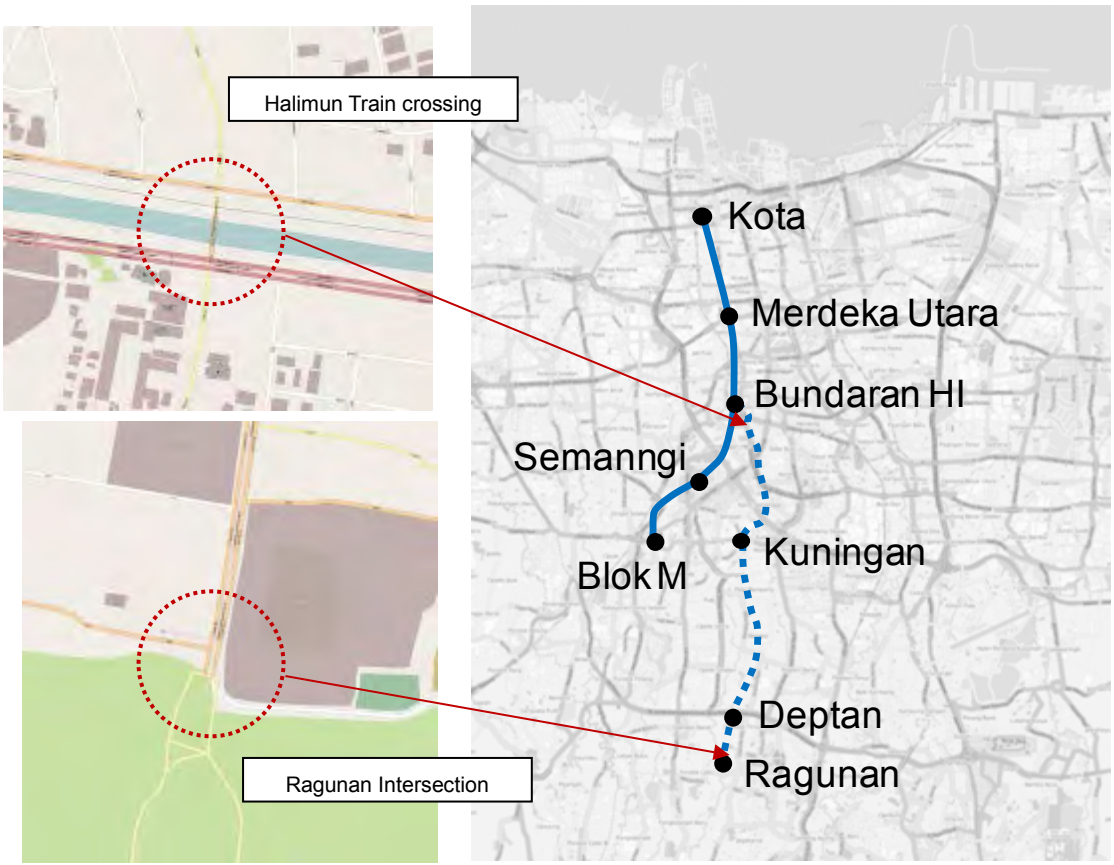


Figure2-5-1 Corridor 6 and the places which need to improve the geometric design

(1) Improvement in Halimun Train crossing

Field survey found that BRT operation diagram is heavily-influenced by Halimun Train crossing. BRT stopped for up to approximately five minutes and turned around the small intersection. In order to introduce articulated BRT, the operation route needs to bypass the intersection, or the intersection needs to be improved.

Figure2-5-2 Conditions in Halimun train crossing

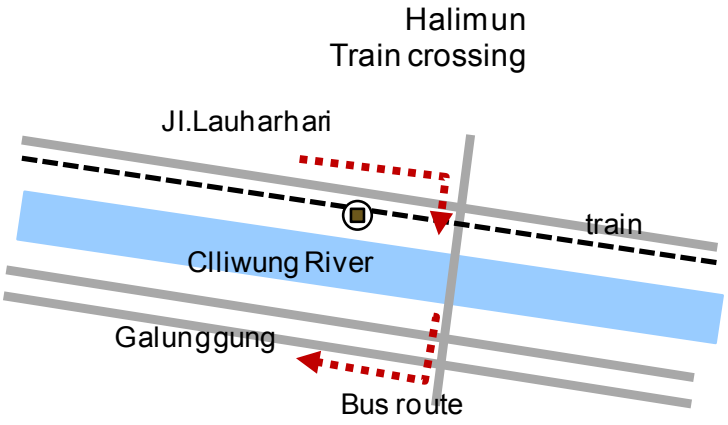


Figure2-5-3 Top view of the train crossing

(2) Improvement in Ragunan Complex small rotary intersection

In order to introduce articulated BRT on Corridor 6, the small rotary intersection in Ragunan needs to be improved. The intersection is the junction of five roads and there are the terminals of Transjakarta BRT, COPAJA and minibus, and the entrance of the zoo. The intersection is very complicated. Therefore it needs to be improved to a larger roundabout. Roundabout doesn't need any signals and it can handle from 800 to 1,000 traffic volume.

Figure2-5-4 Conditions in the intersection in Ragunan

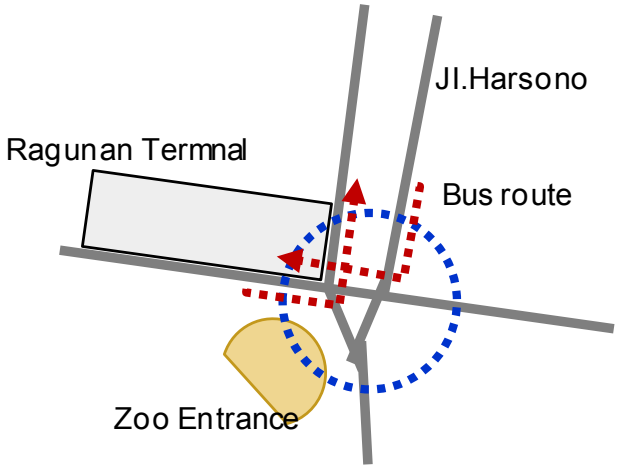


Figure2-5-5 Top view of the intersection in Ragunan

2.6 Improvement of Transport services

2.6.1 Proposal for Improvement of Transport services and expected effect

In order to improve level of service of public transport, user's convenience, operational organization plans and prosecution of the necessary political means should be properly taken into account. Table2-6-1 shows proposal for Improvement of transport services, and expected effect.

Table2-6-1 Improvement of transport service and expected effect

	Necessary Policies	Expected Effect
For BRT Users	**Park & Ride**: Parking Facility close to BRT station.	Promote modal-shift from motor vehicle to BRT
	IC Card: One common card to pay public transport fare, Parking charge, Gas and so forth	Increase BRT user's convenience
	PTPS (Public Transport Priority System): Signal control system favoring more effective BRT operation.	Reduce BRT travel time, and increase BRT travel speed
For Operators	**CNG Gas Station:** CNG Gas Stations based on demand.	Promote increase of number of BRT vehicles
	Enhancement of Driver's skill: Traffic education and training system for more safety and effective driving manner	Enhance safer and more effective traffic flow
	Big Data Collection: BRT user travel data collection system	Promote development more user friendly public transport plans

2.6.2 Park and Ride Facility

To promote the modal-shift from the vehicle to public transport, it is necessary to construct more parking facilities because of the existing facility is insufficient. In this section, the typical parking facility in Jakarta will be selected. In addition, its desirable condition will be examined, and the possibility of increasing the number of parking cars will be investigated.

2.6.2.1 The Condition of existing Park and Ride Facility

It is needless to say that construction of more parking facilities is necessary for promotion of the modal-shift from the vehicle to public transport. In addition, park and ride function can contribute to smooth transfer to BRT. In order to achieve smooth transfer to BRT transport, not only facility but also the user friendly seamless public transport system should be introduced. The typical park and ride facilities in Jakarta are listed as follows.

Place	Type	Parking Capacity(PCU)
Kalideres	Parking Facility close to BRT station.	90
Lebak Bulus		25
Ragunan		280
Kp.Rambutan		30

Figure2-6-1 The typical park and ride facilities in Jakarta

2.6.2.2 Survey of Ragunan parking

Among the existing parking, one of the most highly used parking facility is Ragunan parking. The condition of parking passenger usage and facility was surveyed in holidays in the afternoon and weekday in the morning. The result of survey is as follows.

1) Peak time of BRT operation is AM7：30～AM8：00 at Ragunan Station.
2) Ragunan Parking Facility is full at AM8：00.
3) The structure of Ragunan Parking is made of steel. The parking space on the ground floor is used for motorcycle, and the 2nd and the 3rd floor is used for car.
4) Some parking spaces are used as private parking space for a long time.
5) Ragunan Parking Facility has enough space on holidays, on the other hand, parking of zoo next to Ragunan Parking is fully occupied.

Table2-6-2 Specification of Ragunan parking facility

Type	Vehicles	Motor-Bike
Floors	2F&3F	1F
Parking Numbers	280 pcu	

Figure2-6-2 Condition of Ragunan parking facility

2.6.2.3 Plan for improvement of Ragunan Parking Facility

The possibility of increasing the number of parking spaces as park and ride facility will be discussed in this section. Unit parking space is assumed as 25-30 m^2/car for parking on the ground, and 35 m^2/car for steel structure based parking system.

On the basis of the site survey, it was concluded that it is possible to secure the land space 30,000 m^2 and to increase 1,000 vehicles parking space by utilizing the existing parking space of the zoo efficiently and constructing of multistory parking facility.

Corridor 6 has 1,249 cars per hour as the traffic volume targeted for shift based on 2.4.2.1. When 20% of the volume shifts, 250 cars per hour will be on Corridor 6. Even if all cars for 4 hours (e.g. 6:00-10:00) park all day, 1,000 vehicles parking space is enough.

Figure2-6-3 Site view of Ragunan parking area

2.6.3 Deployment of Traffic IC Card

Traffic IC Card is very convenient for users since it can be used for payment of BRT fare, Parking fare, GS Station, others. In this section, usage of the IC card will be discussed. When the IC card is adopted, the development of usage pattern such as the shopping service, the payment of the ERP charge, payment of fare of public transport like BRT, the payment at the gas service station, and the payment of the parking fee. As a result, the following merits for users are assumed.

- The quick wicket passage, smooth getting on and off the public transport
- The cashless in the gas service station
- Service improvement including various types of discount and point system
- Availability of various means of transport through one piece of card
- Free from small change by electronic money functions

Traffic IC card can be used for many transport system in country wide. Traffic IC card is deployed also in Japan and its deployment ratio is 80% in Metropolitan area in Japan.

Figure2-6-4 Development usage of IC Card

It is possible to collect fare of the public transport by the introduction of the traffic card effectively and safely, so it is able to accomplish securing of profit surely. The following support policies are thought about to plan spread of traffic IC cards promotion.

① IC card can be charged anytime at a convenient place;
(such as ticket office of the station, convenience store, shopping center, bank)
② Make a difference, such as discount with a card in cash;
③ The card deposit should be cheap;
④ Both pre-paid and post-paid method should be adopted as a charge system.

E-ticket of BRT is a major traffic IC Card in Jakarta. Since it is collaborated with domestic banks such as Bank Mandiri, BRI, BCA and BNI, it also can be used as an e-cash card for payment at convenient store, restaurant and highway. However, the penetration rate was only 20% as of January of 2014 and the promotion to give a card (20,000 rupiah) for free was conducted in August of 2014 in order to promote. More promotions (for example, chargeable at bus stop) are still needed in the future.

2.6.4 Signal control and PTPS (Public Transport Priority System)

A method to improve the service for the user of the BRT, includes improvement of the scheduled speed and time of BRT. BRT system does not keep the scheduled speed and time schedule at this time because of some bottle necks on BRT lane as being described in 2.3.2 section.

The form of the bottleneck part is divided into following two.

① By the signalized Intersection and rotary shaped Intersection;
② By the basic geometric road structure such as shape, placement, and maintenance.

As mentioned above, we describe about ① in this section. As a result of the survey, typical bottle neck points on BRT lane on corridor1 and Corridor6 are as follows.

Table2-6-3 Typical Bottle Neck Point on BRT Line

<table>
<tr><th>Typical Bottle Neck</th><th>Rotary shaped Intersection,</th></tr>
<tr><td> 

Signalized Intersection, : Kuningan
Signalized Intersection, : Duren Tiga</td><td>✓ Corridor1 : Kota Staion south
✓ Corridor1 : Monas
✓ Corridor1 : Bundaran HI
✓ Corridor1 : Bundaran Senayan

Signalized Intersection,
✓ Corridor1 : Harmoni south
✓ Corridor1 : Blok M north
✓ Corridor6 : Kuningan
✓ Corridor6 : Mampang
✓ Corridor6 : Duren Tiga
✓ Corridor6 : Jati Padang</td></tr>
</table>

Such the bottle neck point disturbs scheduled speed and time of BRT and it is with the factor that a bus forms a queue in each bottleneck region. As a result, it becomes difficult to offer comfortable service to the user of the BRT system and leads to losing a use opportunity as the public transport. On the other hand, to improve charm of the public transport is related to achieve modal shift and examine the improvement of the bottleneck point where a signal intervenes because it is necessary to offer value to the user.

The following 2 plans are considered as the solution technique of the part concerned as been shown it in table 3-4-2.

It is the most important to improve the public transport service when we consider that promotion of the modal shift because of increase of traffic congestion in Jabodetabek. Therefore, plan 2: Public Transport Priority System (PTPS) is desirable as solution to bottlenecks where signals exist.

Table2-6-4 Solution Plan of bottle neck of Intersection with signal

Solution Plan		Contents
Plan1	Improvement of Signal System	To control signal interval in accordance with traffic condition. More advanced system senses the traffic condition and control the signal interval in real-time. Public transport isn't always given priority because the measure is the instrumental in both general transport and public transport.
Plan2	Adopting of Public Transport Priority System(PTPS)	The system which detects a bus approaching the crossing and adjust the signal interval. It assigns the highest priority to the public transport. It can minimize stop time for public transport and improve punctuality and quick-deliverability.

PTPS has the good results in Japan. For example, as a result of introducing the system into nonstop bus to Narita, it shorted the time by 10 % and the percentage of the vehicle which was able to satisfy the planned period increased from 11% to 56% (Data resources: JTPA REP No92). Conceptual diagram of the system is shown in Fig. 2.6-5.

The system consists of the on-board device and roadside antenna. Signal interval is adjusted by connection between the controllers of antenna and signal. The control is divided into four steps.

- ✓ Step1：Detect BRT vehicle by communication with reader & OBU.
- ✓ Step2：Calculate the arrival time at intersection.
- ✓ Step3：Request the suitable traffic light pattern
- ✓ Step4：Control the “Green light interval” and so on

PTPS is very simple and flexible because it can operate with a single signal. The on-board unit and the antenna used in PTPS are similar to those used in ERP so they are superior at maintenance, information handling and the future development. Therefore, PTPS can easily improve punctuality, quick-deliverability and value of BRT as public transport.
In DKI Jakarta, PTPS has not been introduced yet.

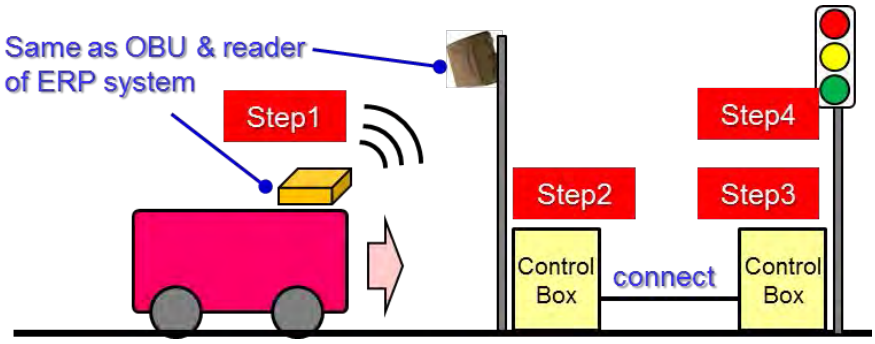


Figure2-6-5 The Concept of PTPS (Public Transport Priority System)

2.6.5 CNG Gas Station

Although TransJakarta which operates BRT system in DKI Jakarta is promoting to introduce CNG(Compressed Natural Gas) bus, the problem is lack of gas station supplying CNG. CNG station in Jakarta is called SPBG(Stasiun Pengisian Bahan Bakar Gas: Fuel Gas Filling Station) and there are 16 stations operated by the state-own company, Pertamina and private entities in DKJ Jakarta. In order to improve the transport capacity of BRT, the spread of CNG station is essential.

Table 2-6-5 CNG Station in DKI Jakarta (Source: Pertamina website)

Location	Operator
Jl. Raya Pluit	Pertamina
Jl. Youth	
Jl. Sunday Market	
Jl. East Tevet	
Jl. Sumenep	
Jl. Margonda Kingdom	
Jl. Raya Bogor	
Jl. Wr. Distended	
Jl. Objects Kalideres	
Jl. Sudirman Tangerang	
Jl. Pondok Ungu (PGN)	Private
Jl. Urine (PPD)	
Jl. Danau Sunter	
Jl. A. Yani	
Jl. Daan	
Jl. Pioneer-Independence	

CNG is less hazardous than diesel fuel and Indonesian government recommends CNG as wells as other countries in the world. Indonesia is one of the major natural gas-producing countries but the spread of CNG vehicle is behind developing nations such as China and India and the number of CNG gas station is not much. However, not only providing incentives to businesses introducing CNG vehicles but also the network construction of gas station is needed since the state-own energy company, Pertamina is planning major construction of CNG station and increase of CNG vehicle can be expected. Table 2.6-6 shows the number of CNG vehicles and stations in each country of 2013. In India suffering from rapid increase of traffic volume and traffic congestion as Indonesia, as of 2013, approximately 1.5 million CNG vehicles are in widespread use with a focus on bus, three-wheeled vehicle and commercial vehicle. 1.47 million out of them are private cars and there are 700 gas stations.

The challenges for the spread of CNG station are shown in Figure 2.6-6. To spread gas stations, active support from government is essential while cost down of high pressure container is needed. Clear spread policy and relaxation of regulations, support and incentive based on the policy will promote the spread of gas station. In “Energy Policy Act of 2005” by U.S. Department of Energy, tax exemption of 30% of installation cost (up to thirty thousand dollar for a major business and up to a thousand dollar for a household) is provided. Tax credit (50cents per gallon) is also provided to natural gas sellers. In addition, local government receives grants to promote the shift to public transport. U.S. Department of Transport also has the same grant program for local governments.

On the other hand, the idea of adopting a diesel engine for BRT can be considered because the spread of CNG is behind and the grant for gas is reduced. The environmental design of diesel engine is rapidly improved in recent years and refueling can be done at existing gas stations.

Table 2-6-6 The Number of CNG Vehicles and Stations in Other Countries (2013)

Country	The Number of CNG Vehicle	The Number of CNG Stations
Iran	3,300,000	7,960
Pakistan	3,100,000	3,330
Argentina	2,172,768	1,920
Brazil	1,730,223	1,796
India	1,50,0000	724
China	1,500,000	2,800
Japan	42,590	314

Source: “For the Spread of Natural Gas Vehicle, 2013 ver.” by The Japan Gas Association

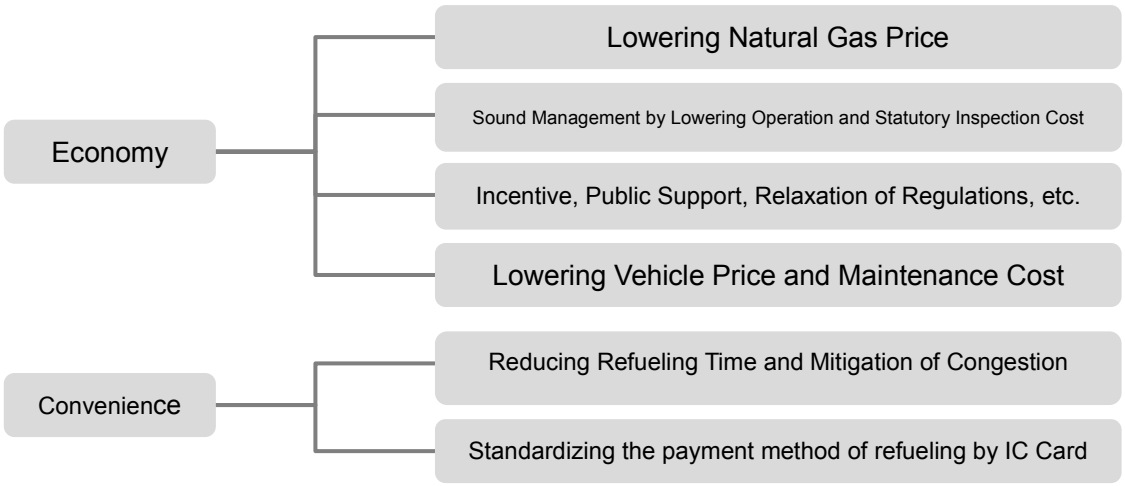


Figure 2-6-6 The Challenges for the Spread of CNG Station

Note: Created based on “For the Spread of Natural Gas Vehicle, 2013 ver.” by The Japan Gas Association)

2.6.6 Education for Drivers

In order to improve the transport capacity of BRT system, not only improvement of infrastructure but also educational activity for BRT drivers and general drivers driving on the roads around BRT is needed. Improving the driving skill will realize safe operation and lead to increase of BRT users by improvement of general service. The education for general drivers and BRT users also relates to safe and efficient operation of BRT.

Table 2-6-7 Education Policy for Improving BRT Operation

Target		Issue / Measure
Business Operators	Drivers	・ Understanding the items to be observed for safe driving ・ Understanding structural features of vehicle and pavement surface ・ Improving driving skills such as danger anticipation and avoidance ・ Understanding physiological and psychological factors related to safe driving and complete health management ・ Understanding the items to be paid attention for security such as door opening/closing and rapid acceleration/deceleration ・ Understanding the road and traffic situation in operated routes or areas and the points of concern
	Managers	・ Understanding the importance of safety climate ・ Establishing safety climate ・ Building a framework of safety management
Users, General Traffic	General Drivers	・ Understanding traffic rules ・ Implementing a measure not to enter the BRT lanes ・ Re-educating elderly drivers
	Users	・ Instructing manners on getting on/off and using BRT such as crossing a BRT lane
	Pedestrians (specially children and elderly people)	・ Traffic safety education for young people at educational institutes ・ Traffic safety education for elderly people

The report of “Examination Committee of Measures to Prevent Human Error Accidents in Public Traffic” of Ministry of Land, Infrastructure and Transport (April of 2006) noted that 80% of traffic accidents was caused by human error. There are some definitions of human error. It commonly means interference with functions of systems and machines despite human’s intentions or skills. The error without his/her intents is understood as a narrow definition of human error while the intentional action with recognizing risks is categorized into unsafe action. In most cases, unsafe actions violate regulations defined by business operators. His/her personality can be one of the causes of unsafe action but it is said that environments such as residential environment and climate have a lot of influence. In public transport, it’s important to establish safety a climate giving the highest priority to safety (safety climate) and penetrations such as in-service education and training are required not to reduce the safety awareness. Establishment of

safety climate leads not only to prevent intentional unsafe actions but also to prevent the accidents caused by unintentional action or mitigate the damages. To establish it, everyone from top-level executives to drivers must understand the “safety management” processing compliance, risk management and PDCA cycle, build the management system and address it continuously. Administrative agencies need to loosen the economic restriction while they are required to maintain and improve the safety regulations. BRT system is operated by single driver and the drivers have a lot of responsibility for safety during operation. Sometimes the drivers have to drive with private cars so they are also needed to have high safety awareness and skill. In addition, longer or irregular driving imposes a heavy burden on the drivers and it can trigger human error. Therefore, establishing safety climate in overall business operators is desired.

To realize it, the following measures are required: holding of educational seminars and constructing regularly and continuous educational systems based on the data of occurrence of “sudden break” using GPS gyro technology.

The Transjakarta BRT system is practicing Bus Tracking System and planning the expansion into the all lines. The system collects and analyzes the location of the bus by on-board GPS transmitter. The specific application with a view of operation is to instruct drivers the headway. With a view of user, it can improve the convenience of BRT by publishing the operating condition on the web. In these ways, service deployments by using the operating data are being tried. In future, the variety of data will enable the variety of service.

The information expected to be a new source of data is ticket gate information which is being introduced into Corridor 1. The problem of the current BRT system is not to have the system which can figure out the demand of BRT correctly. In general, demand of public transport can be grasped by periodic demand survey. In case of the city growing rapidly, it is difficult to figure out the public transport demand which varies with the season and other conditions.

Therefore, it is desirable to collect and analyze the information of ticket gate with IC card being introduced currently. The information from automatic ticket gate is tied to the behavior of user so you can figure out the demand correctly with them. As a result, to make a decision of BRT operation is facilitated.

In addition, the behavior of BRT user can be known by collecting OD (Origin-Destination) data and the operating timetable can be set appropriate to the behavior to user. To figure out the demand in immediate future is possible by analyzing the informations of environment and surrounding events.

Low utilization ratio of automatic ticket gate is an issue. The field survey on Corridor 1 found that most of the BRT users buy tickets in window. Automatic ticket gate is not deployed to other lines and users have few advantages. It is needed to provide incentives to IC card users and promote increase in user of automatic gate.

On the other hand, expansion of the information of automatic gate is hoped. OD date can be known by collecting the information of unloading. Current BRT system is single-price and only the information of loading is collected. Various public transports like MRT will be operated and mutual use of IC card will be started. Information of unloading is needed for mutual use of IC card and it is important to introduce automatic ticket gate which can collect the information of unloading.

Efficient operation and comfortable service for users can be achieved by collecting the behavior of users. In addition, coordination with existing bus tracking system enhances the information service for users. Consequently, these can increase the value of BRT system.

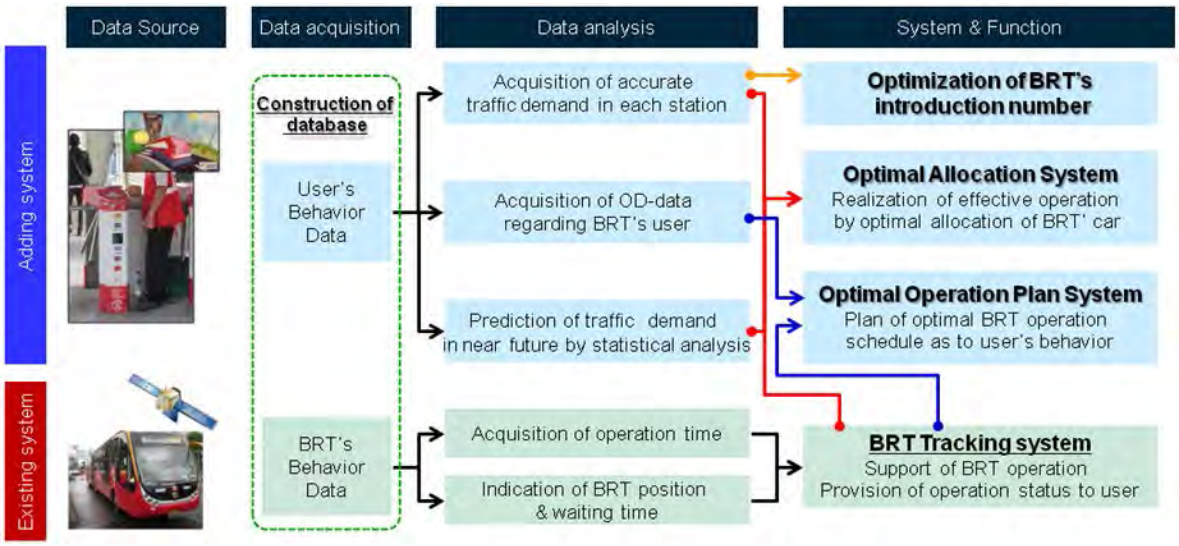


Figure2-6-7 Example of Service for Users by big data of BRT

Chapter 3. ITS related Measures

Inthis survey, the development of ITS master plan was initially considered as the study framework of automobile traffic congestion mitigation measures in DKI Jakarta. ERP was also supposed to be positioned in the ITS master plan. However, in consultation with DKI Jakarta, many officials had the opinion that the study on ITS was not enough for considering road traffic congestion mitigation measures.

With this background, the study on ITS master plan has been slightly less meaningful while the meaning and the importance of considering comprehensive urban road traffic congestion mitigation measures has been recognized again. Then, it has developed the recognition between the survey team and DKI Jakarta officials that the interactive development of ITS through ERP could solve traffic congestion and significantly reduce CO2.

In addition, MOT published "Laporan Akhir – Grand Design Penembangan Intelligent Transport System (ITS)" (final report – grand design of ITS) in 2012. Based on that, this survey provides indirect support for MOT and therefore it creats ITS master plan centering on ERP in order to support the concretization of MOT's ITS master plan.

In the view of the above, Chapter 2 discusses the comprehensive urban road traffic congestion measures including the ITS. In Chapter 3, based on the comprehensive measures discussed in Chapter 2, the desired functions and possible roles of ITS will be discussed. The process of reviews on ITS services is shown in Figure 3-1.

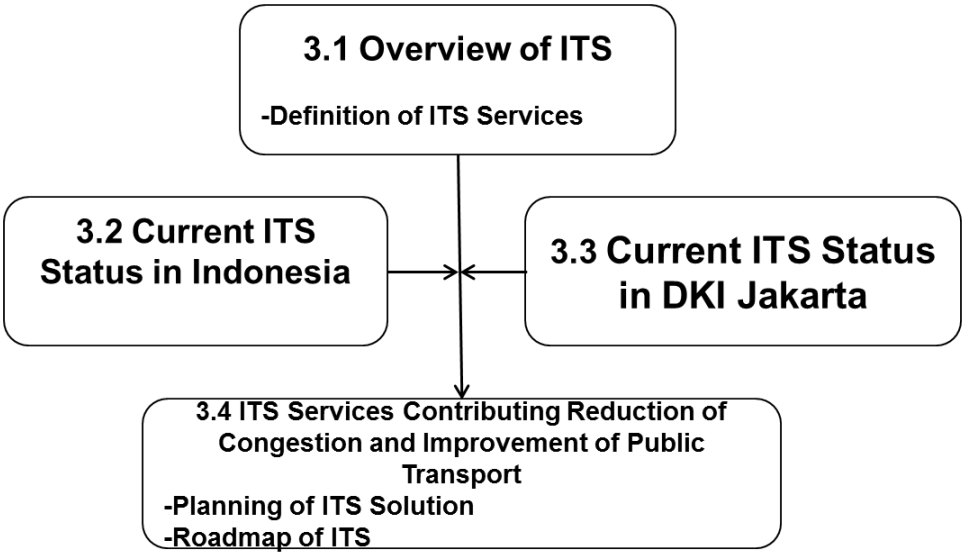


Figure 3-1 Review flow on ITS services

3.1 Overview of ITS

3.1.1 ITS Services

To review ITS services in DKI Jakarta, ITS services need to be categorized into possible types. There are 9 service sectors in the early stage of ITS in Japan as Table 3-1-1.

In these ITS service sectors, ERP can be positioned as one of comprehensive ITS measures with utilizing (2) electronic toll collection systems and (4) optimizing traffic management to reduce traffic congestion. There arealso desired functions and measures such as (6) support for public transportation and (9) support for emergency vehicle operations at the same time as ERP. In addition, the functin is expected to bring other function and measures and have majorripple effect.

ERP and the related measures are one of extremely valuable and high-level ITS measures because those not only resolve traffic congestion but also become a foundation of various ITS services in DKI Jakarta, Indonesia.

Table3-1-1 ITS Service Sectors

Sector	Major function	ERP releted sector	(Ref.)ITS sector in Indonesia(Table 3-2-1)
(1)Advances in navigation systems	Providing traffic information for drivers		Traveler Information Systems (TIS)
(2)Electronic toll collection systems	Charging for road usage, IC card	++	Electronic Financial System (EFS)
(3)Assistance for safe driving	Providing safety information for drivers		Advanced Vehicle Control & Safety Systems (AVCSS)
(4)Optimization of traffic management	Traffic signal control, traffic control	++	Advance Traffic Management Systems (ATMS) -Including Transportation Demand Management
(5)Increasing efficiency in road management	Increasing efficiency of maintenance		
(6)Support for public transport	Management of public transportation operation, PTPS	+	Public Transport Systems (PTS)
(7)Increaseing efficiency in commercial vehicle operations	Commercial vehicle operation and management		Commercial Vehicle Management System(CVMS)
(8)Support for pedestrians	Route guidance for pedestrians		
(9)Support for emergency vehicle operations	Disaster and accident announcement	+	Emergency Management Systems (EMS)

3.1.2 Measures for Transportation Demand Management

Transportation Demand Management(TDM) in cooperation with road improvement is effective for congestion reduction. (1) Equalizaion of traffic in rush hour, (2) decentralization of locally-concentrated traffic, (3) chage in travel mode and (4) relief of traffic demand are shown in the following figure as concrete measures of TDM. These are similar to the issues in Jakarta. Road pricing, modal shift to public transport and park-and-ride are also cited as important measures for ITS.

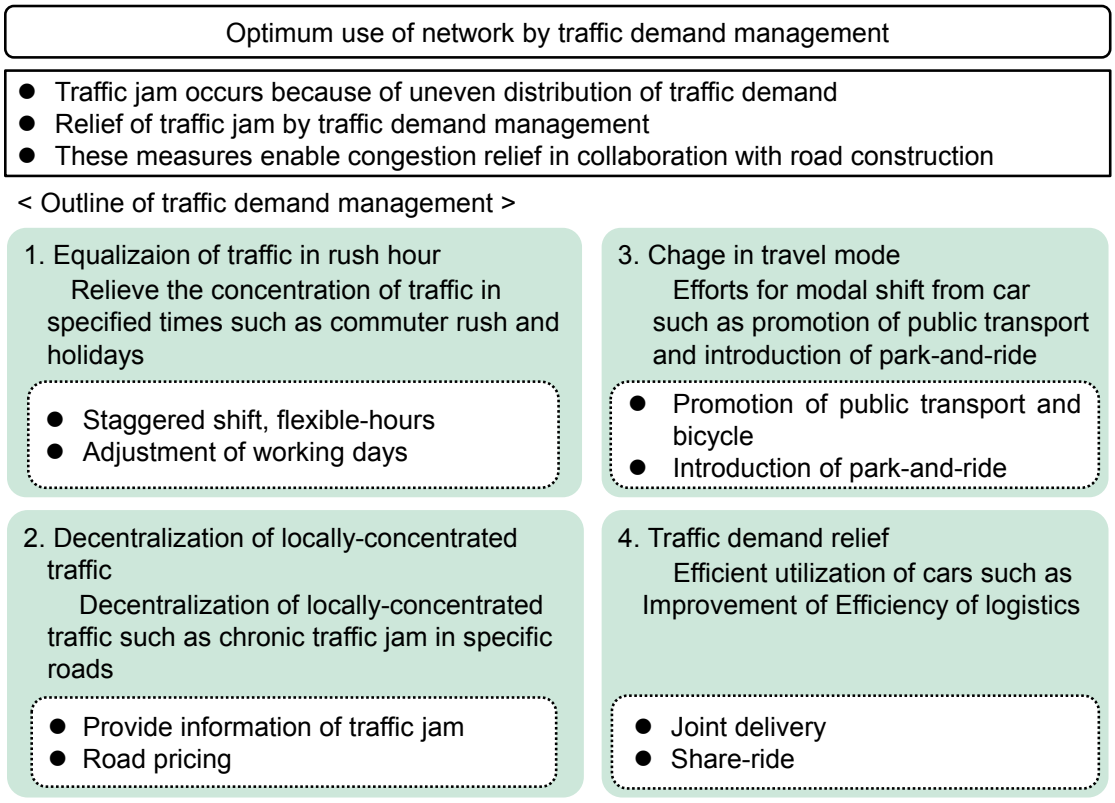


Figure 3-1-1 Optimum use of road network in Japan

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

3.2 Current ITS Status in Indonesia

In Indonesia, MOT leads the development of ITS master plan. The following is the brief of "Laporan Akhir - Grand Design Pengembangan Intelligent Transport System (ITS)".

3.2.1 Implementation and Function of ITS

Intelligent transportation system (ITS) is an application of information technology and communication on transportation infrastructure and vehicles as an alternative solution for the growing density problems in the big cities / metropolitan. The system is applied for controlling and managing the traffic, vehicles distribution and infrastructure to achieve a safer, more organized and improved transportation system, and efficiency improvement of the transit system and traffic infrastructure. This system will reduce the traffic density to more efficient energy use andreduction of greenhouse gas emissions.

ITS can improve the accessibility, efficiency and safety of transportation by identifying the traffic area through the combination of transportation system with information technology. With the ITS implementation in Indonesia, every road user will be able to access the road information in real time and

easily. Every person can know whether the road is jammed or smooth through a mobile device. In addition, ITS also deals with rail events. For example, the train can stop automatically even when it comes close to colliding if the device is installed on the train. The concept of this system is useful for improving the operation management of Trans Jakarta, too. In general, the ITS consists of several systems, including latestn information and navigation systemsand serves as a traffic management system that can provide real time information on traffic conditions. ITS also can be utilized as an accident management system for detecting emergency events such as traffic accidents, fires, floods, landslides or other disasters. It also performs as an electronic-transportation payment collection system and a system for driving assistance which gives a warning against too-close approach between vehicles , traveling the wrong way, and speeding.

The table below shows a list of ITS services in Indonesia. Major services include Advance Traffic Management Systems (ATMS), Traveler Information Systems (TIS), Public Transport Systems (PTS), Commercial Vehicle Management System(CVMS), Electronic Financial System (EFS), Emergency Management Systems (EMS), and Advanced Vehicle Control & Safety Systems (AVCSS). The service related to ERP is Electronic Financial System (EFS). The similar systems such as ETC and electronic payment system for introduction of ERP have been already built.

Table 3-2-1 List of ITS services

ITS Services	Service components
Advance Traffic Management Systems (ATMS)	1. Traffic Control 2. Traffic Management/Signal Control 3. Traffic Demand Management System 4. Automated Detection of Weather/Road Condition
Traveler Information Systems (TIS)	1. Route Guidance 2. Traveler Services Information 3. En-route Driver Information 4. Pre-trip Travel Information 5. Parking Information
Public Transport Systems (PTS)	1. En-route Transit Information 2. Public Transportation Management
Commercial Vehicle Management System(CVMS)	1. Commercial Vehicle Operations (CVO) 2. Hazardous Material Incident Response 3. Automated Roadside Safety Inspection
Electronic Financial System (EFS)	1. Electronic Toll Collection 2. Electronic Payment System
Emergency Management Systems (EMS)	1. Incident Management 2. Emergency Notification 3. Personal Mayday Support 4. Emergency Vehicle Management 5. Public Mayday Support
Advanced Vehicle Control & Safety Systems (AVCSS)	1. Safety Readiness 2. Pre-crash Restraint Deployment 3. Driving Safety Warning

3.2.2 Analysis on the ITS implementation survey result in several cities in Indonesia

In Indonesia, ITS has been implemented in several cities such as Jakarta, Solo, Surabaya, and Yogyakarta. Several ITS systems including Area Traffic Control System (ATCS), CCTV cameras, Variable Message Sign (VMS), Parking Information Systems, E-Enforcement, E-Toll, and Integrated Public Transportation System have been developed in Indonesia. On the other hands, the needs of ITS have been growing and more cost efficient and effective ITS is desired.

The table below shows a brief overview on the development condition of Intelligent Transportation System (ITS) in terms of system development, managerial, execution, and other involved stakeholders in 29 cities / districts in Indonesia.

Table 3-2-2 Summary of survey results based on ITS implementation services

ITS Services	Cities where ITS has been implemented	Information
Advance Traffic Management Systems (ATMS)	DKI Jakarta, Bandung, Surabaya, Depok, Bogor, Bekasi, Medan, Makasar, Yogyakarta, Semarang, Pekanbaru, Balikpapan, Palembang, Banjarmasin	- Almost all of the city using ATCS technology. The ATCS implementation has not yet reach the optimal in several cities. - Cities / Districts, which has not implementated the ATMS service, are still using simple traffic lights and not centralized.
Traveler Information Systems (TIS)	DKI Jakarta, Depok, Bandung, Surabaya, Makasar	- TIS services is applied using VMS technology - GPS technology is used for Busway information arrival in Jakarta - Traffic monitoring using CCTV - Parking Information
Public Transport Systems (PTS)	-	-
Commercial Vehicle Management System(CVMS)	-	-
Electronic Financial System (EFS)	DKI Jakarta, Yogyakarta, Palembang, Bogor	- Using JakCard in Busway TransJakartawith the cooperation of Bank of DKI - Using Smarcard in Trans Yogya and Trans Musi
Emergency Management Systems (EMS)	-	-
Advanced Vehicle Control & Safety Systems (AVCSS)	-	-

ITS which has been applied in Jakarta, includes Traveler Information System and Variable Message Sign (VMS). Traveler information system is operated by GPS, camera-installed TransJakarta bus andthe Passenger Monitoring System (PMS) and provides the information of the time required to get to the bus stop located in the destination. However, system failure often happens so the system is not so useful

for the users of TransJakarta bus.

The function of Variable Message Sign (VMS) is to inform road users of current road conditions. Currently, the new type of VMS is utilized in Tegal Parang and Hayam Wuruk and Sawah Besar. VMS is connected with CCTV in several roads and intersections in Jakarta and it is installed in every intersection on Jalan MH. Thamrin and Sudirman. CCTV system has been used in Sydney, Australia and called Sydney Coordinated Adaptive Traffic System (SCATS). The system has addressed accidents and hazardous conditions. In Jakarta, Jakarta's Transportation Department and Polda Metro Jaya (Jakarta's police force) are working on the same system together. So far, the response to an emergency such as an accident took times since the response had to follow the manual. The failure of the CCTV or LED of VMS also often happens in Jakarta. The complexity of the fiber optic network installation in the underground of Jakarta makes the installation of CCTV difficult.

It is reported that some conditions have to be met in order to implement ITS in Jakarta:

① Obligations related to the micro cell operating license by third parties in Jakarta.
② Improvement of Fiber optic network.
③ Establishment of traffic control system as future ITS (under the Jakarta Transportation Agency).

Incremental arrangement and expansion have realism to meet the above requirements. The network based on a fiber-optic technology has been already developed in the area where the bus tracking system (BTS) of BRT, area traffic control system (ATCS), and traffic information system (TIS) have been introduced. The management of above information has started to be unified under the traffic information center. It is necessary to steadily push ahead this kind of approach.

In these, ②improvement of Fiber optic network is essential information infrastructure for development of ITS and introduction of ERP. The infrastructure needs to be durable and safe in order to send huge amount of important information through fiber optics. In Japan, the network is often constructed in the form of C.C.BOX (Communication (or Compact) Cable BOX) under sidewalks. It needs to withstand heavy load and functions even in heavy rain and terrorism if the network is buried under the carriage way. So fiber optic network should be considered carefully before introduction of ERP.

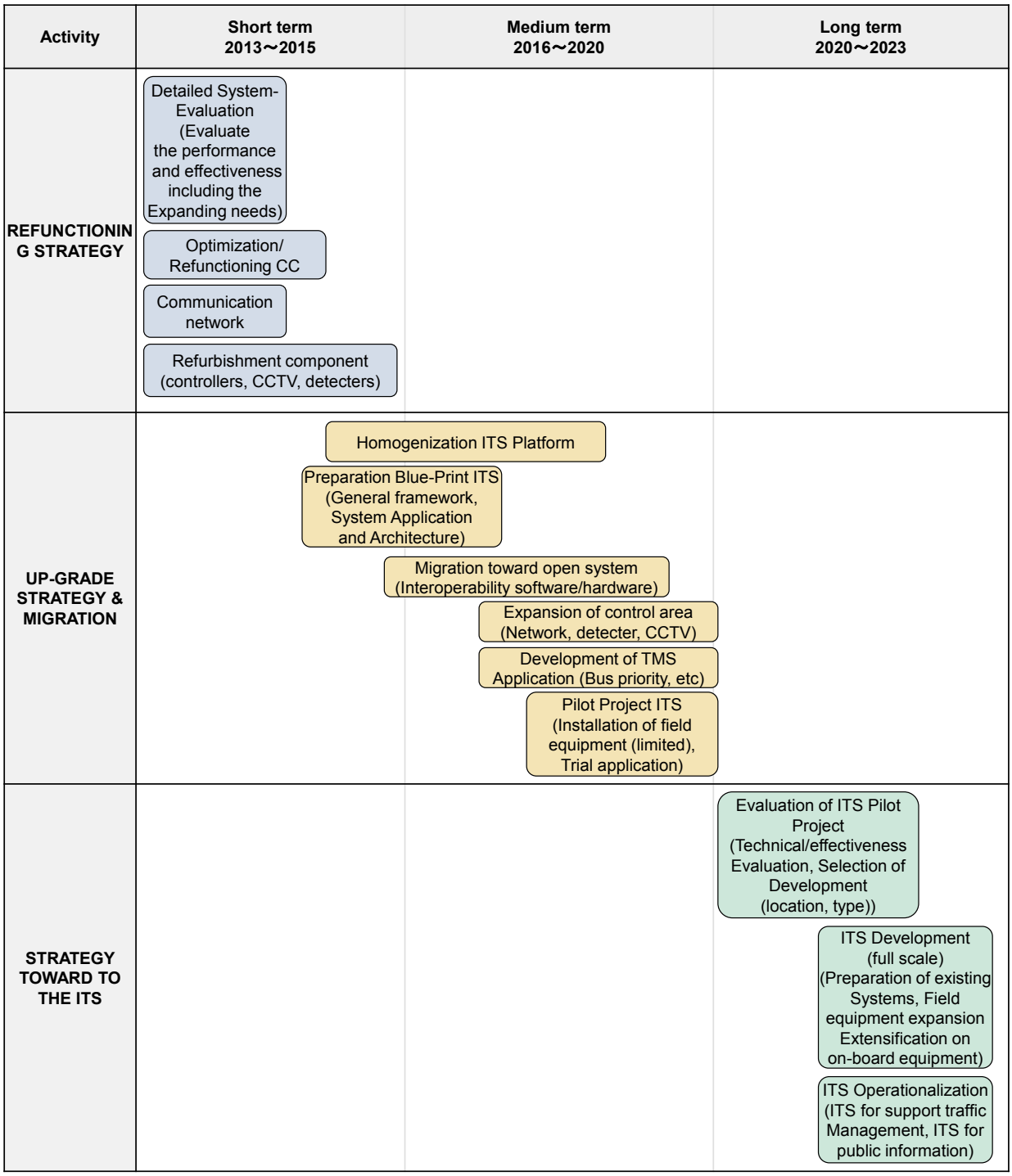
First targets of the implementation of ITS in Jakarta are as follows:

1) Optimizing the traffic flow to reduce travel time, fuel, and pollution.
2) Optimizing the operation of TransJakarta busthrough review on headway, public transportation priority system and passenger information system.
3) Providing comprehensive, accurate, and real-time transportation information.

In these targets, Traffic Information Center is essential to provide 3) integrated traffic information. Jakarta already has Traffic Management Center which has basic function of it and there is a foundation for the future.

The figure below is the brief flow of the ITS technology development and expansion schedule based on "Laporan Akhir - Grand Design Pengembangan Intelligent Transport System (ITS)" created by MOT. In this concept, evaluation of existing systems will be done in the short term (2013-2015), upgrade and migration of the system will be in the medium-term (2013-2015) and the extensive introduction of ITS will be done in the long term (2020-2023).

Table 3-2-3 Stages of technology developement



Source: Summary of "Laporan Akhir - Grand Design Pengembangan Intelligent Transport System"

3.3 Current ITS Status in DKI Jakarta

This section describes the detail of major existing approach on ITS in DKI Jakarta. The ITS-related measures currently implememted by DISHUB include area-wide traffic signal control system, bus tracking system, and traffic information collection system introduced by the traffic control center of DISHUB. Furthermore Lewat mana, which is a private company, is providing traffic congestion data.

3.3.1 Traffic Management Center operated by DISHUB

Traffic Management Center is implementing the following ITS related measures.

- Area-wide Traffic Control
- Bus Tracking System
- Traffic Information Collection

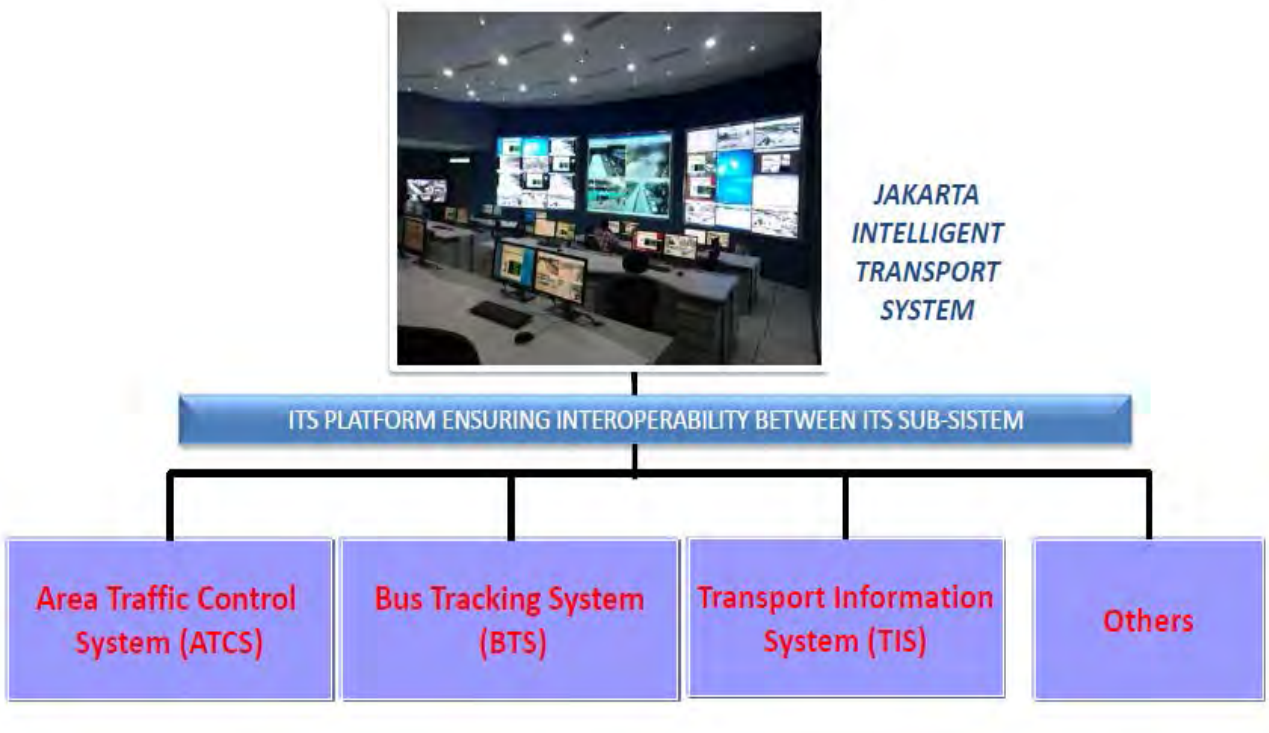


Figure3-3-1 Traffic Management Center operated by DISHUB (Source: DISHUB)

(1) Area-wide Traffic Control（ATCS）

ATCS manages the signal cycle of 300 signalized intersection in DKI Jakarta and the Traffic Management Center controls 25 intersections automatically. By setting the benchmark for each signal and comparing it with the actual results of the automatic control, they attempt to achieve optimal cycle setting. In order to increase the capacity in the intersection through the automatic process from

observing traffic flow at intersections, calculating the appropriate signal cycle, to applying it the local site, three modes of control are prepared in accordance with the traffic conditions. In general, the signal cycle of DKI Jakarta is very long and some of them are over 5 minutes. On the other hand, the cycle is set to 180 seconds in the intersection controlled by the control center. This is a relatively short cycle. Signal control software is SCATS made in Australia.

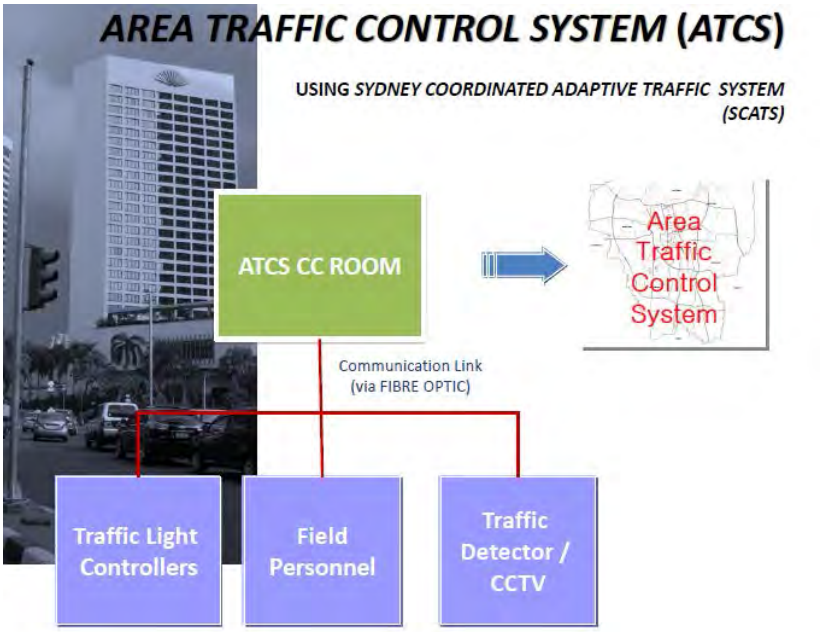


Figure3-3-2 Are-wide Traffic Control System (Source: DISHUB)

(2) Bus Tracking System（BTS）

In BTS, a signal is received from GPS installed in the Transjakarta, bus positioning information is aggregated in traffic management center, and mapping process is conducted based on the information. The location of many running buses can also be identified on the screen of the traffic management center.

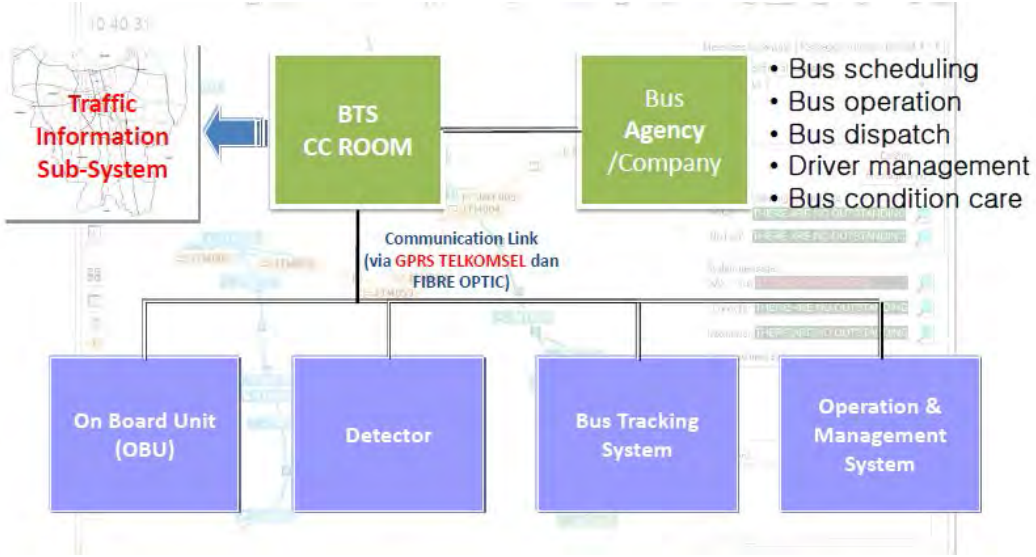


Figure3-3-3 Bus Tracking System (Source: DISHUB)

(3) Traffic Information Collection（TIS）

DISHUB has installed CCTV camera at the major intersections and has had the system of checking traffic congestion. CCTV cameras have been installed in each lane. Based on the congested situation that is displayed on the monitor of the traffic management center, the queuing time of the vehicle is measured. That is, traffic congestion is determined by the length of the queuing time. Thus, it is possible to confirm the traffic congestion by visual observation. However, it does not reach the stage of providing information to drivers and pedestrians through utilizing and processing the information.

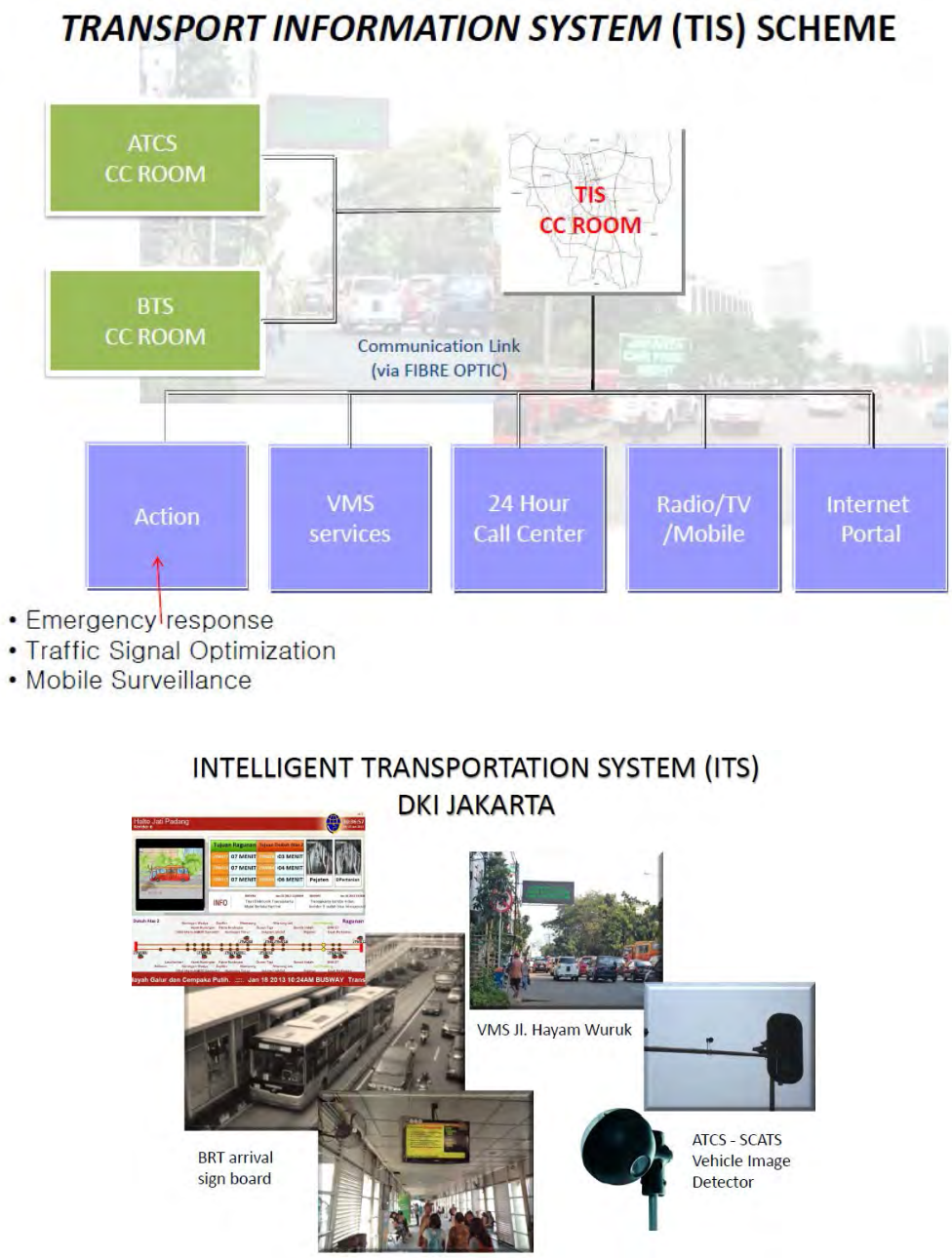


Figure3-3-4 Traffic information collection system (Source: DISHUB)

3.3.2 Traffic information provision by Private Sectors

(1) Lewat Mana

Lewat Mana is a pure private enterprise. It collects information through CCTV installed in 120 locations in DKI Jakarta, SMS (Short Message Service) from the users, Twitter, and the GPS function of the mobile phone. Based on the information, Lewat Mana provides traffic information with road users through the Internet and mobile phones. Further, by using the Twitter, information is provided as a message from the operator. The following figure shows the example provided on the internet screen.

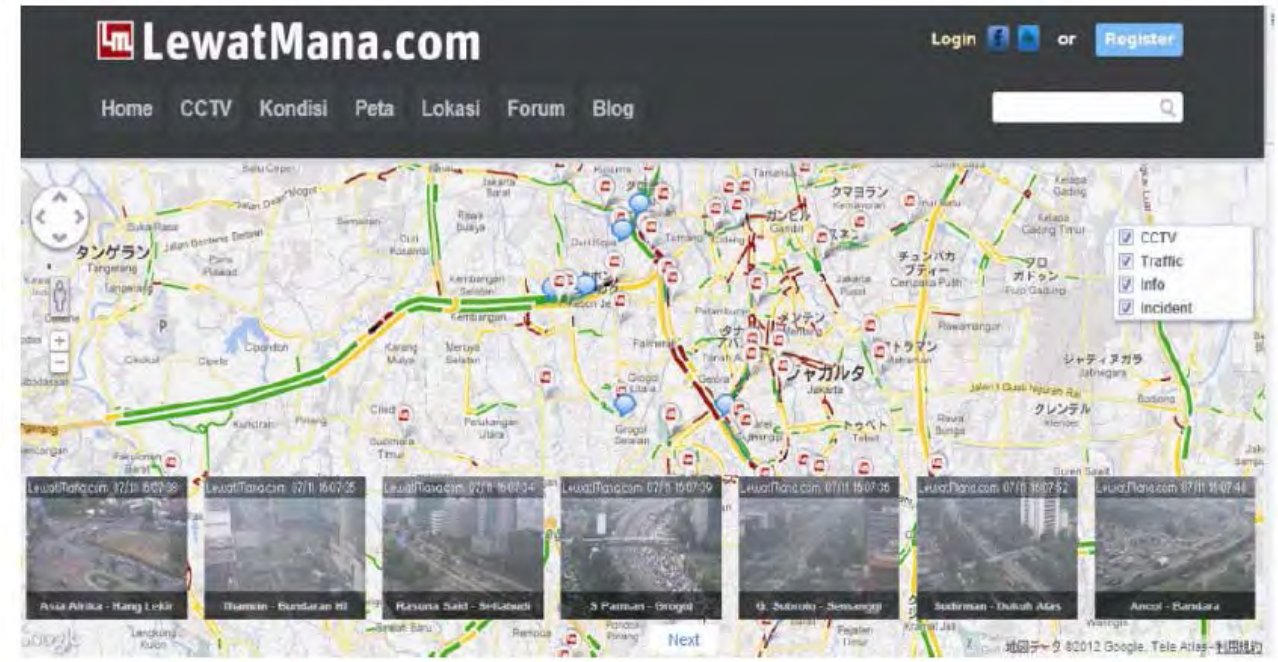


Figure3-3-5 Traffic congestion information provided by Lewat Mana (Source: LewatMana.com)

(2) Information Provision using SNS

On the other hand, Bambang Susantono, vice minister of MOT, said that pioneering improvement of mass transit (MRT, LRT and BRT) in 2020is planned in major cities of Indonesia in the lecture of “Sustainable Transport in ASEAN: Indonesia Initiatives” at Final Symposium of Study of Long-Term Transport Action Plan for ASEAN, Tokyo, 20 February 2014.

Additionally, traffic information services utilizing web and smartphone are provided by private companies in Indonesia. Nebengers.com (http://www.nebengers.com/?page_id=226) is the largest community site for car-sharing and ride-sharing.

Figure 3-3-6 Information service utilizing Web and smartphone

Source: Nebengers.com

3.4 ITS Services Contributing Reduction of Congestion and Improvement of Public Transport

3.4.1 Basic Policy of Planning ITS Services

In this section, we describe the basic outlines of ITS items, particularly the services and systems which are considered to be useful for Indonesia side. The important perspectives in planning are as follows.

(1) Attention on Localization and Sustainability

Though technical support by Japan and other countries is needed during the beginning of implementation, proactive operation and management by MOT and Jakarta Government is preferable. Periodic support and technical instruction by system and equipment manufacturers is also imperative but this point is important when it comes to maintenance.

(2) Emphasis on Local Needs

Based on the result of the field survey, questionnaire and interview with the experts, we select a system or service with high local needs. A system or service which needs prioritized and focused approach is mainly considered. From the view of comprehensive problem resolutions, a system that is considered as an important is also prioritized.

(3) Package Measures to Solve Congestion

To relief congestion, introduction of ITS-related devices and systems brings a major effect only after t integration of both hardware-side measures such as road infrastructure improvement and software-side measures such as change of traffic consciousness and education for citizen. It is proved that in the process of ITS implementation in Japan.

(4) Reflection of Policy of Indonesian and Jakarta Government

Not only relief of congestion aimed by Indonesia and Jakarta Government but also reduction of GHG emission can be expected as secondary effect.

(5) Adaption to Rapid Advances in Technology

The system needs to be flexible for advances in technology such as smartphone and changes in society and lifestyle.

(6) Others

The system needs to be flexible for change in city planning, public transport and traffic demand and replace of devices and systems.

3.4.2 ITS Solution for Reduction of Congestion

As stated before, various measures related road traffic and ITS are being planned or implemented. Typical systems implemented by DISHUB include Area Traffic Control System (ATCS), Bus Tracking System (BTS) and Traffic Information System (TIS).

Services which need realization or more improvement for easing congestion and ITS solutions for which support from Japan is considered to be effective are described below.

3.4.2.1 Planning of ITS Solution

(1) Collection and Provision of road traffic information

① Integration and management of information

Integrated management of road traffic information is also an issue in Japan. In particular, it is in the situation that various kinds of traffic information owned by operators and managers in rail and operators, and police department are not coordinated. In Jakarta, many actions are feasible such as visualization of traffic flow and information provision for users, improvement of operational management and monitoring of BRT, share and integration of traffic probe data called Big Data, development of private sectors by opening traffic data.

② Provision of information and improvement of traffic management center

Although Traffic Management Center operates some traffic control systems in Jakarta currently, more improvement of functions is needed for the future. Real-time signal control reflecting real-time traffic flow, traffic prediction information based on weather condition and existing traffic data and variable channeling in accordance with traffic situations and time zone are desired.

Expansion of Bus tracking system is planned to apply it to all lines in the future. The improvement of convenience of BRT system is expected through an operational support such as instruction of controlling headway for bus drivers and a service for users such as provision of operational situation on the Internet.

(2) Introduction of ERP

ERP's effect for easing congestion in urban area and promoting modal shift to public transport is clear from the performance in Singapore and our survey. As stated before, ERP, which was introduced in Singapore in 1990s, is reliable and now accepted as one of the Singaporean social infrastructures.

(3) Support for Modal Shift to Public Transport

① Improvement of geometric structure of intersections and traffic signal controllers

Intersections facilitating the smooth travel of BRT, improvement of road geometric structure of BRT terminal sections and PTSP which prioritizes public transport are effective for promoting modal shift to public transport. For example, improvement of road marking, installation of pavement lighting system and introduction of roundabout can be considered.

② Introduction of Transport IC Card

Transport IC card is available for payment of BRT, parking and refueling so it is very convenient for road users. For operators, it not only functions as reliable fee collection but also collects user information. It leads accurate project planning and provision of high quality service.

(4) Construction and implementation of traffic education system

Regardless of introduction of high-technology systems, education is important soft measure for realization of reliable operation of BRT drivers. Education for drivers of passenger cars and mini-bus who can influence on BRT operation is also necessary.

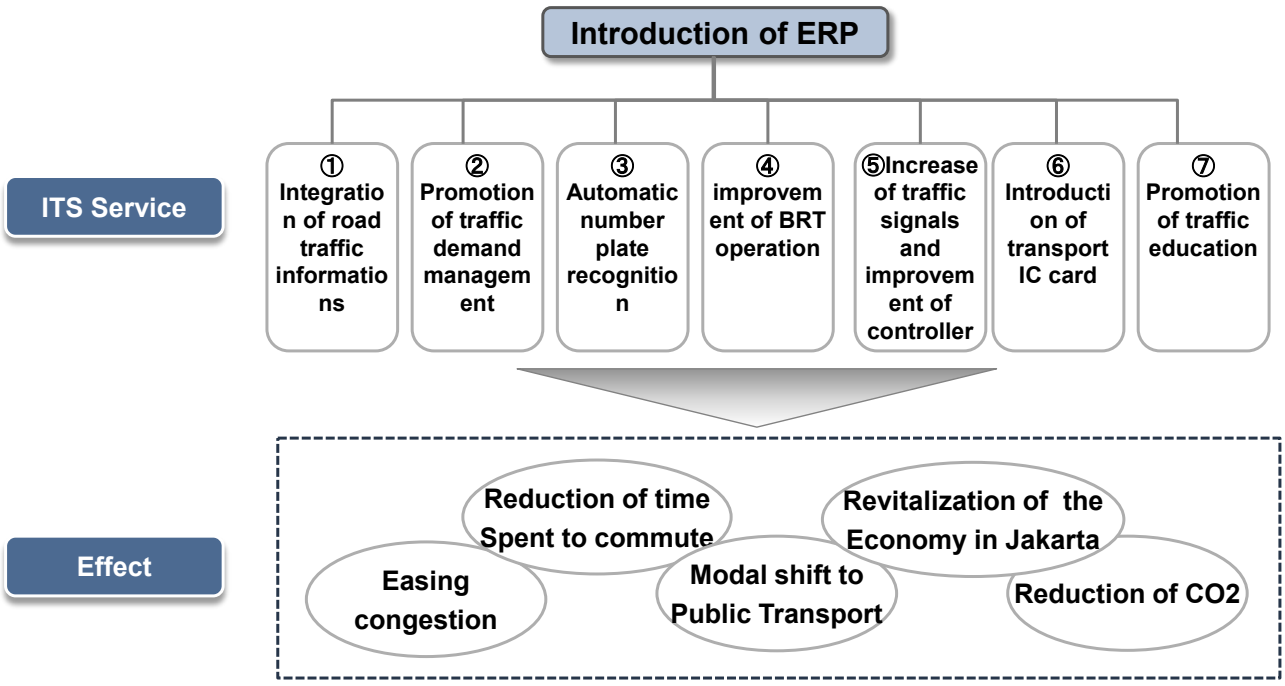


Figure 3-4-1 Introduction of ERP and its effects

3.4.2.2 Roadmap of ITS

The systems which promote ITS related measures easing congestion and promoting modal shift to public transport were stated so far and the figure below shows the roadmap of them. This schedule is moved up in comparison with the MOT plan. These ITS services are desired to be planned and implemented as soon as possible in order to ease chronic congestion, reduce CO2 and stimulate economy and life of citizens in Jakarta city.

ITS is expected not only to provide a stand-alone service but also to promote modal shift to public transport more effectively through multiple systems and measures.

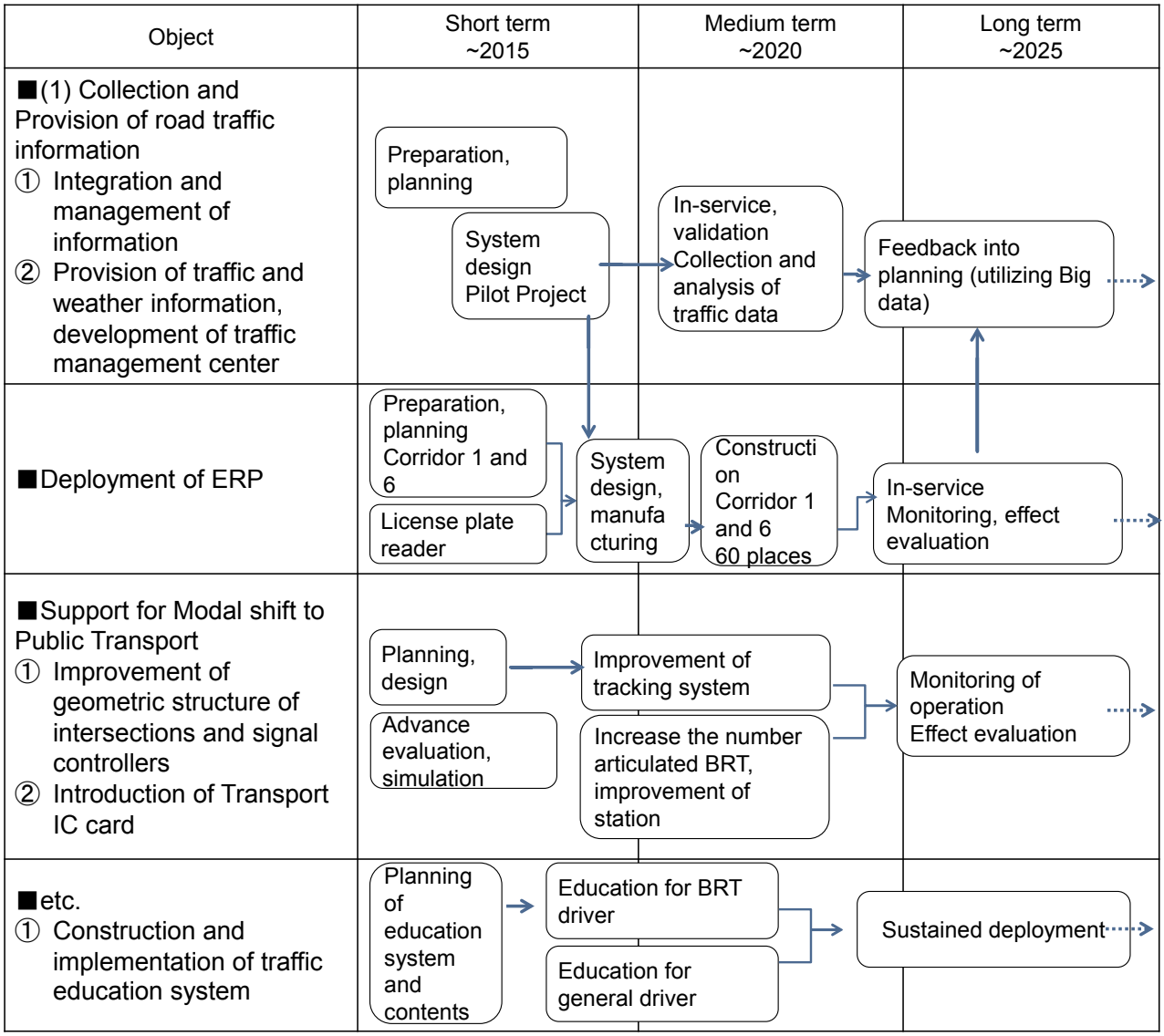


Figure 3-4-2 Roadmap of ITS service

3.4.2.3 Importance of pioneering introduction of ERP

While we suggested various ITS services, introduction of ERP is considered to contribute directly and effectively to ease traffic congestion in urban area of Jakarta.

The figure below shows the outline of modal shift to public transportation and change in traffic volume of vehicle flowing into the urban area. There are three steps in modal shift to public transport: improvement of BRT (optimization of TransJakarta operation), introduction of ERP and introduction of MRT. Although multiple utilization of ITS measures is desired for realization of targeted user services, introduction of ERP is the most effective measure of ITS which realizes the Jakarta's goal of easing traffic congestion and early implementation is desired.

MRT improvement is also expected as a measure for mass transit but it needs much cost and time. ERP is a light infrastructure comparatively and expected as a measure realizing the revitalization of local economy and improvement of quality of life.

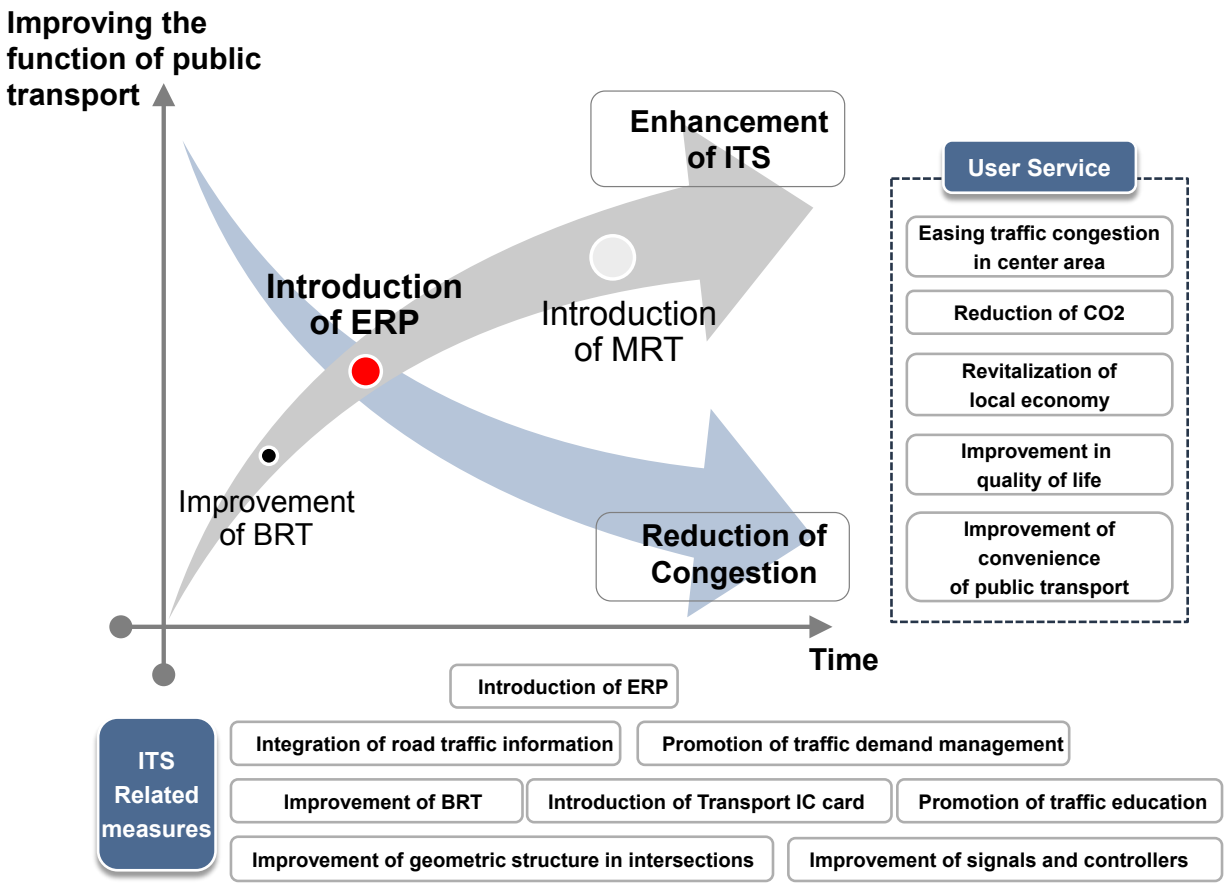


Figure 3-4-3 Outline of ITS approach and introduction of ERP (drawn up by JICA)

Chapter 4. Review of the Legal Framework

4.1 Legal Structure for ERP Project Implementation

Major legal structure for ERP project implementation is shown as the figure below.

The legal system for ERP project implementation can be categorized into 5 groups: road traffic, retribution, local government, project scheme and others (spatial planning, environment, information communication). For ERP implementation, PP (Government Regulation) 32/2011 on road traffic management and PP 97/2012 on Traffic Control Retribution are the key regulations in the legal structure.

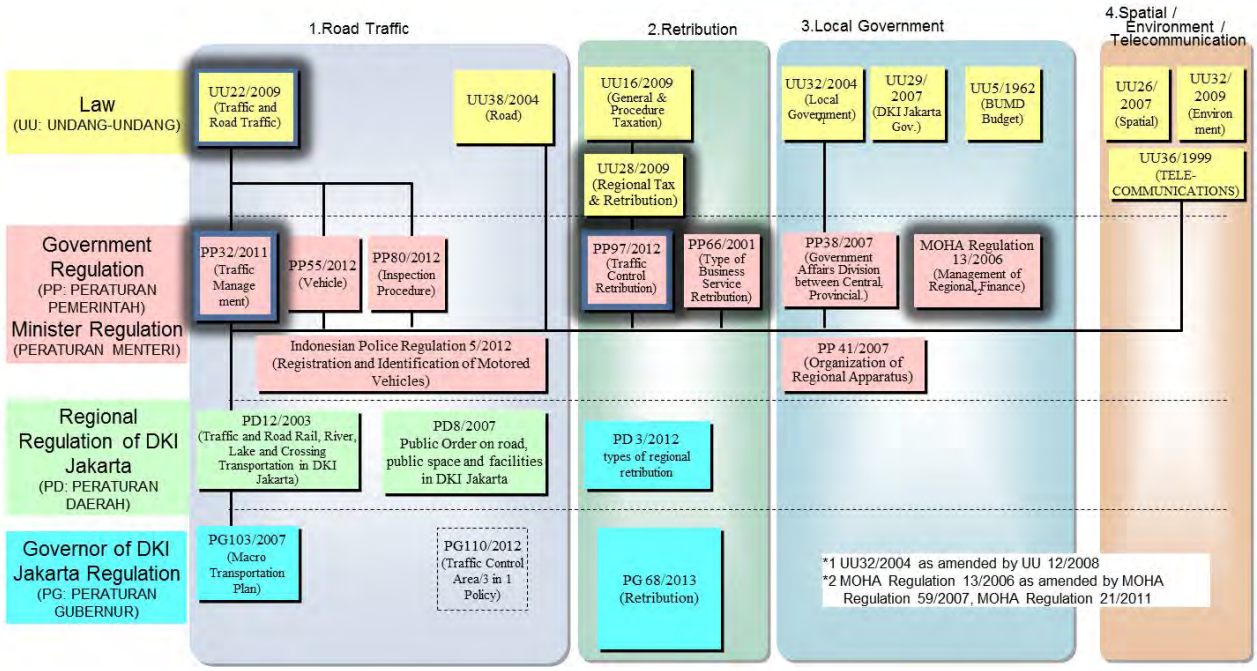


Figure4-1-1 Legal Structure for ERP (1/2)

Source: Created by JICA ERP Study Team

For project scheme, ERP project is not included in the scope of PPP in Presidential Regulation 67 of 2005 (partially amended by Presidential Regulation 13/2010, 56/2011, and 66/2013) for PPP infrastructure of Indonesian central government. Thus, ERP project scheme has to be reviewed based on regulations of regional partnership project of local government such as widely applicable PP50/2007 (See 4.4).

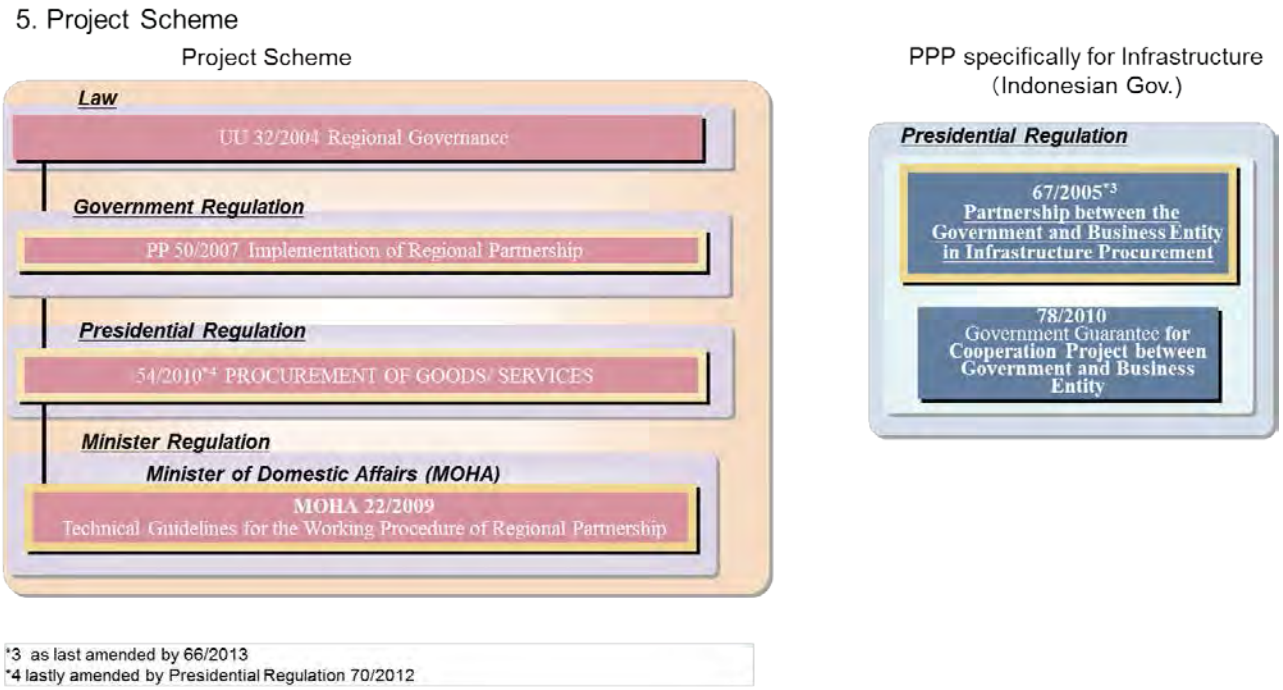


Figure4-1-2 Legal Structure for ERP (2/2)

Source: Created by JICA ERP Study Team

Table4-1-1 Summary of Related Laws

Category	Law Type	Competent Authority	Regulation #	Title	Summary	Enacted Date	Remarks
1. Road Traffic	Law	Central Government, Regional Government, and National Police	UU22/2009	Traffic and Road Transportation	This law regulates to develop and implement secure, safe, orderly, and smooth traffic and road transportation. The regulation of traffic and road transportation is through the activity of moving vehicles, people, and/or goods on the road; activity of using facilities, infrastructure, and supporting traffic and road transportation facilities; and activity in relation with the registration and identification of motor vehicles with its driver, traffic education, traffic management and engineering, and traffic and road transportation law enforcement. In terms of ERP, it stipulates the basic rights and obligations of traffic and road transportation users such as the duties of the government in managing the traffic and roads and the obligations of the road users to abide by the law.	2009/6/22	-
		Central Government and Regional Government	UU38/2004	Road	This law regulates the implementation of the regulation, development, construction, and monitoring of public road; regulation, development, concession and monitoring of toll road; and special roads. The regulation of road is through the classification of it from its function and status. In terms of ERP, it stipulates the basic legal framework of the construction of	2004/10/18	-

Category	Law Type	Competent Authority	Regulation #	Title	Summary	Enacted Date	Remarks
					supplementary equipments/accessories of roads and it provides criminal sanctions on the destruction or hindrance of road.		
	Government Regulation or Minister Regulation	Minister of Transportation, Head of National Police, Governor, and Regent/Mayor	PP32/2011	Traffic Demand Management	In view of UU22/2009, this law stipulates the responsibility of relevant government/regional body and implementation policy on the management and engineering, impact analysis and traffic demand management for the purpose of optimizing the road network, improving the safety and smoothness of traffic and road transportation. In terms of ERP, it prescribes that traffic restriction on individual vehicle and restrictions on goods vehicles can be done by imposition of traffic control retribution, but also prescribes essential points for implementation of traffic control retribution including minimum criteria, applicable class of road, purpose of utilization of income from traffic control retribution.	2011/6/21	-
		Minister of Transportation, and Governor	PP55/2012	Vehicle	This regulation stipulates the classification of vehicle based on its function and type; the technical requirements of road vehicles; regulation on motor vehicle testing.	2013/5/23	-
		Minister of Transportation, Provincial Head of Road Traffic and Transportation Facilities and Infrastructure, Regency Head of Road Traffic and Transportation Facilities and Infrastructure, and National Police	PP80/2012	Motor Vehicle Inspection and the Prosecution of Road Traffic and Transportation Violation Procedure	This regulation prescribes the procedure of inspecting motor vehicle on the road and the procedure of the enforcement of traffic and road transportation violation.	2012/10/15	-
		National Police and National Police Traffic Corps	Indonesian Police Regulation 5/2012	Registration and Identification of Motor Vehicle	This regulation states the system management of registration and identification of motor vehicles; the implementation of registration and identification of motor vehicles; the registration and identification of the ownership of motor vehicle. In terms of ERP, this regulation would set as the legal framework to classify the vehicles as object of ERP charge.	2012/10/1	-
	Regional Regulation of DKI Jakarta	Governor, City Transportation Board, and Head of Transportation Unit	PD12/2003	Road, Train, River and Lake Traffic	This regulation states the types, elements and requirements of the Facilities and Infrastructure of Road Transportation; Train Transportation Facilities; River, Lake, and Crossings Transportation; the types, elements; the requirements for drivers on the road; the framework, elements and requirements of the traffic of Road and Train; the types, requirements of Road Transportation, Train Transportation, and River, Lake, and Crossings Transportation; the requirement of the facilities for the disabled and ill people, traffic impact analysis, retribution, information and statistic system, monitoring and control, criminal sanctions; and investigation.	2003/11/13	as has been amended by PD5/2014

Category	Law Type	Competent Authority	Regulation #	Title	Summary	Enacted Date	Remarks
		Governor	PD8/2007	Public Order	This regulation prescribes the system in maintaining public order in DKI Jakarta. It contains explanation regarding road, road transportation, and river transportation; green line, park, and public places order; river, pipeline, pond, and offshore; environmental order; certain place and business order; building order; social order; health order; entertainment and noisiness order; development, control, and oversight; investigation; criminal provision. In terms of ERP, this regulation stipulates the order of using the road and prohibition of activities hindering the road (such as the prohibition of using jockeys in three-in-one road areas).	2007/10/5	-
	Governor of DKI Jakarta Regulation	Governor	PG103/2007	Macro Transportation Pattern	This regulation states the direction of the development of transportation system; the development of transportation system through planning and implementation; the cooperation between DKI Jakarta with its neighboring cities; funding, coordination, control, evaluation, and report of Macro Transportation Pattern. In terms of ERP, this regulation prescribes the right of DKI Jakarta to cooperate with third parties in relation to the development of transportation system. The development of transportation system consists of the application of transportation demand management (including road pricing).	2007/7/26	-
		Governor	PG110/2012	Traffic Control Region /3in1	This regulation stipulates the specific area and time for "3 in 1" traffic control. In such area and time, cars have to take minimum three person. In terms of ERP, this regulation can be used as a basis to draft a regulation to introduce ERP.	2012/9/7	-
2.Retribution	Law	Central Government , Regional Government , Minister of Domestic Affairs, Minister of Finance,	UU28/2009	Regional Tax and Retribution	This law stipulates types of tax and retribution, tax and retribution collection process, procedures of formulation of regional regulation regarding tax and retribution, and sanctions for non-compliance with payment of tax and retrbution. In terms of ERP, this regulation prescribes the collection process of retribution.	2009/9/15	-
	Government Regulation or Minister Regulation	Minister of Transportation, Regional Government	PP97/2012	Traffic Retribution Control and Extension Retribution to Foreign Employees	PP97/2012 stipulates the principal policy of imposition of Traffic Control Retribution and Retribution of Renewal of Permit For Employing Foreign Manpower. In terms of Traffic Control Retribution, it also prescribes essential matters for implementation of Traffic Control Retribution including responsible body, charged class of vehicle, procedure of introduction, utilization and subject of Traffic Controlf Retribution etc, in the same as PP32/2011.	2012/10/29	-
		Minister of Domestic Affairs and Ministe of Finance	PP66/2001	Regional Retribution	This regulation stipulates regarding the public services retribution, business services retribution, certain permit retribution, types and details retribution, other retribution, calculation and implementation of retribution fees, elimination of credit procedure from the expired retribution, retribution shares from region regency to village and region retribution.	2001/9/13	-
	Regional Regulation of Jakarta	Governor	PD3/2012	Regional Retribution	This regulation states the classification and types of retribution by its groups of in the field of governance, in the field of economy and administration, development and environment, and social welfare. This regulation further stipulates the name and object, retribution subject, the measurement procedure in knowing the service utilization, and the number of tariff principle of retribution for each groups of regional retribution in DKI Jakarta. In terms of ERP, this regulation can be used as a reference to draft a new regional regulation on regional retribution.	2012/9/12	-

Category	Law Type	Competent Authority	Regulation #	Title	Summary	Enacted Date	Remarks
	Governor of DKI Jakarta Regulation	Governor	PG109/2013	Regional Retribution	This regulation stipulates the registration, determination of cancellation, payment, billing, expiration of bill, objection, overpayment, administration and reporting, examination, coordination and development technical operational of regional retribution fees.	2013/9/30	-
3.Local Government	Law	Central Government, Minister of Domestic Affairs, and Minister of Finance	UU32/2004	Regional Governance	This regulation stipulates the establishment of local and special district, delegation of government affairs, regional government performance principles, local rights and obligations, local government, duty, authority and obligation of head and vice head of local government.	2004/10/15	as has amended two times by Perpu 3/2005 and UU 12/2008 ,and Constitutional Court Decision No.97/PUU-XI/2013
		Central Government (Minister of Domestic Affairs)	UU29/2007	Province Government of Capital City Jakarta	This regulation prescribes the DKI Jakarta as a special province and as the capital city of Indonesia with its special rights to regulate certain sectors independently.	2007/7/30	
		Central Government (Minister of Domestic Affairs)	UU5/1962	Regional Company	This law stipulates regarding characteristic, purpose and business field, asset, capital, management, supervision in the regional company.	1962/2/14	no amendment for this regulation, but there exists a new substance which is added in MOHA Regulation No. 43 of 2000 concerning the Guidelines for Regional Company Cooperation with Third Parties
	Government Regulation or Minister Regulation	Central Government	PP38/2007	Government Affairs Division between Central Government and Local Government	This regulation stipulates the government affairs, government affairs division, management of government affairs between provincial government and local district/city government.	2007/7/9	-
		Central Government (Minister of Finance, and Minister of Domestic Affairs)	MOHA Regulation 13/2006	Regional Financial Management Guidance	This regulation stipulates management of regional budget, structure and formulation of APBD (Regional Revenue and Expenditure Budget), regional government officers to manage the regional revenues and expenditures, evaluation and supervision on the management of regional budget. In terms of ERP, retribution is considered as a regional revenue, thus, revenue from ERP charge and expenses incurred for ERP Project shall be determined in APBD which is determined annually.	2006/5/15	as has been amended by MOHA 59/2007 and MOHA 21/2011.
		Minister of Health, and Minister of Domestic Affairs	PP41/2007	Local Organization Structure	This regulation stipulates the formation of organization structure; the position, duty and function of provincial region structure: local secretary, Regional House of Representative secretary, local construction plan, local duty, local technical institution, the position, duty, function of the province region, education of local organization, expert staff and organization control and guidance.	2007/7/23	-
4. .Spatial / Environment /Telecommunication	Law	Central Government	UU26/2007	Spatial Planning	This law stipulates the principle and purpose of spatial planning: legal certainty, accountability and openness, the classification of spatial planning: main system function, administrative area, activities, strategic values area; duty and authority: aims for the people, performance of spatial planning, spatial planning management	2007/4/26	-

Category	Law Type	Competent Authority	Regulation #	Title	Summary	Enacted Date	Remarks
					and guidance by coordination, socialization, consultation, supervision and education on the implementation of spatial planning.		
		Minister of Environment	UU32/2009	Environmental Protection and Management	This law stipulates the environmental management, protection plan, continuing construction and ecosystem; protection and prevention of the destruction of environment, guarantying the environment; requirement to obtain environmental licenses, controlling the damage and destruction of environment, duty and authority of the government to manage the environment, the role of society, sanctions for non-compliance with requirement to manage the environment. In terms of ERP, this regulation prescribes the obligation of preparing environmental documents and the environmental documents will depend on the actual activity conducted in the ERP Project.	2009/10/3	-
		Minister of Communication and Information Technology	UU36/1999	Telecommunications	In terms of ERP, this regulation prescribes the construction of telecommunication facilities and infrastructure and the licenses needed to utilize a radio frequency spectrum.	1999/9/8	-
5. Project Scheme)	Government Regulation	Minister of Domestic Affairs	PP50/2007	Procedure of Implementation of the Regional Corporation	This regulation stipulates the cooperation principle: efficiency, effectiveness and good faith; procedure for the regional cooperation; approval from the Regional House of Representative; result of the cooperation; dispute settlement; cooperation changes; termination of cooperation, guidance and controlled by the minister; cooperation board; to help the performance of head of region in implement the cooperation. In terms of ERP, this regulation prescribes the procedure of regional cooperation as a reference for the procurement of goods to DKI Jakarta.	2007/8/22	-
	Presidential Regulation	President's Office	PresReg54/ 2010	Procurement of Goods or Government Services	This regulation stipulates the procedure of procurements: the principles; the parties of the procurements of goods; general plan of procurement of goods; managements of the procurements goods; procurements of goods by the good/services provision; use of production of procurement goods/ services; control, supervising, complain and sanctions, procurements of goods/ services by international selection, development of human resources, in the procurement organization, the fund raising of the procurement of goods/ services by the foreign debt and the participation of foreign company to the procurement of goods/ services. In terms of ERP, this regulation provides a detailed regulation of the Working Group ULP (Procurement Service Unit)/ Procurement Officer who prepares and establishes Goods / Works Construction / Services Provider selection method and tendering process.	2010/8/6	as has been amended two times: Perpres 35/2011 and Perpres 70/2012
	Minister Regulation	Minister of Domestic Affairs	MOHA 22/2009	Technical Procedure of Regional Cooperation	This regulation prescribes the scope and procedures on cooperation among regional governments, and cooperation between regional government and third parties. In terms of ERP, the regulation provides the possibility for cooperation between regional government and third parties in providing services and goods for ERP Project.	2009/5/22	-
6. PPP specifically for Infrastructure (Indonesian Gov.)	Presidential Regulation	President's Office	Perpres 67/2005	Cooperation between the Governmetn and Business Entity in Infrastructu	This regulation stipulates the types, purposes of the cooperation principle between government and business entities, identification and determination of project based on the cooperation agreement; initial tariff and adjustment tariff; business entity procurement procedure in cooperation agreement for 8 infrastructure projects. Since ERP is not	2006/11/9	as has been amended three times: Perpres 13/2010, Perpres 56/2011, and Perpres 66/2013

Category	Law Type	Competent Authority	Regulation #	Title	Summary	Enacted Date	Remarks
				re Provision	included in such 8 infrastructure projects, thus this regulation is not related to ERP Project.		
		Minister of Finance	Perpres 78/2010	Infrastructure Guarantee in the Cooperation Project between Government and Business Entity	This regulation stipulates principles, scopes, general requirements, infrastructure guarantee, business entity and infrastructure guarantee for 8 infrastructure projects under Perpres 67/2005. In terms of ERP, this regulation is not applicable.	2010/12/21	-

4.2 Legal Basis of Imposition of ERP

4.2.1 Imposition of ERP

In Article 60 (2) of PP 32/2011, traffic demand management can be conducted by the traffic restriction shown as below. Article 60 (3) and Article 79(1) of PP 32/2011 also stipulate that traffic restriction on private vehicle and goods vehicle can be done by the imposition of Traffic Control Retribution.

Based on Article 1(2) of PP 97/2012, Traffic Control Retribution is a collection on the use of certain road segments, certain corridors, certain areas at certain time, and certain density level.

In addition, Article 8 of PP 97/2012 stipulates that the system and equipment for ERP the regional government must provide is required to be an electronic system.

As stated above, ERP Charge could be considered as Traffic Control Retribution based on current regulations and be introduced on private vehicle and goods vehicle.

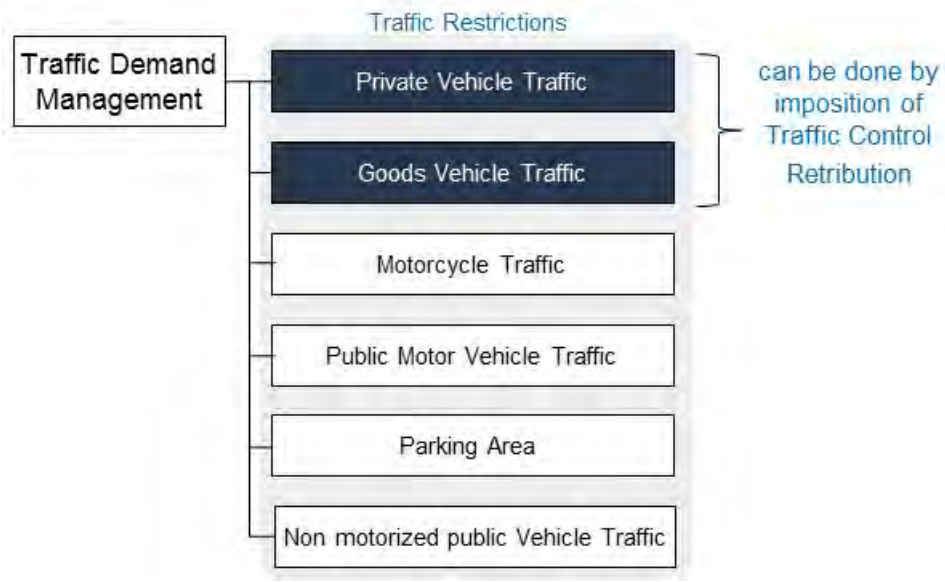


Figure4-2-1 Structure of Traffic Restrictions for Traffic Demand Management

Source: Created by JICA ERP study team based on Article 60 of PP32/2011

4.2.2 Implementation Body

Article 2(2) of PP 97/2012 stipulates that the collection of Traffic Control Retribution shall be conducted by the provincial government in the provincial road segments. Article 2 of PP 32/2011 also stipulates that management and traffic engineering activities are the responsibility of Governor and Head of Police of the Republic of Indonesia for provincial road. Based on current regulations shown as the table below, local government is responsible for introducing system and equipment necessary for Traffic Control Retribution.

Table4-2-1 Overview of the related articles (ERP Implementation Body)

	Article	Summary
PP32/2011	Art. 81	For the introduction of Traffic Control Retribution, local government must do: a. provision of roads that will be imposed restrictions that meets the requirements of the minimum standards; b. installation, repair, and maintenance of equipment roads in the area, corridor, or certain roads directly related to road users on roads and / or intersection, and c. supply systems and equipment necessary to implement the traffic restrictions for private vehicles and goods vehicles.
PP97/2012	Art. 8	For the implementation of Traffic Control Retribution, the regional government shall be required to provide the system and equipment required for applying the limitation of motor vehicles traffic of individuals and goods. The system that stated in this provision is an electronic system.

4.2.3 Targeted Roads

Article 79(3) of PP 32/2011 stipulates that traffic restriction on private vehicle and goods vehicle may not be conducted on national roads. So the applicable roads of ERP are all roads excluding national roads.

4.2.4 Charged Classes of Vehicle

Article 3 of PP 97/2012 stipulates as the following table. ERP charged classes of Vehicle are limited (e.g. motorcycles excluded).

Table4-2-2 ERP Charged Classes of Vehicle

- Private vehicle (including Passenger car; Bus; and Car for goods with total volume < 3,500 kg.)
- Goods vehicle (including all public and private vehicle for goods with total volume ≥ 3,500 kg.)
  - Exception
    - ✧ Motorcycles, public passenger vehicles, fire brigade vehicles, and ambulances

4.2.5 ERP imposition Criteria

PP97/2012 and PP32/2011 stipulates as the following table.

Table4-2-3 ERP imposition Criteria

Item	Summary
Charged road segments, corridors, or areas	· Having 2 road lines, each lane having at least 2 lanes; and · Mass public transport network and service are available in the route. ➢ The mass public transport should meet the minimum service standard specified by the minister responsible for the means and facilities of road traffic and transport. (Article 4 of PP 97/2012, Article 79(2) of PP 32/2011)
Charged time	· Charged time shall be determined based on the level of traffic density in charged road segments, corridors or areas. · The level of traffic density shall be determined based on the criteria of: a. Having the ratio of the traffic volume of motor vehicles to the road capacity in one of the road lanes ≥ 0.9; and ✧ The ratio means the comparison of both which is measured when the traffic restriction for motor vehicles for individuals and goods is not applied. b. Having the average speed ≤ 10km/h, ✧ The average speed means the average speed of vehicle which is measured when the traffic restriction for motor vehicles for individuals and goods is not applied. Occurring regularly every working day. (Article 5 of PP 97/2012, Article 79(2) of PP 32/2011)

4.2.6 Introduction Process

Article 5 of PP 97/2012 stipulates that the determination of criteria fulfillment for ERP imposition shall be determined by the ministry who is responsible for road traffic and transportation (the Ministry of Transportation).

Based on Article 7 of PP97/2012, the regional government who will perform ERP submits a request for determination of criteria fulfillment to the Ministry of Transportation. The Minister shall determine the fulfillment of criteria within maximum sixty (60) work days effective from the date of the request receipt.

4.2.7 Charge Amount

Article 11(1) of PP 97/2012 stipulates that effectiveness of traffic control and ability to cover implementation costs shall be considered. According to Article 155 of UU 28/2009, amount of Traffic Control Retribution shall be reviewed at least once in every 3 years.

Table4-2-4 ERP Charge amount (the amount of Traffic Control Retribution)

	Article	Summary
PP97/2012	Art. 11(1)	(1) The determination of the amount of Traffic Control Retribution shall meet the principles and objectives as follows: a. effectiveness of traffic control; and b. that could cover the cost of implementation. (2) The effectiveness of traffic control as intended in paragraph (1) letter a shall be measured based on the congestion cost (3) The cost of implementation as intended in paragraph (1) letter b shall include capital cost, operational cost, maintenance cost and interest expense.
UU 28/2009	155	The amount of Traffic Control Retribution is reviewed at least once in 3 (three) years.
UU 28/2009	155 (2) and (3)	Review on the amount of Traffic Control Retribution is considering price index and economic increase. Amendment of retribution tariff must be determined in the form of governor regulation (head of regional regulation). Elucidation of Article 155(3) of Law 28/2009 stipulates that the head of regional can adjust the retribution tariff if the costs of services are increase significantly and/or the retribution tariff is no longer effective by the reason to control the demand of services.

4.2.8 Formulation of Regional Regulations on ERP (Traffic control Retribution)

UU 28/2009, PP97/2012 and PP 32/2011 do not regulate the details of imposition of Traffic Control Retribution. Shown as below, UU 28/2009, PP97/2012 and PP 32/2011 stipulates that the details shall be regulated by regional regulation.

Table4-2-5 Formulation of Regional Regulations on ERP

	Article	Summary
PP 32/2011	Art. 83	(1) The set of the implementation of traffic restrictions by imposing retribution on the area of traffic control, corridor, or a particular road as referred to in Article 80 shall be regulated by regional regulation. (2) Regional regulations as referred to in paragraph (1) should at least contain: a. areas, corridors, or certain road traffic restrictions imposed by the imposition of traffic control retribution; b. the amount of traffic control retribution; c. procedures for collecting and using traffic control retribution; and d. utilization of traffic control retribution.
PP 97/2012	Art. 6	The determination of certain road segments, certain corridors, or certain areas, at certain times which fulfill the provisions as intended in Article 4 and Article 5 shall be regulated in the Regional Regulation.
UU 28/2009	Art. 156	(1) Retribution is determined by Regional Regulations. (3) Regional Regulations concerning Retribution shall at least regulate provisions pertaining to: a. Name, object, and the Parties Subject to Retribution Charges; b. Type of Retribution; c. Method in measuring the level of utilization of the concerned services; d. Principles applied in stipulating the structure and the level of tariff of Retribution; e. Structure and amount of Tariff of Retribution; f. Territory of collection; g. Stipulation of payment, location of payment, installments, and postponement of payment; h. Administrative sanctions; i. Billing; j. Deletion of Retribution Charges receivables that have expired; k. Effective date. (4) Regional Regulations concerning Retribution Charges may also regulate provisions pertaining to: a. Period of Retribution Charges; b. Granting of relief, reduction, and release in certain matters on principal Retribution Charges and/or the sanctions thereof; and/or c. Procedures for deletion of Retribution Charges receivables that have expired.

For appropriate introduction of ERP, regional regulations need to stipulate the details of the followings.

- Procedure and operation for registry management of On-Board Unit (OBU)
- Mandatory installation of OBU compatible with ERP
- Timing of the retribution collection.
- Definition of ERP Violation and Enforcement.
- Procedures of charging vehicle non-equipped OBU
- Procedures of charging vehicle from outside of DKI Jakarta

Pursuant to Article 157 of PP28/2009 for provincial tax and Retribution, enactment of regional regulations regarding introduction of Retribution should follow the procedure shown as below. Formulation of regional regulation regarding Retribution must be evaluated by MOHA coordinating with MOF.

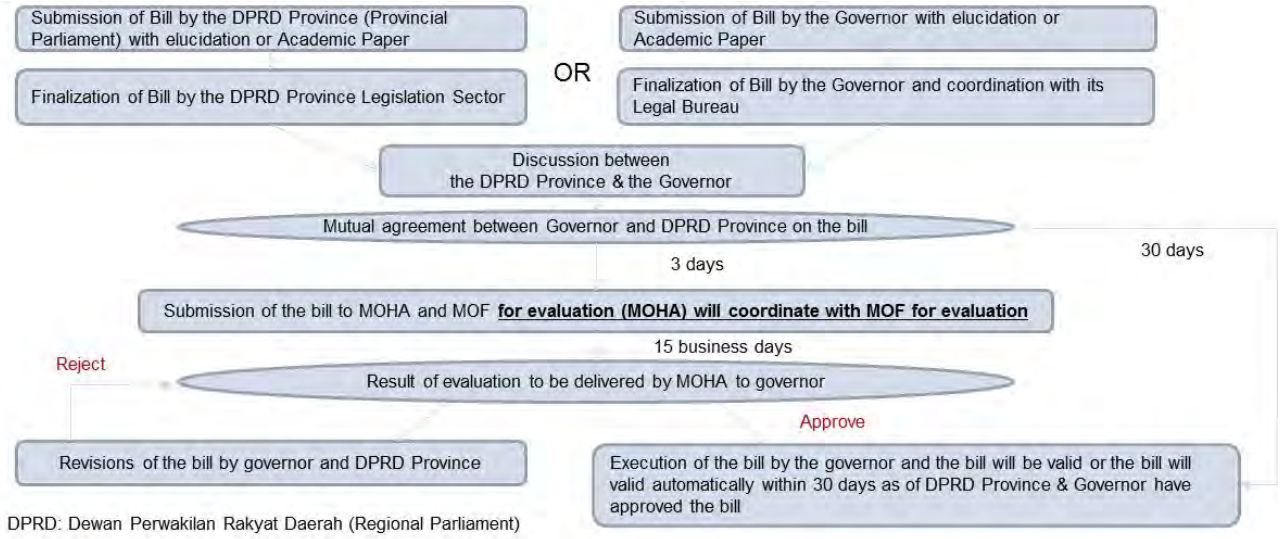


Figure4-2-2 FLOWCHART FORMULATION OF REGIONAL REGULATION REGARDING RETRIBUTION

Source: Created by JICA ERP study team based on Article 157 of PP28/2009 regarding provincial tax and Retribution

4.2.9 ERP Violation and Enforcement

Measures of payment failure of ERP charge and vehicles without on-board unit need to be stipulated. Especially, in case payment failure of retribution is considered as unpaid money, it's possible to demand it, however, the unpaid status is not within "illegal action" and it may be hard to make an arrest on the spot.

In the existing legal framework, UU22/2009 stipulates the definition of road traffic violation and the enforcement procedure as below. Therefore, the definition of ERP violation should be shown on road signs and others to road users and any violation of ERP should be sanctioned within the scope of UU22/2009. In the 3 in 1 traffic control, the enforcement of violation is in accordance with UU 22/2009.

Although UU28/2009 also regulates violation of retribution, it is a penalty for direct retribution collectors who fail to pay collected retribution to the local government. Like entrance fee for zoo, retribution from citizens is

based on the assumption that public service is provided to them at the same time, so there is no penalty for citizens who violate retribution.

- Pursuant to UU22/2009 (Traffic and Road Traffic), any violation of traffic signs, road markings, and/or other traffic signal device must be sanctioned.
  - In terms of ERP users, failure to comply with orders, prohibitions, or instruction on traffic signs is subject to imprisonment of a max. 2 months or fine of a max. IDR500,000 (Art. 287 UU 22/2009).
- Pursuant to UU28/2009 (Regional Tax & Retribution), the failure to fulfill the obligation to pay retribution must be sanctioned.
  - In terms of the Retribution Collector, the failure to comply with the above in a timely manner shall result the Retribution Collector to be imposed administrative sanction of 2% interest every month from the payable retribution (Art. 160 UU 28/2009).
  - In terms of the Retribution Collector, the failure to fulfill the obligation to pay retribution resulting to the loss of regional finance shall result the Retribution Collector for maximum of 3 months of confinement or for maximum criminal fine of three times the amount of the entire outstanding or the remaining unpaid retribution (Art. 176 UU 28/2009).

4.2.10 Enforcement Body

Investigation of the crime of Traffic and Transportation shall be conducted by Police force of Republic of Indonesia and the investigator of specific civil servant in the field of traffic and road transportation that is appointed by the Head of Province Department that is in charge of facility and infrastructure of traffic and road transportation in accordance with UU 22/2009. It is supposed that the enforcement body of ERP violation shall be determined under the UU 22/2009 as enforcement against violation of road traffic as well.

4.2.11 Motored Vehicle Registration Database

In Head of Indonesian Police Force Regulation 5/2012, Article 31 (1) stipulates that identification and verification of motored vehicle identity registration is conducted towards:

- Physical data of the motored vehicle, type, variety, model, year of manufacture, cylinder, machine number, color, fuel, number of wheels and fuse;
- Fungsional data such as the utilization and eligibility of the motored vehicle;
- Juridical data such as the origin of the motored vehicle and identity of the owner.

Pursuant to the Article 31 (2) of Head of Indonesian Police Force Regulation 5/2012, the data resulted from the identification and verification of motored vehicle identity registration serves as forensic data of the national police. Current issue is that it is difficult to build an integrated database because motored vehicle registration database varies depending on the manager.

4.3 Institutional Framework on Retribution, Regional Government Revenue and Expenditure

4.3.1 Legal Basis of Traffic Control Retribution

Article 80 (1) of PP32/2011 stipulates that Traffic Control Retribution is a public service retribution. Public service retribution is not a kind of tax but a payment for public service. Retribution is considered as revenue of regional government.

Article 3 (1) of PP97/2012 stipulates that the object of traffic control retribution is the use of specific roads, specific corridors, or specific areas on a specific time by private or freight motored vehicle. Therefore, in terms of PP32/2011, it is supposed that Traffic Control Retribution is considered as a payment by road users for usage of public service such as provision of public road, however, it becomes revenue of regional government directly and it is not tariff as toll road tariff.

Article 160 of UU28/2009 also regulates that collection of retribution is done through the issuance of a letter stating the payable retribution or other documents. Other documents can be in the form of ticket, coupon, and subscription cards. No current laws and regulations explicitly regulate electronic charge of retribution.

4.3.2 Usage of income received from Traffic Control Retribution

According to Article 9 (1) of PP 97/2012 and Article 80 (2) of PP32/2011, income received from Traffic Control Retribution must be utilized to increase the traffic performance and public transport services.

4.3.3 Overview of Institution on Regional Government Revenues and Expenditures Budgetary (APBD)

Article 26(1) of MOHA Regulation 13/2006 (as lastly amended by MOHA Regulation 21/2011) stipulates that income received from the collection of retribution is classified as regional government revenue. According to Article 122 of MOHA Regulation 13/2006, all regional government revenues and expenditures for the implementation of local government affairs shall be managed within Regional Government Revenues and Expenditures Budgetary (APBD).

In addition, according to Article 15 of MOHA Regulation 13/2006, under the framework of Regional Government Revenues and Expenditures Budgetary (APBD), changes of Regional Government Revenues and Expenditures, and implementation of Regional Government Revenues and Expenditures each year is set by regional government regulations.

In order to use the income received from collection of Traffic Control Retribution, such expenses must be formulated in Regional Government Revenues and Expenditures Budgetary (APBD) which is determined annually under regional regulation as well.

Regional regulation on Regional Revenues and Expenditure (APBD) shall be formulated in accordance with the following flowchart. For formulation of Regional Revenues and Expenditure (APBD), regional regulation on APBD must be stipulated annually with approval of DPRD (Dewan Perwakilan Rakyat Daerah: Regional

Parliament) and evaluation of MOHA. The purpose of evaluation of MOHA is to ensure whether the draft of regional regulation is in accordance with higher hierarchy laws and regulations.

In case approval by DPRD and/or evaluation by MOHA for draft regional regulation on APBD are delayed, there is a possibility that annual expenditure for traffic performance activity improvement from income of traffic control retribution not conducted as scheduled.

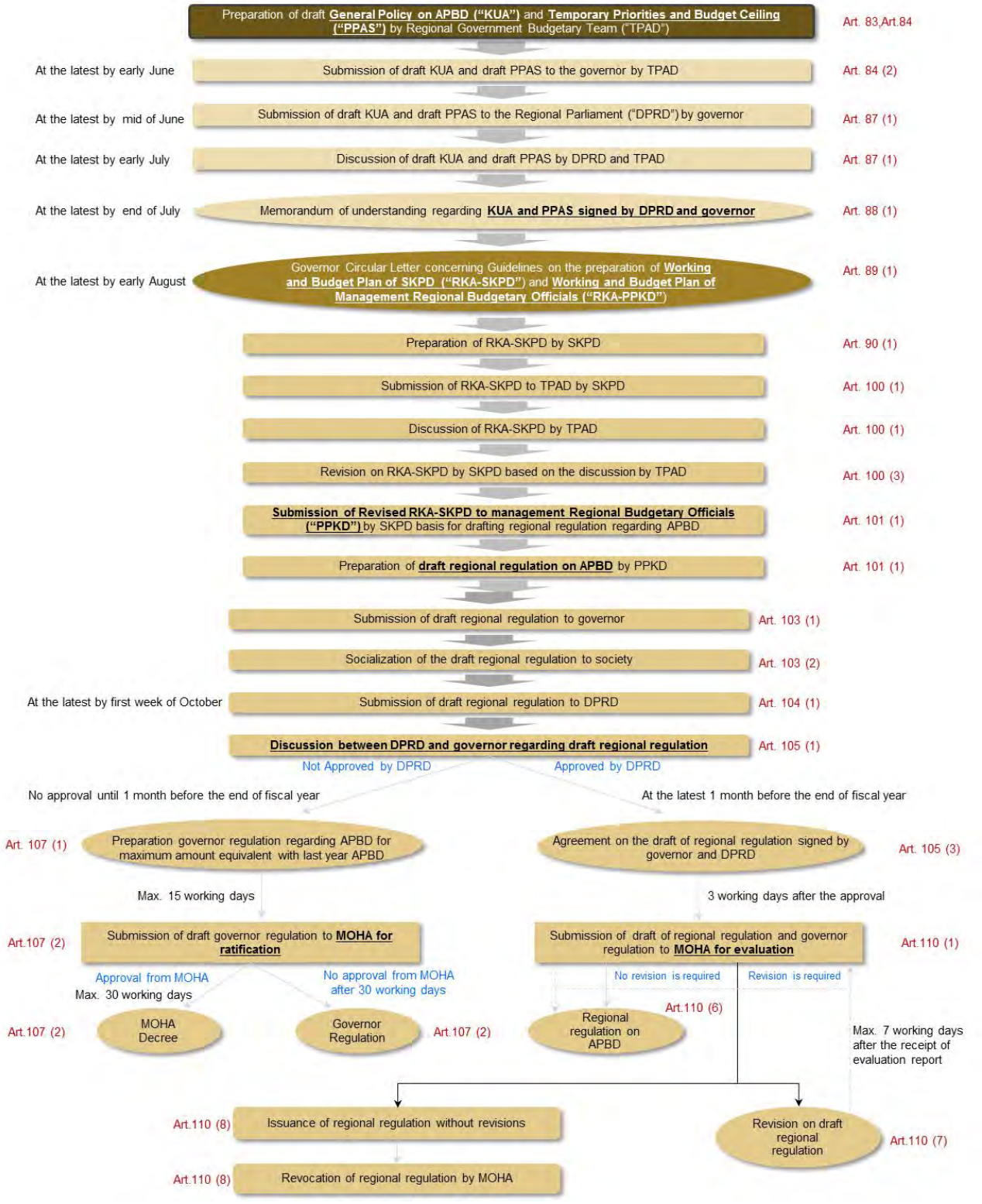


Figure4-3-1 FLOWCHART OF FORMULATION OF REGIONAL REVENUES AND EXPENDITURE (APBD)

source: Created by JICA ERP study team based on MOHA Regulation 13/2006 (as last amended by MOHA Regulation 21/2011)

4.3.4 Collection Body of Traffic Control Retribution

According to Article 10 of MOHA Regulation 13/2006, collection of non-tax revenue of regional government such as retribution is specified as one of responsibility of Regional Apparatus Working Unit (SKPD), part of regional government. Article 1 (10) of MOHA Regulation 13/2006 stipulates that SKPD (Regional Government Working Unit) or Regional Apparatus Working Unit is regional apparatus in the regional government level as the user of regional budget/goods. Thus, it is supposed that a SKPD has the authority of collection of Traffic Control Retribution.

Pursuant to Article 122 of MOHA Regulation 13/2006, SKPD which has the authority to collection and use regional government revenue needs to comply with the following regulations.

- Income of SKPD (Regional Government Working Unit) is prohibited to be used directly to finance expenditure, unless otherwise regulated under the prevailing laws and regulations.
- Income of SKPD (Regional Government Working Unit) in form of cash money or cheque must be deposited into the regional government general treasury account within maximum of 1 (one) working day.

Therefore, Traffic Control Retribution collected by SKPD must be deposited to Regional Government Account within 1 working day. The conceptual diagram of collection and usage of Traffic Control Retribution is shown as below.

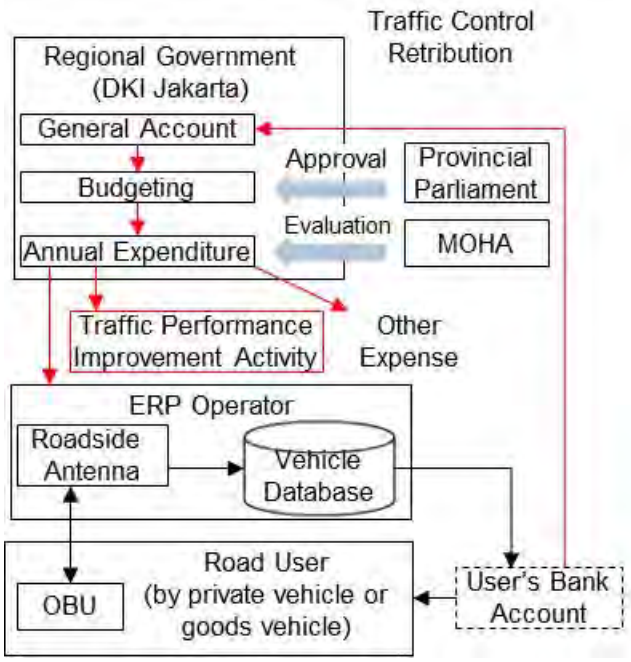


Figure4-3-2 Conceptual Diagram of Collection and Usage of Traffic Control Retribution

Source: Created by JICA ERP study team

4.4 Legal Framework on Project Scheme

4.4.1 Project Scheme

4.4.1.1 Laws and regulations which regulate Public Private Partnership

The partnership between public and private entities in Indonesia is regulated under Presidential Regulation 67/2005 (Presreg 67/2005) which has been amended three times and PP 50/2007.

(1) Presidential Regulation 67/2005

Presidential Regulation 67/2005 (Presreg 67/2005) regulates the partnership between the government of the Republic of Indonesia (the minister/head of institution/head of regional government) and a business entity in the activity which consists of construction works to build or increase the performance of infrastructure and/or management of infrastructure and/or maintenance of infrastructure for the purpose of increasing the advantages of infrastructure.

According to the 2nd amendment of Presreg 67/2005 (Presreg 13/2010), the sectors of infrastructure that can be partnered with business entity are as follows:

i. transportation infrastructure, consisting of services in relation with the airport, procurement of and/or services of seaport, facilities and infrastructure of railroad system;
ii. road infrastructure, consisting of toll road and toll bridges;
iii. irrigation infrastructure, consisting of water canal;
iv. drinking water infrastructure, consisting of water obtainment building, transmission network, distribution network, water treatment installation;
v. sewage infrastructure consisting of sewage treatment installation, collecting network and main network, and waste facility including transportation and disposal area.
vi. telecommunication and informatics infrastructure, consisting of telecommunication and e-government infrastructure;
vii. electric power infrastructure, consisting of power plant, including development of geothermal energy, transmission, or distribution of electricity; and
viii. oil and gas infrastructure, including transmission and/or distribution of oil and gas.

It can be concluded that the Presreg 67/2005 limits infrastructure projects to those that are only in line with the above mentioned eight sectors. However ERP Project is not covered in the eight sectors stipulated by Presreg 67/2005, taking into account the attitude of Indonesia. So it is supposed that the ERP Project cannot be conducted through the PPP infrastructure scheme under Presreg 67/2005 at this time.

(2) PP 50/2007

The cooperation regulated under PP50/2007 and MOHA Regulation 22/2009 regulates the agreement between:

- governor and other governor;
- governor and regent/mayor;
- regent/mayor and other regent/mayor; and or
- governor, regent/mayor and third parties (private entities, regional government-owned enterprise (BUMD) and other domestic legal entities)

Pursuant to Article 4 of PP50/2007, the object of the cooperation agreement regulated by the PP50/2007 and MOHA Regulation 22/2009 is the entire regional government affairs that is the authority of autonomous region and can be in the form of public service procurement.

According to Article 10 of UU 32/2004, regional government has the full authority and regional autonomy to implement their governmental affairs that falls under their authority, except for the governmental of the central government which are as follows:

i. foreign politics;
ii. defense;
iii. security;
iv. judicial;
v. national physical and monetary; and
vi. religion.

PP 50/2007 is open to other projects as long as the projects fall under the authority of the regional governments as stated above. The broad scope of partnership project in PP 50/2007 provides the possibility for the ERP Project to be facilitated under partnership agreement between the regional government (DKI Jakarta) and private entity.

Pursuant to MOHA Regulation 22/2009, partnership agreements under PP 50/2007 can be in the form of the following table. MOHA Regulation 22/2009 stipulates the schemes such as BTO, BOT and other project scheme. Based on MOHA Regulation 22/2009, BTO and BOT can be applied as project scheme in which private entity is responsible for finance, construction and maintenance of system and equipment for ERP.

Article 2 of PP 32/2011, legal basis for ERP charge, stipulates that management and traffic engineering activities for state road are implemented on provincial government's responsibility. Management and traffic engineering activities include regulation, engineering, empowerment and supervision in Article 3 of PP 32/2011 and engineering, as defined in Article 28 of PP32/2011, includes: "repair of geometric roads and / or intersections as well as road equipment that is not directly related to road users", "procurement, installation, repair, and maintenance of road equipment related directly to road users" and "optimization of traffic engineering operations to improve the order, smoothness, and the effectiveness of law enforcement". These facts indicates

that procurement, installation, repair and maintenance of ERP equipment should be implemented on provincial government's responsibility and procurement of ERP equipment is needed to be conducted based on traditional public procurement system.

Table4-4-1 Partnership Schemes under MOHA Regulation 22/2009

Partnership Scheme		Summary	
i. Service Contract	a. Operation/ Maintenance Contract	Partnership model	Regional government appoints business entity for operation/maintenance of public services facility.
		Object of partnership	Can be implemented in every public service facilities.
	b. Management Contract	Partnership model	Regional government appoints business entity for development of facilities owned by regional government.
		Object of partnership	Can be implemented in every public service facilities.
	c. Lease Contract	Partnership model	Business entity will lease infrastructure facility based on contract to regional government to be operated and maintained by the regional government for a certain period of time.
		Object of partnership	Can be implemented in every public service facilities.
	d. Concession Contract	Partnership model	Business entity is given concession right or responsibility to provide development services over partial or whole system of certain infrastructure, including operation and maintenance of the facility and providing service to the community and working capital;.
		Object of partnership	May be implemented for the procurement of infrastructure which is integrated in a region for long operation period (more than 25 years). This scheme is recommended to be conducted when the economic and financial of the regional government is in good state.
ii. Build Contract	a. Build Transfer Operate	Partnership model	Business entity is given the responsibility to build facility/infrastructure, including to finance and after the construction is complete, the control and ownership of said facility/infrastructure is transferred to the regional government. Further, regional government gives back the right to operate for a certain amount of time in order to receive return of investment capital and reasonable profit.
		Object of partnership	Can be implemented in to provide public services in form of facilities or infrastructure, such as road, waste, clean water, amusement park, etc.
	b. Build Operate Transfer	Partnership model	Business entity is given the right to finance and build a facility/infrastructure followed by operation and can collect fees during certain amount of time in order to receive return of investment capital and reasonable profit. After the certain amount of time has elapsed the ownership shall be transferred to regional government.
		Object of partnership	Can be implemented in to provide public services in form of facilities or infrastructure, such as road, waste, clean water, amusement park, etc.
	c. Build Lease Transfer	Partnership model	Business entity is given the responsibility to build infrastructure including to finance. Regional government then lease the infrastructure through leasing agreement from the business entity for a certain period of time and after the leasing term has elapsed, the regional government shall have control and ownership of the infrastructure.
		Object of partnership	Can be implemented in to provide public services in form of facilities or infrastructure, such as road, waste, clean water, amusement park, etc.
iii. Rehabilitation Contract	a. Build Add Develop Transfer	Partnership model	Business entity is given the right based on the contract with the regional government to add facility to an existing public facility. Further, the business entity will be given the right to manage the additional facility until the business entity has received return of investment capital and reasonable profit.
		Object of partnership	Can be implemented in to provide public services in form of facilities or infrastructure, such as road, waste, clean water, amusement park, etc.
	b. Joint Venture	Partnership model	Regional government together with business entity form a business entity in form of Limited Liability Company (Perseroan Terbatas) to build and/or manage asset owned by the joint venture company.
		Object of partnership	Joint venture company can participate in providing public services, in accordance with prevailing laws and regulations.

source: Created by JICA ERP Study Steam based on Attachment II of MOHA Regulation 22/2009

The examination of Project scheme for ERP project and comparison is studied in chapter 5.

4.4.2 Tender Process

For partnership between regional government and private entity based on PP 50/2007, the procurement of goods or services is conducted by way of tender as follows.

4.4.2.1 Laws and regulations which regulate Tender Process

Tender process is c*l*assified into 3 types of tender depending on the specification of the goods/services as follows: (a) public tender, (b) limited tender and (c) simple tender.

The applicable laws and regulations to tender process are Presidential Regulation 54/2010(Presreg 54/2010; lastly amended by Presidential Regulation 70/2012) and Head of NPPA Regulation No. 14 of 2012 ("NPPA Regulation 14/2012"). The competent authority in terms of general tender process is National Public Procurement Agency / *Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah*] "("NPPA").

(1) Definition and Applicability of each tender

The definition and applicability of each tender are shown in the following table. Public tender applies to all tender process in principle. However, limited tender can apply to ERP project when its construction, operation and maintenance work are included in "complex works" mentioned below.

Table4-4-2 Definition of each tender

	Definition
Public Tender"	"Public Tender" is defined as selection method of goods/construction works/other services providers for all works which can be participated by all goods/ construction works/ other services providers who fulfill the requirements.
Limited Tender	"Limited Tender" is defined as selection method of goods/construction works providers which can only be conducted by limited provider and the works is complex in nature.
Simple Tender	"Simple Tender" is defined as selection method of other goods/services providers for works not exceeding IDR5,000,000,000.

Table4-4-3 Applicability of each tender

	Applicability
Public Tender	Public Tender applies generally to all tender process other than that is already covered by other tendering process (Article 36 (1) of Presreg 54/2010).
Limited Tender	Limited Tender applies to procurement of goods/service that requires complex works with limited provider of services or goods (Article 36(2) of Presreg 54/2010). "complex works" is illustrated under Article 1(36) of Presregf 54/2010 as works that requires high technology, high level of risk, utilize specially design utility and/or works which value exceeds IDR100,000,000,000 (one hundred billion Rupiah).
Simple Tender	Simple Tender applies to procurement of goods/service which value is not more than IDR5,000,000,000 (Article 37(1) of Presreg 54/2010).

(2) Qualification of Tender Participants

Qualification of the person/company that is entitled to participate in tender is stipulated in Article 19 of Presreg 54/2010 as follows:

a. comply with laws and regulations to carry out activities / business;
b. have the expertise , experience, technical and managerial capabilities to provide goods / services;
c. obtain at least 1 (one) work as provider goods / services within a period of 4 (four) years , either in the governmental or private environment, including subcontract;
d. provisions referred to in letter c, excluded for providers of goods / services which are established for less than three (3) years;
e. have sufficient human resources, capital, equipment and other facilities required for the procurement of goods / services;
f. In the event the provision of goods / services will be conducted through partnership, provider of goods / services shall have joint operation agreements / partnerships which stipulates partnership percentage and companies that represent partnerships;
g. has a basic capabilities for non-small business , except for consultancy works;
h. not under the supervision of the court, not in the state of bankruptcy, business activities are not being suspended and / or directors acting for and on behalf of the company is not under criminal sanction, as evidenced with a sign waiver by the Provider of goods/service;
i. as a taxpayer to have a Taxpayer Identification Number (NPWP) and has fulfilled tax obligations of the previous years (Annual PPTK) and have a monthly tax report on Income Tax Article 21, Income Tax Article 23 (if there are transactions) , Income Tax Article 29 25/Pasal and VAT (for the Taxable Person) at least 3 (three) months in the current year;
j. have the capacity to legally bind themselves to the contract ;
k. not included in the black list ;
l. have a fixed address and clear and can be reached by services delivery ; and
m. sign the Integrity Pact.

(3) Flow of tender process

Pursuant to Attachment of NPPA Regulation 14/2012 Chapter II A.8, generally, the tender process consists of the following stages. The stages are general in nature for post-qualification public tender with “one cover” or “*satu sampul*” method and eliminate system. Therefore, actual tender stages may differ depending on the qualification method, evaluation method, and submission of tender offer documents method:

(i) Announcement of tender in website of DKI Jakarta and in NPPA website/invitation for Limited Tender
(ii) Registration and retrieval of procurement documents by tender participant
(iii) Explanation on the procurement documents
(iv) Submission of tender offer documents to tender committee

(v) Opening and checking of the tender offer documents

(vi) Evaluation by tender committee of tender offer documents and qualification of bidder

(vii) Qualification verification of bidder who have fulfilled the required qualification

(viii) Drafting of Minutes of Tender Result by tender committee

(ix) Determination of the tender winner by tender committee

(x) Announcement of tender winner

(xi) Objection to the determination of tender winner (if any) to the tender committee

(xii) Appeal of objection to the determination of tender winner to the tender committee.

(xiii) Appointment Letter of Goods and Service Provider by [-Commitment Determination Officer/ *Petugas Pembuat Komitmen* (PPK).

1) *Qualification methods*

Pursuant to Article 56 of Presreg 54/2010, there are 2 types qualification methods are as follows:

1. Pre-Qualification (*Pra-kualifikasi*)

Pre-Qualification is the qualification assessment process that is conducted before the submission of tender offer document. Pre-qualification is conducted for procurement as follows:

a. selection of consultancy service;
b. selection of goods/construction work/other services provider which is complex in nature through public tender;
c. selection of goods/construction work/other services provider which is conducted by way of direct appointment, except for emergency response; or
d. selection of provider through direct procurement.

2. Post-Qualification (*Pasca-kualifikasi*)

Post-Qualification is qualification assessment process that is conducted after the submission of the submission of tender offer document. Post-qualification is conducted for procurement of the following:

a. public tender, except for public tender for complex works;
b. simple tender/direct appointment;
c. selection of individual consultancy service.

2) *Evaluation methods*

Pursuant to Article 48 of Presreg 54/2010, evaluation method consists of the following:

1. Elimination System (*Sistem Gugur*)

Evaluation of tender is generally conducted by using elimination system.

2. Value System (*Sistem Nilai*)

Evaluation using the value system is used for the procurement of goods / services that take into

account the technical superiority and compatible with the tender offer price, considering the price of tender offer is strongly influenced by the technical quality.

3. **Assessment Costs over The Economical Life Evaluation System (*Sistem Penilaian Biaya Selama Umur Ekonomis*)**

   Evaluation using cost assessment over the economical life evaluation system is used for the procurement of goods/services that take into account factors of economic age, price, operating costs, maintenance costs, and certain operating period.

3) *Submission of tender offer documents methods*

Pursuant to Article 47 of Presreg 54/2010, the tender committee determines the submission of tender offer documents methods, as follows:

1. **One Cover Method (*Metode Satu Sampul*)**

   One Cover Method is used for procurement of goods/services that are simple and that the price standard has been determined by the government and technical specifications can be clearly stipulated in the procurement document.

2. **Two Covers Method (*Metode Dua Sampul*)**

   Two Covers Method is used for procurement of goods/services where the technical evaluation is affected by the offering price and for procurement which uses value system or assessment costs over the economical life evaluation system**.**

3. **Two Stages Method (*Metode Dua Tahap*)**

   Two Stages Method is used for procurement of goods/services which have the following criteria;

   - Works that are complex in nature;
   - Fulfills all the work characteristic of the overall system, including consideration of the ease or efficiency of operation and maintenance equipment
   - There are other alternative on the use of the system and the design of the application of different technologies;
   - Technical evaluation may takes a long time; and/or
   - Require technical equivalency.

(4) Treatment of BUMD

ERP project is possibly implemented by BUMD as well since the definition of third party includes BUMD in Article 1 (3) of PP50/2007 regarding partnership agreement between local government and third party. According to the relevant laws and regulations, BUMD is not treated favorably in any of the tender process and treated equally to other bidders.

4.5 Others

4.5.1 Certification of Telecommunication equipment and device

UU36/1999 stipulates that usage of radio frequency spectrum must obtain the approval from Menkominfo. Permission for telecommunication equipment and device is also required based on the regulation of Regulation Menkominfo 29/2008.

Table4-5-1 Certification of Telecommunication equipment and device

Law	Article	Summary
Item 1 request for permission of usage of 5.8GHz radio wave		
UU 36/1999	33	The use of radio frequency spectrum and satellite orbit must obtain the approval from the Menkominfo (Ministry of Communication & Information).
Regulation of **Menkominfo** No. 27/PER/M.KOMINFO/ 06/2009	3	Usage of 5.8 GHz radio frequency band for wireless broadband is required to obtain class permit (*izin* kelas).
Regulation of Menkominfo No 17/PER/M.KOMINFO/ 09/2005 *1	3(4)	Class permit is attached to the certification of telecommunication equipment and device which is issued by the Directorate General of Post and Telecommunication ("**DGPT**"). Thus, the usage of 5,8 GHz radio wave only requires certification of telecommunication equipment and device from DGPT.
Item 2 Procedures for obtaining certification of electronic equipment and/or system for ITS services (including ERP system)from government in Indonesia		
"**Reg Menkominfo 29/2008**	7, 8	**Application of certification of telecommunication equipment and device must be applied by**: **(a) Manufacturer of the telecommunication equipment and device;** **(b) Distributor which is appointed by the manufacturer;** **(c) Importer;** **(d) Assemblers of telecommunication equipment and device; or** (e) **Institution who utilize the telecommunication equipment and device for its own purposes.** The certificate of telecommunication equipment and device consist of **(a) Certificate A for manufacturers or distributors** and (b) **Certificate B for importers, assemblers, or institution**. **The application letter to Certification Institution (Directorate of Standardization of Post and Telecommunication ("Certification Institution")** must be attached with the following documents: a. Copy of establishment deed and its changes; b. Copy of NPWP (Tax Registration Number); c. Copy of TDP (Company Registration Certificate) for distributor; d. Original of the appointment letter from the manufacturer for distributor; e. Copy of NPIK (Specific Import Number); f. Statement letter to guarantee with after sales service, unless such equipment and device will not be traded; g. Statement letter that the testing sample is available and ready to be tested; h. Copy of technical supplementary and operational document; i. Copy of EMC (Electromagnetic Compatibility) test result and statement letter with stamp duty from the applicant on the validity of EMC test result; j. Copy of MRA (Mutual Recognition Arrangement) document, for the evaluation of documents related with MRA; k. Statement letter with stamp duty from the applicant stipulating that the technical and quality specification of the CPE (Customer Premises Equipment) is the same with the technical and quality of the CPE which has received the certificate through measurement test; Statement Letter with stamp duty from the manufacturer that guarantees the technical and quality specification of the equipment and group telecommunication device and or access group (Non CPE) is the same with the technical and quality specification of the equipment and group telecommunication device and or access group (Non CPE) which has received the certificate through measurement test. Upon the fulfillment of the abovementioned required documents, the **next step is testing of telecommunication equipment and device** by way of (a)measurement test which is conducted by a test institution which is laboratory appointed by DGPT and/or (b) evaluation of documents by the Certification Institution. Such test must be conducted based on technical requirements determined by the DGPT. Further, the Certification Institution will issue certificate of telecommunication equipment and device which has been fulfilled the technical requirements within 2 business days as of the evaluation of the test report. The Certification Institution will announce the telecommunication equipment and device which has obtained certification through DGPT's website.
Item 3 the current condition on the allocation of usage of radio frequency spectrum for ITS		
"**Reg Menkominfo 29/2009**"	1	Allocation of radio frequency is usage of allocation of frequency band in the table of allocation of frequency for utilization by one or more radio communication agency. The details of table of allocation of frequency are attached to Reg Menkominfo 29/2009.

Note:*1 Regulation of Menkominfo No 17/PER/M.KOMINFO/09/2005 as amended by Regulation of Menkominfo No. 23/PER/M.KOMINFO/12/2010

4.5.2 Authority of DKI Jakarta

Unlike other provinces of Indonesia, DKI Jakarta has special tasks, rights, obligations and responsibilities as a capital city of Indonesia. Thus, this section reviews current laws and regulations on the special authority of DKI Jakarta in terms of ERP introduction.

According to Article 26 (4) of UU 29/2007, to the extent it has not been regulated or in conflicted with other prevailing laws and regulation of higher hierarchy, the DKI Jakarta provincial government has authority to enact an implementing regulation within its authority in the field of transportation. The DKI Jakarta provincial government has the authority for the determination and implementation of policy in the field of transportation.

4.5.3 Spatial Planning/Environment

Considering Article 61 of PP 32/2011, introduction of ERP needs to keep a consistency with related spatial planning. The current urban spatial planning (Rencana Tata Ruang Wilayah) of DKI Jakarta has been approved by MOHA (which conducts the governmental affairs in the field of spatial) and is stated in Regional Government Regulation 1/ 2012 concerning Area Spatial Planning of DKI Jakarta 2030. Article 29 of Regional Government Regulation 1/ 2012 includes implementation of traffic control mechanism in arterial roads. Therefore, this ERP project is consistent with current urban spatial planning.