

## 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.

This chapter reviews 2 types of project scheme for the implementation of ERP in the form of PPP project. Both are quite common in Toll Road Construction and O&M project in the emerging countries: BTO (Build & Transfer & Operation) and BOT (Build & Operation & Transfer). Based on the system that private entity recoups capital investment, the BOT scheme is categorized into the 2 schemes: the Unitary Payment and the Directly Collected from Road User.

The following 3 schemes are discussed in this chapter.

Table5-1-1 Type of Project Scheme

1	BTO	Unitary Payment	Private company prepares necessary fund, builds infrastructure and transfers it to the government. Then, operates it during a certain period. The recoup of investment for construction and operation is done by unitary payment.	BTO (Service-purchasing type)
2	BOT		Private company prepares necessary fund, builds infrastructure and operates it during a certain period. The recoup of investment for construction and operation is done by unitary payment. Then, transfers it to the government.	BOT (Service-purchasing type) (Including finance lease in ownership transfer type)
3		Directly Collected From Road User	Private entity prepares necessary fund, builds infrastructure and operates it during a certain period. The recoup of investment is done through operation revenue. Then, transfers it to the government.	BOT (Financially independent type)

Source: JICA Survey Team

In Indonesia, there is a tendency that the term PPP project is used for a project which is financially supported by the government and for the rest, the term BOT project is used. To avoid misunderstanding, we do not follow the typical term in this report

## 5.1.1 Unitary Payment Scheme (BTO: Build & Transfer & Operation)

### 5.1.1.1 Overview of Unitary Payment Scheme (BTO)

As already mentioned in Chapter 4, public procurement system is needed to be applied for BTO scheme since regional government is responsible for operation (including procurement and installation) under PP32/2011.

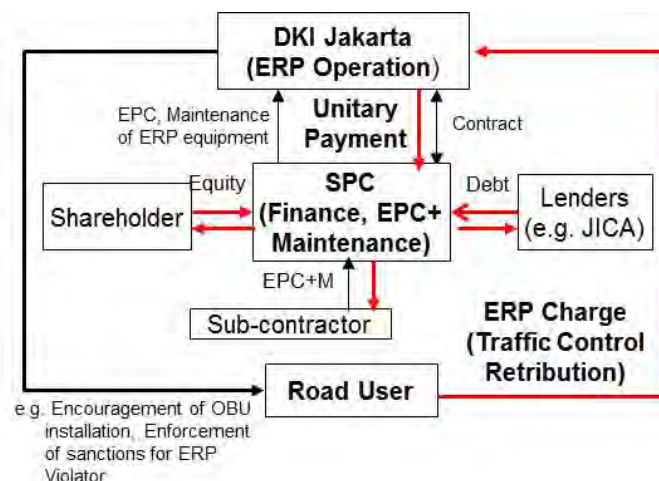
Under this Unitary Payment Scheme (hereinafter BTO Scheme), DKI Jakarta Gov. has the ownership of ERP system (Article 8 of PP97/2012) and is responsible for ERP operation. Under this condition, DKI Jakarta Gov. may contract private entity (SPC) for engineering, procurement, construction and maintenance (EPC&M) of ERP system. SPC supplies ERP system (EPC) with its own financing and provides maintenance service of ERP system to DKI Jakarta Gov. as an outsourcer. These will be depending on the contract between DKI Jakarta Gov. and the SPC.

DKI Jakarta Gov. acts a responsible body for management and traffic engineering against road users in this scheme (Article 2 of PP 32/2011).

DKI Jakarta Gov. collects Traffic Control Retribution from road users directly (Article 2(2) of PP97/2012, Article 10 of MOHA Regulation 13//2006 amended by MOHA Regulation 21/2011); the income of Traffic Control Retribution is regional government revenue. DKI Jakarta shall pay to SPC the unitary payment during project implementation period for the initial investment and maintenance cost borne by SPC in accordance with the contract between DKI Jakarta Gov. and SPC.

Thus, DKI Jakarta Gov. can implement ERP project without high initial investment for ERP from its own budget like general BTO scheme.

The conceptual diagram of BTO scheme is shown as below.



Source: JICA Survey Team

Figure5-1-1 Unitary Payment (BTO)

A multi-year contract between DKI Jakarta and SPC is required to secure SPC's capital recovery through unitary payment under general BTO scheme with public procurement system. The legal background of

multi-year BTO scheme contract between regional government (DKI Jakarta Gov.) and private entity is reviewed in the next section.

### 5.1.1.2 Multi-Year Contract regarding Cooperation Agreement between Regional Government with Private Entity

#### (1) Overview of Multi-Year Contract

Pursuant to Attachment I of MOHA Regulation 22/2009, cooperation agreement between regional government with private entity (that is funded by Regional Government Revenues and Expenditures Budget (“APBD”)) shall be conducted in accordance with Presreg 54/2010 amended by Presreg 70/2012. Pursuant to Article 50 of Presreg 54/2010, procurement of goods/services by regional government can be conducted under single-year contract or multi-year contract.

The definition of multi-year contract is shown as below. The major cases of multi-year contract by regional government include road and building construction projects but there is no case of multi-year contract including long-term maintenance and operation. However, based on a result of current examination and analysis in this study, implementation of construction work for the ERP project can be considered that the output of such construction work requires more than 12 months to be completed, and maintenance of ERP project must be continued for more than one turnover of fiscal year. So it is assumed that the ERP project is eligible for multi-year contract regulated by Article 54A (2) of MOHA Regulation 13/2006. Therefore, it is supposed that EPC and Maintenance contract for the ERP project between the regional government (DKI Jakarta) and private entities can be in the form of multi-year contract.

Table5-1-2 Definition of single year / multi-year contract

Type of contract	Definition
Single-year contract	is defined as a contract in which the implementation of work of said contract is funded by APBD for 1 (one) fiscal year only (Article 52 paragraph (1) of Presreg 54/2010).
Multi-year contract	<p>is defined as a contract in which the implementation of work of said contract is funded by APBD for more than 1 (one) fiscal year (Article 52 (2) of Presreg 54/2010).</p> <p>Type of multi-year contract (Pursuant to Article 54A (2) of MOHA Regulation 13/2006)</p> <p>(i) construction work where the implementation of the work is technically considered as one package and the output requires more than 12 (twelve) months to be completed</p> <p>(ii) work or activity that based on its nature must be continued for more than one turnover of fiscal year</p>

Source: JICA Survey Team

Table5-1-3 Multi-year contract case of regional government

No.	Related Laws	Projects	Period
1.	Perda Kalimantan Tengah No. 2 of 2011	Construction of Province Road Kalimantan Tengah	4 years (2011-2014)
2.	Perda Kabupaten Sanggau No. 8 of 2009	Construction of Regional House of Representative (DPRD) of Kabupaten Sanggau	4 years: Construction from 2009 until the end of 2011 Maintenance maximum until December 2012
3.	Perda Kota Bandung No 10 year 2011	Construction of Center Foot Ball Stadium	5 years (2009-2013)

Source: JICA Survey Team

## (2) Requirement for Multi-Year Contract

Pursuant to Article 52 (3) of Presreg 54/2010 and Article 54A of MOHA Regulation 13/2006, cooperation agreement between regional government with and private entity for EPC and/or O&M can be in the form of multi-year contract, under the conditions that it has been approved by DPRD and governor in the form of MOU, and that the term period of the multi-year contract shall not exceed the end of the expiration of the governor office term (one cycle office term for a governor is 5 years maximum). If the regional government/private entity intends to continue the work under the multi-year contract after the expiration of the governor office term, the regional government shall conduct the above procedure again. When ERP project is implemented through re-entering into a multi-year contract, it is preferable that the selection of private entity and the procedure of re-signing the contract should be conducted based on ERP system maintenance capability and experience of private entity for ensuring a stable ERP project management.

## (3) Requirements for Implementation of Multi-Year Contract in DKI Jakarta

The implementation of multi-year contract by DKI Jakarta Gov. is further regulated under the following regulations.

- Governor of DKI Jakarta Regulation No. 37 of 2011 concerning Procedures for Implementation of Regional Government Revenues and Expenditures Budget (“Governor DKI Jakarta Reg 37/2011”)
- Governor of DKI Jakarta Regulation No. 100 of 2003 concerning Procedures for Proposal and Approval for Multi-Year Contract (“Governor DKI Jakarta Reg 100/2013”);

Pursuant to Article 78 of Governor DKI Jakarta 37/2011, implementation of multi-year contract must be clear and must be technically accountable, profitable for regional government of DKI Jakarta and do not incur losses to the goods/service providers, so that future allocation of annual budget must be estimated. Budget allocation for multi-year contract must be prioritized to be determined in the annual budget.

Further, under Article 79 of Governor DKI Jakarta 37/2011, multi-year contract is conducted by 1 (one)

services/goods provider or consortium of services/goods provider. The multi-year contract must be made into master contract and annual contract. The master contract is only made once covering the total value of the works, term period of the work, details of the stages of work and payments annually. Meanwhile, the annual contract is made annually covering the value of works and the term of works for such 1 (one) fiscal year.

Pursuant to Article 80 of Governor DKI Jakarta Reg 37/2011, the process of procurement of goods/service using multi-year contract shall be conducted in accordance with the prevailing laws and regulations relating to the procurement of goods/services. In this case, the procedures for procurement of goods/ services are in accordance with Presreg 54/2010 and its implementing regulations.

- (1) Submission of written proposal by the relevant SKPD/UKPD to head of BAPPEDA;
- (2) Examination of the proposal and its attachment by BAPPEDA;
- (3) Issuance of recommendation from the governor of DKI Jakarta;
- (4) Execution of MOU between governor and DPRD approving Multi-Year Contract;
- (5) Procurement of goods/services; and
- (6) Execution of multi-year contract between the relevant SKPD/UKPD and the private entity..

The relevant laws and regulations in relation to multi-year contract for cooperation between regional government and private entity are not applied to financial contract among private entities. Therefore, the terms and conditions of such financial contacts can be determined at the discretion of the contracting parties.

In conclusion, it is supposed that the proposed scheme (BTO) utilizing multi-year contract between regional government and private entity for EPC and/or Maintenance of ERP is feasible from the perspective of the relevant laws and regulations. According to interview with BAPPEDA for applicability of multi-year contract in DKI Jakarta Gov., they showed understanding of implementation of ERP project by single company over multi years. However, appeal to BPKD of DKI Jakarta is still needed to realize BTO scheme utilizing multi-year contract because an applicable criterion for multi-year contract of service is strict.

### **5.1.2 Unitary Payment (BOT: Build & Operate & Transfer)**

Pursuant to Article 2 of PP32/2011, regional government is responsible for implementation of management and traffic engineering activities including ERP in state road. Article 28 of PP32/2011 also regulates that regional government is responsible for procurement and installation of traffic control equipment. Therefore, it is currently difficult to introduce BOT scheme under which SPC maintains ERP with owning the facility even after construction.

As a scheme under which SPC can maintain ERP system with keeping ownership of the facility, application of finance lease in ownership transfer type based international accounting standard can be considered. In this finance lease, it is potentially recorded as an asset of DKI Jakarta when SPC leases it to DKI Jakarta Gov. and sets 75% of economic useful life as an irrevocability period even if SPC prepares necessary funds, maintains

ERP system, keeps the ownership and then.

However, Article 49 (5) of Public Asset Law 1/2004 bans giving state or regional asset into security to obtain finance. Setting a regulation of non-cancellation during lease period and guarantee for midterm cancellation can violate the above mentioned law and in that case there is a possibility that finance lease in ownership transfer type is difficult to apply.

PP 27/2014 regarding management of public asset regulates lease scheme, but its scope is a contract of leasing asset from public sector to private sector. So the law is not applied to the ERP project in which an asset is leased from private sector to public sector.

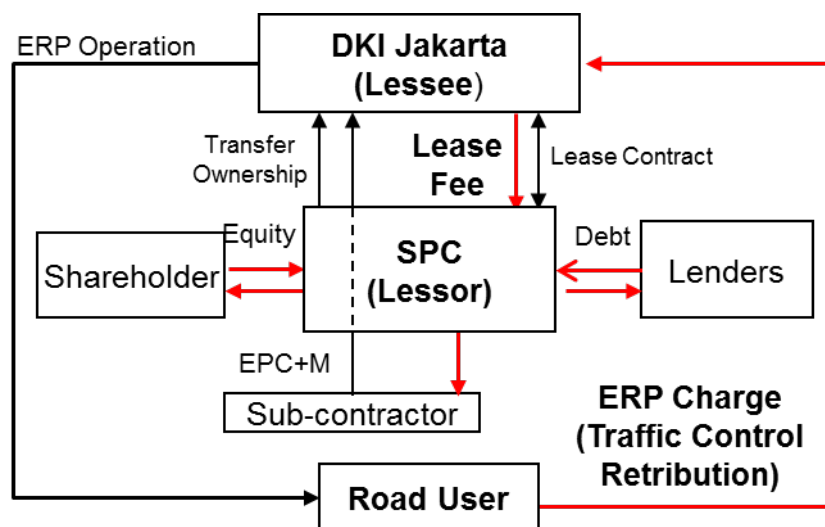


Figure5-1-2 Finance Release in Ownership Type

### 5.1.3 Directly Collected From Road User

Under the Directly Collected From Road User Scheme (hereafter as BOT scheme), DKI Jakarta contracts private entity (SPC) for engineering, procurement, construction and maintenance (EPC&M) of ERP system as same as the BTO scheme. The major difference between BOT scheme and BTO scheme is that the right to collect ERP charge is given to SPC by DKI Jakarta Gov. In BOT scheme DKI Jakarta Gov. is still being responsible of ERP operation and fulfills its responsibility for road users as an implementation body of traffic control and road design as well as unitary payment (BTO) scheme but doesn't collect ERP charge. On the other hand, SPC can collect ERP charge from road users directly and income resulting from the charge becomes SPC's revenue. SPC recoups the initial investment with income from the ERP charge and also covers maintenance cost.

Under the BOT scheme, DKI Jakarta Gov. does not need to pay initial investment cost and maintenance cost from their own budget as well as the unitary payment (BTO) since SPC copes with the cost.

However, only regional government can collect Traffic Control Retribution and SPC cannot have the authority to collect Traffic Control Retribution under the framework of the prevailing laws and regulations. Therefore, a project cannot be implemented under the Directly Collected from Road User scheme in the existing laws and

regulations.

The conceptual diagram of the Directly Collected from Road User (BOT) scheme is shown as below.



Source: JICA Survey Team

Figure5-1-3 Directly Collected From Road User (BOT)

#### 5.1.4 The Current study of ERP Project Scheme in Indonesia

We have interviewed the organizations involved with ERP project scheme, the DKI Jakarta and the Ministry of Finance, to know the current understanding of project scheme in Indonesia as follows:

##### 5.1.4.1 DKI Jakarta Provincial Government

In several local presses, the statement of the regional government was made either under the name of Governor or the Vice Governor that ERP Project is implemented without spending any APBD and is fully invested by Private Sector. The scheme is very similar to BOT scheme mentioned in section 5.1.2. During the discussions with DKI Jakarta Gov., some of the opinions were that although the APBD is abundant to implement ERP by their own, they would not like to spend their APBD because ERP is a kind of project that restrains people's activity and spending tax for it can be easily criticized. They would not like to take the investment risk for such a project.

We would conclude with assumption that DKI Jakarta Gov.'s concern for project scheme is how they can implement ERP with private investment.

##### 5.1.4.2 Ministry of Finance

The Directorate of Regional Tax and Regional Retribution of Ministry of Finance is involved with regulating the government regulation 97 (PP97/2012) which stipulates that ERP charge is a Regional Retribution.

According to this Directorate, since ERP charge is a Regional Retribution, the authority to collect ERP charge



only belongs to the Regional Government, DKI Jakarta Gov. Consequently, implementation and operation of ERP is done under the responsibility of DKI Jakarta. On the other hand, as long as complying with these conditions, the involvement of private sector is possible including providing goods and services for ERP and financing for the project.

We would conclude with assumption that Ministry of Finance's concern for project scheme is the compliance with the collection scheme of Regional Retribution.

### 5.1.5 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.).

Table5-1-4 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)	<p>e.g.: Encouragement of OBU installation, enforcement of sanctions for ERP violator</p>	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 from income of ERP charge

Source: JICA Survey Team

## **5.2 The Legal Feasibility of ERP Project Scheme**

Under current regulation, the legal feasibility of the ERP project scheme is mainly decided with following preconditions that ERP charge is a regional retribution and only DKI Jakarta Gov. has the authority to collect it. In regard of such conditions, it is possible to conclude that Unitary Payment Scheme (BTO) is legally feasible and can be applied without question.

On the other hand, the issue for Directly Collected From Road User Scheme (BOT) is that it is not applicable for collecting regional retribution. However, the scheme can be applied if the ERP charge is something else such as a Tariff. Therefore, in DKI Jakarta Gov., BOT scheme is considered as an applicable option if there are changes in Government Regulation in the future. Furthermore, there are opinions that it is the central government who defined ERP charge as a regional retribution, and if DKI Jakarta considers it is not practical, they have autonomy to change the definition by regulating a new regional regulation. In other words, DKI Jakarta Gov. can apply BOT scheme by stipulating ERP charge as a Tariff with their regulation. According to DKI Jakarta Gov., there are many cases of these discrepancies between the central government regulations and regional government regulation in practice, and it should be validated in the view point of which is more efficient and practical.

In our study, we will not deny the possibilities of changing the current Government Regulation nor regulating different Regional Regulation. However, we will stand in a view point that Unitary Payment Scheme (BTO) is more legally feasible and has no contradiction to apply with the current regulations.

## **5.3 Organization Framework, Operation, and Maintenance of ERP Project**

### **5.3.1 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.

### 5.3.2 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.

Table5-3-1 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

SPC will mainly take a role as an outsource contractor for EPC and maintenance of ERP Project. The regulating, traffic engineering, empowerment, and supervision will be done by DKI Jakarta. Due to the legal reason, the operation is done by DKI Jakarta in principle, and some of the daily operation is outsourced to the private sector.

### 5.3.3 Publicity of ERP

The roads are usually free of charge and ERP charge would be an additional cost for road users. Therefore before the commencement of ERP, it is necessary to make people understand why they need to pay for ERP charge and raise social acceptance. Two important factors to raise social acceptance are validity of targeted route and the validity of ERP charge amount and well prepared publicity of ERP needs to be considered at the same time.

The publicity may be done through government advertisement, newspapers, and televisions and the information should contain the targeted road, day of commencement and amount of ERP charge. Furthermore, a detailed guidance of how and where to apply for ERP which includes frequently asked questions should be described on a government website and brochures.

The screenshot shows the Singapore Land Transport Authority (LTA) website page for Electronic Road Pricing (ERP). The page includes the LTA logo with the tagline 'We Keep Your World Moving' and the Singapore Government logo. Navigation menus for 'home', 'about lta', 'careers', 'press room', 'publications & research', and 'faq's are visible. A breadcrumb trail reads 'home > roads & motoring > managing traffic & congestion > electronic road pricing (erp)'. The main heading is 'ELECTRONIC ROAD PRICING (ERP)'. Below this is a photograph of an ERP gantry with a digital display showing rates: '\$2.00', '\$3.00-7.50', and '\$1.00'. To the right of the photo is a 'DID YOU KNOW?' section with a question mark icon, stating: 'Singapore was the first city in the world to manage road congestion by implementing an Electronic Road Pricing system. ERP has since been used as a reference by other cities like London.' Below the photo is a 'WHAT IS ERP?' section with the text: 'ERP is an **Electronic Road Pricing System** used in **managing road congestion**. Based on a pay-as-you-use principle, motorists are charged when they use priced roads during peak hours. ERP rates vary for different roads and time periods depending on local traffic conditions. This encourages motorists to change their mode of transport, travel route or time of travel.' To the right of this section is a 'HAVING PROBLEMS WITH YOUR IU?' section with the text: 'Send your vehicle to the authorised inspection and other appointed centres. IUs are covered by a 5-year warranty against manufacturer's defects. You will have to pay for a replacement should your IU become faulty after its warranty period. You may check the warranty period of your IU by calling our customer service line at 1800-CALL LTA (1800-2255 582).'

Figure5-3-1 A guidance of ERP in Singapore Government Website

### **5.3.4 Methodology of OBU Defusion**

There are two types of ERP system in General. The first type utilizes on-board-unit (OBU) as charging device and automatic number plate recognition (ANPR) as enforcement purpose. The other type utilizes only ANPR for both charging and enforcement purpose. When considering the heavy traffic volume in DKI Jakarta, We suppose the ERP system in Jakarta will be the one using OBU which enables full-automatic transaction as long as OBU is equipped properly. Consequently, in order to achieve smooth operation (i.e. a high rate of regular ERP charging), fast penetration of OBU is the answer.

To achieve the aforesaid, two policies are the keys; enabling easy obtaining OBU and giving incentives for using OBU or disincentives for not using OBU.

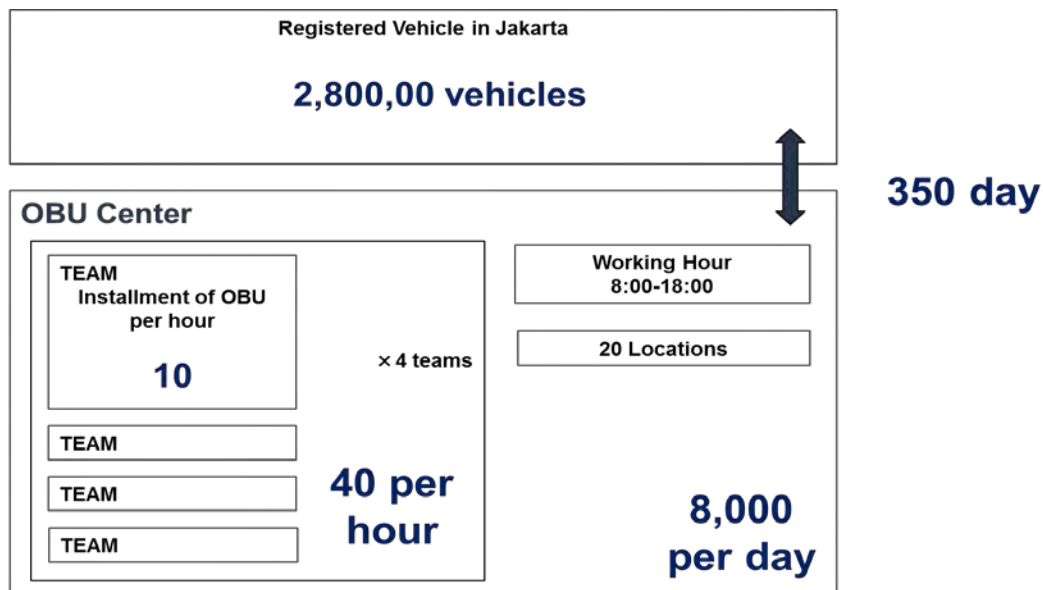
#### **5.3.4.1 Easiness and Security of Diffusing OBU**

When people are already condemned to bear road charges which they are not really willing to pay, people are usually reluctant to spend extra money to afford for OBU. This would result as a very slow diffusion of OBU therefore the price of OBU needs to be low as possible: free of charge is the best. For example in the neighboring country Singapore, they have given OBU for free to all of the users when they started operation in 1998 as first time only. Following the same strategy, we suggest OBU should be given for free in Jakarta.

On the other hand, to avoid forgery and other false uses of OBU, OBU distribution route needs to maintain security level. To maintain the security level, diffusion route in Jakarta needs to be limited to the authorized OBU Distribution center where ERP operator does the registration, issuing, and installment by themselves. Thus OBU should not be available on normal retail stores. In regard of maintaining the security and service level, the number of OBU Distribution center is difficult to increase. In fact, there are only about 12 authorized OBU retail shop in Singapore.

If we target to install OBU to 2.8 million vehicles, which is a number of vehicles registered in Jakarta, in 20 OBU centers where they have capacity of installing 400 OBUs per day (e.g., 40 OBUs installed per hour), it would take at least a year to complete the installment. Public-private Role sharing in ERP Project

Table5-3-2 Period of Diffusing OBU



To accelerate the OBU penetration, we need to consider expanding the distribution channel of OBU to qualified car dealers, parking area on highways and gasoline station especially in consideration of the non-Jakarta residents as they may also use the ERP.

### 5.3.4.2 Incentives/disincentives for installing/not installing OBU

The operation of ERP would be very easy if regulation could make OBU as mandatory equipment for all vehicles. However it is usually difficult to regulate such regulations and equipping an OBU needs to depend on each driver's own will. Accordingly, a policy that would encourage people to equip OBU such as giving some incentives is necessary.

On toll roads, usual incentives given to OBU owners are special discounts when the payment is done electronically. For example in Japanese toll roads, special discounts were applied for ETC users and as a result ETC usage ratio now reaches 90%.

Compared to ETC system on toll roads, the nature of ERP is to reduce traffic congestion and it is not the kind to encourage people using roads by giving incentives. Therefore if we need to increase the penetration ratio of OBU, we need to consider giving disincentives for users who do not equip OBU on the ERP road. There are two kinds of possible disincentives for vehicles that are not equipping OBU on ERP Roads. One is charging the extra charge as administration fee or the other is even stricter to fine penalty for not equipping OBU.

As in the case of Singapore, 70 Singapore Dollars (SGD) will be charged to vehicle that failed to pay ERP charge by not equipping OBU. If the driver did not pay within 30 days, they would be either paying extra SGD 1,000 as a penalty or imprisoned for 1 month. In both cases, an electronic system that could precisely track and apprehend the non-OBU equipped vehicles and a social system including legal basis and regulatory framework that could successfully execute the collection of ERP charge and penalty is the key.



### 5.3.4.3 Correlation between OBU and commencement of Operation

Table5-3-3 OBU and commencement of Operation

Steps	Things to be done	Time
Step 1	Establishment of OBU Diffusion Center Start diffusing OBU	One year before operation
Step 2	Starting test operation of ERP to monitor the usage ratio of OBU (ERP charge will not be imposed)	Until reaching the targeted penetration rate of OBU
Step 2.5	Starting enforcement of road act to equip OBU on ERP road and warn drivers who are not equipped with OBU. (ERP charge will not be imposed)	Same as above
Step 3	Starting Operation	—

If ERP is operated in corridor 1 and corridor 6, the expected numbers of transactions are 7million per day. To deal with this great numbers, most of the transaction needs to be done automatically without human involvement. As long as OBU is equipped properly the deduction of ERP charge is done automatically however for the Non-OBU vehicles, the following procedures will be necessary before collecting ERP charge:

- 1) Identifying the ownership of vehicle by Number Plate
- 2) Deducting ERP chager or Sending Invoice to the Owner

This procedure will done automatically by processing the image of number plate, however if the number plate are bended, stained, or non-registered, the system is unable to process automatically and requires operators to manually check the number plate. If we suppose that there are 100ERP operators who will deal with the manual transaction of number plate verification, and they can handle 150transactions per hour (avg. 24seconds per license plate), the number of manual transaction will be 100,000transactions per day.

If we need to target the number of manual transaction less than 100,000, we need to reduce the parameter of ANPR transaction (i.e. Non-OBU vehicles). Normally the failure percentage of ANPR is between 10-30%, thus number of ANPR transaction needs to be less than 1,000,000.

The ANPR transaction (1,000,000) dived by whole transaction (7,000,000) is about 85% which means OBU usage rate should be above 85%.If we consider the cases of insufficiecnt balance which would also require manual transaction to indentify the users, OBU usage ratio should be above 90% even better.

### 5.3.5 Operation of ERP

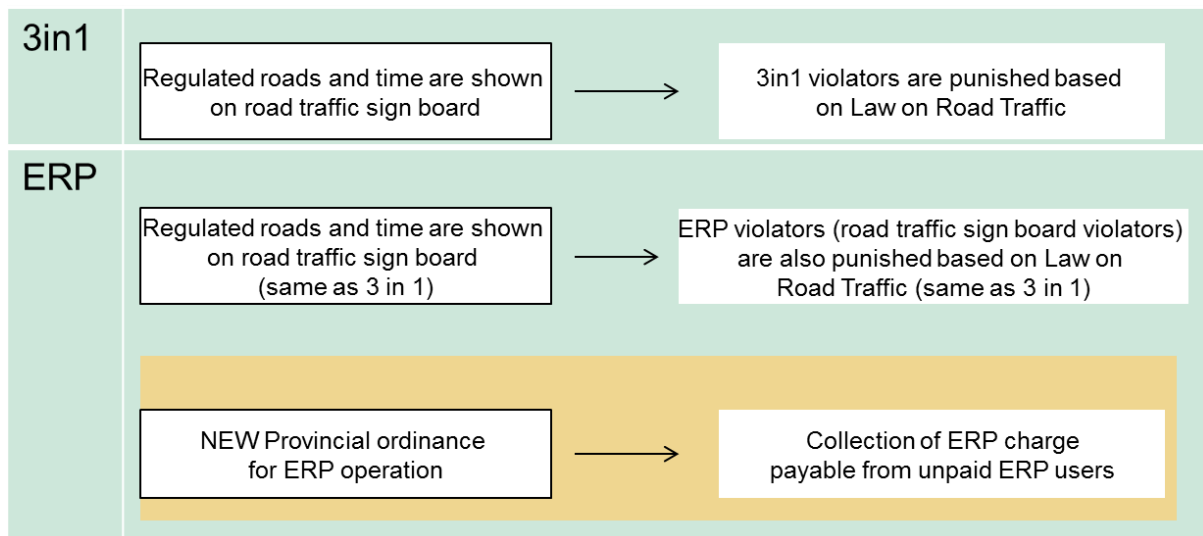
#### 5.3.5.1 ERP Charge Collection

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.

#### 5.3.5.2 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

Figure5-3-2 Legal system for violation and enforcement

##### (2) Obligate installation of OBU

To apprehend the ERP violators in real-time, we suggest making regulation that ERP users be obliged to install OBU at the front location of a vehicle, so that ERP violators can be easily recognized visually.

The users who did not pay ERP charge intentionally by either not installing OBU, using forged OBU or other illegal OBU installation can be punished trough identifying an owner with vehicle identification number on the license plate or arresting at the site.

Table5-3-4 Identifying ERP Violators

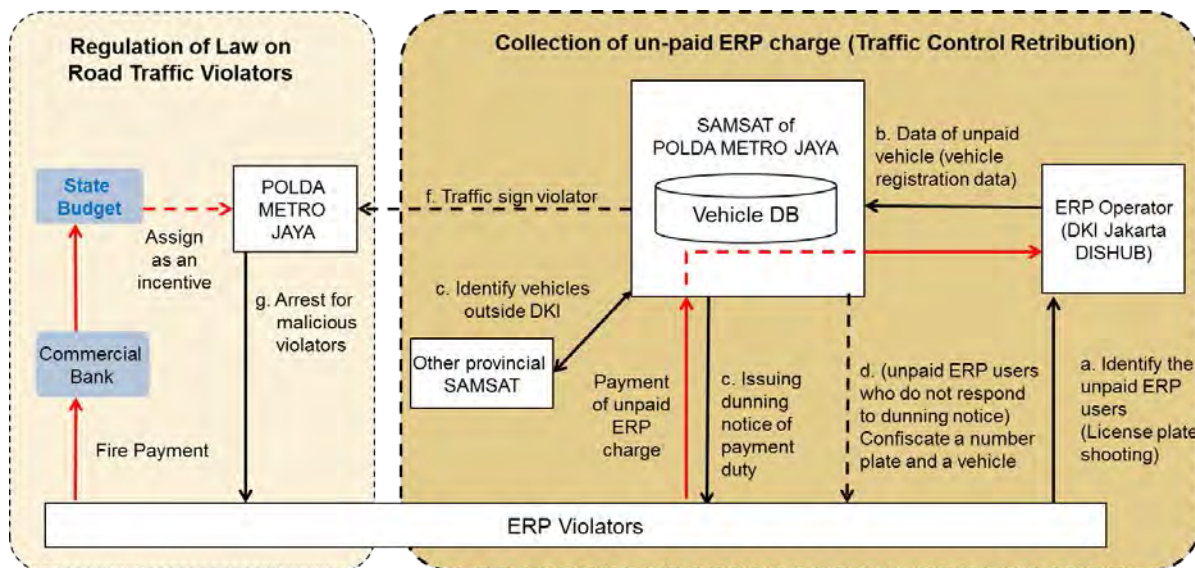
		Number Plate	
		Installed	Not installed (including fake plate)
OBU	Installed	OBU works: Successful transaction	
	Non-installed (including fake OBU)	OBU does not work: ERP user is identified through number plate	Neither OBU nor number plate does not work properly: ERP users cannot be identified  ***  These violators could be apprehend on site if there are legal basis of obligating OBU on ERP roads

Source: JICA Survey Team

### (3) Collection from those who fail to pay ERP charge

Based on the prevailing laws for automobile tax collection the following methods can be considered as collection of ERP charge from those who fail to pay.

- a. A vehicle without proper payment process at the first gantry is detected as an unpaid vehicle by ERP operator.
- b. ERP operator provides the information of unpaid vehicles to SAMSAT of DKI Jakarta that manages vehicle registration database and collects automobile tax. If the operator knows only the vehicle identification number of the unpaid vehicle, the vehicle owner needs to be identified through checking SAMSAT's vehicle registration database.
- c. If the unpaid vehicle is a vehicle registered outside of DKI Jakarta, SAMSAT of DKI Jakarta needs to ask the other provincial SAMSAT to identify the vehicle owner.
- d. SAMSAT of DKI Jakarta sends a demand notice to the owner of the unpaid vehicle .
- e. If the violator ignores the demands several times, SAMSAT of DKI Jakarta seizes the license plate or the vehicle. (employing the current demand scheme of mobile tax)
- f, g. Habitual violators are arrested in the act of violation of the Road Traffic Law in cooperation with police.



Source: JICA Survey Team

Figure5-3-3 Scheme of Regulation of ERP Violator

## 5.4 Response to risks on ERP project

### 5.4.1 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.

Table5-4-1 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		✓	Mitsubishi Heavy Industry has much experience of introducing ERP system within and outside country.
	Cost and construction schedule, etc.	✓	✓	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		✓	EPC contractor is responsible for design

Risk			Allocation		Mitigation Measure
			Public	Private	
		responsibility of the damage of cost increase and delay in completion due to lack of capability of EPC contractor in case that contract conditions (contract price and completion date, etc.) are not clear			and construction risk. For a contract between SPC and EPC contractor, full turn key contract (with fixed lump sum and data certain) is assumed. EPC contractor is obligated to provide performance guarantee and enter into insurance 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

Risk			Allocation		Mitigation Measure
			Public	Private	
					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 charge collection from OBU non-installed vehicle, unofficial OBU installed vehicle, and ERP violating vehicle	✓		Introducing unitary 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	✓		As an implementation body, public sector takes the risk. (it must be regulated by a contract between DKI and SPC)
		Approval on ERP regional	✓		

Risk			Allocation		Mitigation Measure
			Public	Private	
	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 failure due to the difference with the expected situation of power lines, telecommunication cables, and vehicle database	✓		As an implementation body, public sector takes 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.



Risk				Allocation		Mitigation Measure
				Public	Private	
Common	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)	
	Monetary exchange/re-mittance 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)	
	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		✓	Covered by all risk insurance	
	Political risk (war, civil war, riot and terror)	Restoration cost for damages by natural disaster such as abnormal weather, flood, and earthquake, war, terrorism, and riot	✓	✓	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

Table5-4-2 Permission for ERP project

Necessary Permission		Competent Authority	Applicant	Status
ERP introduction	Criteria fulfillment for ERP imposition	MOT	DKI Jakarta	Not implemented yet
	Establishment and approval of a regional regulation on Traffic Control Retribution introduction	Agreement of regional council and governor Evaluation of MOHA and MOF	DKI Jakarta	Not reviewed yet
Wireless radio wave communication	Permission on usage of wireless radio frequency spectrum for ERP	DGPT	DKI Jakarta	Not received yet
	Certification of wireless communications device	DGPT	Communications device manufacturers and suppliers, etc.	Not received yet
Environment	AMDAL	According to related laws and regulations, AMDAL is not required for the ERP project.		

Source: JICA Survey Team

The summary of major terms and conditions of a contract between DKI Jakarta government and SPC for ERP project are assumed as below.

Table5-4-3 The summary of major terms and conditions of ERP project contract between DKI Jakarta and SPC (assumed)

\*More consultations with DKI Jakarta (Dishub) on the following conditions are needed

Item	Detail
Project Summary	<ul style="list-style-type: none"> <li>· DKI Jakarta (Dishub) requests a project company (hereafter, "SPC") to design, construct, maintain ERP related facility in Jakarta and finance for providing those services.</li> <li>· DKI Jakarta (Dishub) pays to SPC in exchange of the abovementioned services in pursuance of this agreement (hereafter, "unitary payment").</li> </ul>
Contract Period	From /// //, //// to /// //, //// ✓ Start date of design /// //, //// ✓ Start date of construction /// //, ////

Item	Detail
	<ul style="list-style-type: none"> <li>✓ Date of Delivery /// //, ////</li> <li>✓ Start Date of Maintenance /// //, ////</li> <li>✓ End Date of Maintenance /// //, ////</li> <li>· However, the period may be modified if Government Event (policy change and/or breach of contract at public sector side) and/or Force Majeure occurs.</li> </ul>
Project Cost	<ul style="list-style-type: none"> <li>· Total project cost*: ///,///,///,///IDR(based on the real price effective as of /// //, ////)</li> <li>*A statement for the total project cost shall be attached.</li> </ul>
Change of Project Specification	<ul style="list-style-type: none"> <li>· DKI Jakarta(Dishub) and SPC can request a consultation on project specification change when they agree it is needed.</li> </ul>
Performance Bond	<ul style="list-style-type: none"> <li>· SPC shall provide performance bond for this agreement.</li> </ul>
Financing	<ul style="list-style-type: none"> <li>· SPC shall provide the fund necessary to implement this project.</li> </ul>
Permission	<ul style="list-style-type: none"> <li>· DKI Jakarta(Dishub) shall acquire necessary permission for ERP introduction.</li> <li>· SPC shall acquire permission on certification of wireless communications device for ERP.</li> </ul>
Delivery of the Site	<ul style="list-style-type: none"> <li>· DKI Jakarta(Dishub) shall deliver the site needed to implement the project to SPC by /// //, ////. (Land acquisition is not basically required since ERP is introduced for existing roads.</li> </ul>
Facility Design	<ul style="list-style-type: none"> <li>· SPC shall be responsible for design of ERP facility (SPC may commission a third party to do all or part of the design.).</li> <li>· DKI Jakarta(Dishub) can evaluate that the design documents comply with the tender documents.</li> </ul>
Facility Construction	<ul style="list-style-type: none"> <li>· SPC shall construct ERP facility under their responsibility and at their own expense. (SPC may commission a third party to do all or part of the construction.)</li> </ul>
Cancellation of Work	<ul style="list-style-type: none"> <li>· DKI Jakarta (Dishub) and SPC agree to have a consultation on the continuance of the project when the construction cannot be implemented due to delay of site delivery, or hurricane, heavy rain, flood, earthquake, fire, riot and other natural or man-made events (hereafter, "disaster"), or DKI Jakarta (Dishub) requires them to cancel the work. DKI shall compensate SPC for their loss if SPC receives damage by fault of DKI Jakarta (Dishub).</li> </ul>
Damage to third party in construction	<ul style="list-style-type: none"> <li>· SPC is liable to pay compensation when they cause damage to a third party during construction. (However, DKI JAKARTA(DISHUB) is liable for damage caused by themselves.)</li> </ul>
Force Majeure during construction	<ul style="list-style-type: none"> <li>· DKI Jakarta (Dishub) and SPC agree to have a consultation on resolution when a disaster caused damages beyond the responsibility of both DKI Jakarta and SPC (hereafter, "force majeure").</li> </ul>
Delivery of ERP Facility	<ul style="list-style-type: none"> <li>· SPC shall deliver ERP facility to DKI JAKARTA(DISHUB) after passing the completion inspection of DKI Jakarta.</li> </ul>
Warranty against defects	<ul style="list-style-type: none"> <li>· DKI JAKARTA(DISHUB) can request SPC to repair the defects or claim damages if any serious defects are found at ERP facility. (within // years from deliver)</li> </ul>
Implementation of Maintenance and Operation	<ul style="list-style-type: none"> <li>· ERP operation (including decision of ERP charge amount, ERP charge collection and management, and control for violators) is implemented under DKI Jakarta (Dishub)'s responsibility and at their own expense in accordance with relevant laws and regulations such as Government Regulation No.32/2011 and No.97/2012.</li> <li>· Maintenance of ERP facility is implemented under SPC's responsibility and their own expense.</li> </ul>
Arrangement of Maintenance framework	<ul style="list-style-type: none"> <li>· SPC can commission maintenance service to a third party.</li> <li>· SPC shall prepare the documents of maintenance plan and organization framework for the maintenance which must be approved by DKI Jakarta (Dishub).</li> </ul>
Report on the Activity	<ul style="list-style-type: none"> <li>· SPC shall submit reports on their activities every // month(s) to DKI</li> </ul>

Item	Detail
	<p>JAKARTA(DISHUB).</p> <ul style="list-style-type: none"> <li>DKI JAKARTA(DISHUB) may request SPC for a report on maintenance service in addition to the above regular report.</li> </ul>
Damage to third party in maintenance	<ul style="list-style-type: none"> <li>SPC is liable to pay compensation when they cause damage to a third party in maintenance service. However, DKI Jakarta (Dishub) is liable for damage caused by themselves.</li> </ul>
Force Majeure during the period of maintenance	<ul style="list-style-type: none"> <li>DKI Jakarta (Dishub) and SPC agree to have a consultation on resolution when the event of Force Majeure prevents maintenance service or causes damage.</li> </ul>
Unitary Payment	<ul style="list-style-type: none"> <li>DKI JAKARTA(DISHUB) shall evaluate the maintenance work done by SPC and notify SPC of the result every // month(s). After the notification, DKI JAKARTA(DISHUB) should promptly pay the predetermined amount as unitary payment to SPC.</li> <li>DKI JAKARTA(DISHUB) can reduce the amount of unitary payment and request SPC to improve their performance if the evaluation result doesn't meet the preset criteria.</li> </ul>
Return of Unitary Payment in case of false report	<ul style="list-style-type: none"> <li>SPC shall return the amount which DKI Jakarta (Dishub) could reduce in the absence of misstatement to DKI Jakarta (Dishub) if any false statement is found in the report on SPC's activities.</li> </ul>
Change of Unitary Payment based on price escalation	<ul style="list-style-type: none"> <li>DKI JAKARTA(DISHUB) or SPC can change the amount of unitary payment every // year(s) if the consumer price index rises or falls over // hundredth from the standard value.</li> <li>DKI Jakarta (Dishub) or SPC can request change of unitary payment when the price of major construction material in Indonesia fluctuates after the conclusion of the contract due to special factors and the unitary payment is no longer appropriate.</li> <li>SPC shall make an effort to reduce the increased cost as possible when the maintenance cost of the facility is expected to increase due to price fluctuation after the conclusion of the contract.</li> </ul>
Modification method of Unitary Payment	<ul style="list-style-type: none"> <li>For change or return of unitary payment, DKI JAKARTA(DISHUB) and SPC agree to have a consultation to determine.</li> <li>However, DKI may make a judgement and notify SPC if the consultation does not reach the conclusion within // day(s) from the start date of the consultation.</li> <li>When SPC needs increased cost or suffer damage, DKI Jakarta (Dishub) and SPC have a consultation on the necessary amount which DKI Jakarta (Dishub) bears.</li> </ul>
Change of Law	<ul style="list-style-type: none"> <li>Where an Indonesian law is newly established or amended and has a favorable effect on SPC, SPC shall be automatically enjoy such favorable effect.</li> <li>Where an Indonesian law is newly established or amended (including suspension of currency exchange / foreign remittance by Indonesian government) and has an adverse effect on SPC, SPC shall be permitted to continue to enjoy former benefits before amended until the termination date of this agreement.</li> <li>Where change of law increases the expense of SPC, SPC can request DKI Jakarta (Dishub) for increased cost. However, SPC should make an effort to reduce the increased cost due to change of law as possible.</li> </ul>
Contract termination right of DKI JAKARTA(DISHUB)	<ul style="list-style-type: none"> <li>DKI JAKARTA(DISHUB) can terminate this agreement if SPC does not rectify the violation. When the agreement is terminated, SPC shall pay a penalty to DKI Jakarta (Dishub).</li> <li>DKI JAKARTA(DISHUB) can terminate this agreement if the project is no longer needed to continue or if required due to other events. If the termination causes damage to SPC, DKI Jakarta(Dishub) shall compensate</li> </ul>

Item	Detail
	SPC for their loss.
Contract termination right of SPC	<ul style="list-style-type: none"> <li>· SPC can terminate this agreement if DKI Jakarta(Dishub) does not rectify the violation. When the termination causes damage to SPC, they can request DKI JAKARTA(DISHUB) to compensate for their loss.</li> </ul>
Contract termination right due to Force Majeure or change of law	<ul style="list-style-type: none"> <li>· If SPC can no longer implement the project due to Force Majeure or change of law, DKI JAKARTA(DISHUB) can terminate this agreement. DKI Jakarta (Dishub) must compensate SPC for their loss when the termination causes damage to SPC..</li> <li>· SPC can terminate the agreement if the suspension period of maintenance service is over // month(s) due to Force Majeure or change of law.</li> </ul>
Compensation for loss due to delay	<ul style="list-style-type: none"> <li>· SPC can request DKI JAKARTA(DISHUB) to pay delinquency charge based on the days of delay per unpaid amount in case of delay in unitary payment due to fault of DKI Jakarta (Dishub).</li> <li>· DKI Jakarta (Dishub) can demand compensation from SPC if SPC fails to deliver ERP facility to DKI Jakarta (Dishub) before the delivery date due to fault of SPC.</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>· SPC shall take out and maintain construction insurance, third-party liability insurance and other insurances as required.</li> <li>· SPC shall submit the insurance certification or the copy to DKI JAKARTA(DISHUB).</li> </ul>
Guarantee of public service provision	<ul style="list-style-type: none"> <li>· SPC can utilize necessary lands, roads and other facilities to implement this project.</li> <li>· DKI JAKARTA(DISHUB) guarantees that power and communication line are available at specified connection points.</li> </ul>
Guarantee of capital and rights	<ul style="list-style-type: none"> <li>· Capital and rights of SPC shall not be expropriated in no event.</li> <li>· If expropriation is needed, DKI JAKARTA(DISHUB) shall pay compensation for SPC's loss.</li> </ul>
Assignment of rights and obligations	<ul style="list-style-type: none"> <li>· SPC may grant a third party any of its rights and obligations to the extent that the third party has necessary financial power and technology to perform the project contract.</li> </ul>
Step in right	<ul style="list-style-type: none"> <li>· Lenders which gives loan to SPC has a right to take over SPC's rights if SPC breaches the loan-related contract.</li> </ul>
Language	<ul style="list-style-type: none"> <li>· The agreement shall be executed in Indonesian and English. In the event of any discrepancies between the two languages, English shall prevail.</li> </ul>
Currency	<ul style="list-style-type: none"> <li>· Indonesia rupiah</li> </ul>
Governing law	<ul style="list-style-type: none"> <li>· The agreement is governed by and shall be construed in accordance with Indonesian laws and regulations. However, any dispute will be settled according to English law.</li> </ul>
Dispute resolution	<ul style="list-style-type: none"> <li>· Internatioanl arbitration at Singapore International Arbitration Centre (SIAC)</li> </ul>

Source: JICA Survey Team

## 5.5 Legal Issues for Implementation of Project

Based on the previous reviews, legal Issues for ERP project are listed as below.

Table5-5-1 Legal Issues for Implementation of Project (Draft)

NO	Action Item		Relative Law	Issue	Required Support	Competent Authorities
1	Legal Basis for ERP Introduction	Meeting criteria for ERP introduction	PP32/2011(Traffic Management) PP97/2012 (Traffic Control Retribution)	<ul style="list-style-type: none"> <li>ERP introduction criteria: the level of traffic density and travel speed are not clear. Those indexes are difficult to measure.</li> <li>Having two (2) road lines, each lane having at least two (2) lanes</li> <li>Mass transportation network and service is available and meets the minimum service standard specified by MOT</li> <li>Ratio of motorized vehicle traffic volume to road capacity in one of the lanes of equal to or higher than zero point nine (0.9);</li> <li>Average speed in peak hour of equal to or less than ten (10) km/hour</li> <li>The above congestion occurs regularly every working day (Art. 79 of PP32/2011, Art.4 of PP97/2012 )</li> </ul>	<ul style="list-style-type: none"> <li>Support for developing measurement method and interpretive criteria for the result</li> </ul>	DKI Jakarta
Judging ERP introduction based on criteria		MOT				
2	Preparation of project scheme and tender	Decision support of project scheme	—	<ul style="list-style-type: none"> <li>No adequate consensus formation on ERP project scheme within DKI Jakarta</li> <li>It is possible that Presidential Regulation on PPP will cover ERP in the future and there's room for examination on project scheme under Presidential Regulation.</li> </ul>	<ul style="list-style-type: none"> <li>Decision support of project scheme                             <ul style="list-style-type: none"> <li>(Plan1:Cooperation scheme of regional governments or Plan 2: Presidential Regulation on PPP)</li> </ul> </li> </ul>	BAPPENAS , DKI Jakarta (DISHUB)
			PP32/2011 (Traffic control)	<ul style="list-style-type: none"> <li>Under the prevailing laws, regional government is responsible for traffic control. So DKI Jakarta needs to own and operate ERP facility. (Article 2, 3, 28 of PP32/2011.)</li> </ul>	<ul style="list-style-type: none"> <li>Need to amend PP32/2011 because private sector cannot own ERP facility under the existing laws (As a special measure, ERP introduction through lease from private sector, etc.)</li> </ul>	MOT, DKI Jakarta (DISHUB)
		Plan 1: Implementation of project with public	Presreg 54/2010 (government)	<ul style="list-style-type: none"> <li>Under multi-year contract of</li> </ul>	<ul style="list-style-type: none"> <li>Support for revising the regulation in order to</li> </ul>	MOHA, DKI Jakarta (DISHUB)

NO	Action Item			Relative Law	Issue	Required Support	Competent Authorities
			procurement	procurement) MOHA 13/2006 <sup>1</sup> (regional finance management)	EPC+M(+Finance), a scheme based on BTO can be introduced while the contract period is up to 5 years (term of governor). (Article 54 A(6) of MOHA13/2006 )	extend the period of multi-year contract.	
			Reviewing the contract draft	Presreg 54/2010 (public procurement),	<ul style="list-style-type: none"> <li>Contract draft, tender system, tender document for multi-year contract of EPC+M(+Finance) are not reviewed yet.</li> </ul>	<ul style="list-style-type: none"> <li>Support for review on contract draft, tender system and tender document</li> </ul>	DKI Jakarta (DISHUB)
		Reviewing the tender system, preparing tender document	MOHA 22/2009 (guideline on cooperation among regional government)				
		Implementing tender (to select an operator)	NPPA Regulation 14/2012(guideline on public procurement)				
			Plan 2: Implementation of project under Presidential Regulation on PPP	Presreg 67/2005 <sup>2</sup> (PPP regulation)	<ul style="list-style-type: none"> <li>ERP is not included in the scope of PPP project at this time.</li> </ul>	<ul style="list-style-type: none"> <li>Approach for amendment of Article 4 of Presreg 67/2007 (adding ERP to the PPP project)</li> </ul>	BAPPENAS
			Reviewing the contract draft		<ul style="list-style-type: none"> <li>Inadequate review on PPP scheme with Presidential Regulation</li> </ul>	<ul style="list-style-type: none"> <li>Support for review on contract draft, tender system and tender document</li> <li>Especially need the review on guarantee for SPC utilizing IIGF(for example, covering risk of unpaid unitary payment by DKI Jakarta)</li> </ul>	BAPPENAS, DKI Jakarta (DISHUB)
		Reviewing the tender system, preparing tender document					
		Implementing tender (to select an operator)					
4	Operation	Constructing the scheme of regulating ERP violators	Clarifying the definition of ERP violation	(UU22/2009 Law on Road Traffic)	<ul style="list-style-type: none"> <li>ERP violators can be regulated according to road traffic sign board same as regulation of 3 in 1, on the basis of Law on Road Traffic (Article 287 of UU22/2009).</li> <li>However, no existing law regulates ERP users who unpaid ERP charge payable as Retribution.</li> <li>⇒Once road traffic sign boards showing the rules of ERP road are installed, the violator can be regulated on the basis of Law on Road Traffic ⇒On the other hand, retribution payment is based on the assumption that public service is</li> </ul>	<ul style="list-style-type: none"> <li>Support for developing new provincial ordinance to regulate users who unpaid retribution.</li> </ul>	DKI Jakarta (DISHUB) , POLDA Metro JAYA

<sup>1</sup> MOHA 13/2006 has been amended by MOHA 59/2007 and MOHA 21/2011.

<sup>2</sup> Presreg 67/2005 has been amended by Presreg 13/2010, Presreg 56/2011 and Presreg 66/2013.

NO	Action Item			Relative Law	Issue	Required Support	Competent Authorities
					provided at the same time, so there is no penalty for users who unpaid retribution.		
	Constructing the scheme of identifying violators (including violators who come from outside of DKI Jakarta)			—	<ul style="list-style-type: none"> <li>Inadequate system to share vehicle DB information among regional governments</li> </ul>	<ul style="list-style-type: none"> <li>Support for improvement of vehicle registration system and DB operation</li> </ul>	DKI Jakarta (DISHUB) , POLDA Metro JAYA, POLRI
	Improving the regulation capacity for vehicles with fake license plate			—	<ul style="list-style-type: none"> <li>System and method to regulate vehicles with fake license plate are not reviewed yet</li> </ul>	<ul style="list-style-type: none"> <li>Support for improvement of regulation capacity for fake license plate</li> </ul>	
	Constructing the implementation body to process compulsory execution (measure for violators who ignore the demands)			—	<ul style="list-style-type: none"> <li>Inadequate system in DKI Jakarta police to seize vehicles or process compulsory execution for outside-DKI Jakarta violators who ignore the demands</li> </ul>	<ul style="list-style-type: none"> <li>Support for developing a system of compulsory execution for outside-DKI Jakarta violators</li> </ul>	



## 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	<ul style="list-style-type: none"> <li>Obtain the information of current traffic volume on ERP corridor to forecast the traffic demand when ERP is introduced</li> <li>Grasp the current situation of BRT (Transjakarta) operation</li> </ul>	<ul style="list-style-type: none"> <li>Corridor 1 : 9 locations</li> <li>Corridor 6 : 8 locations</li> </ul>	Two weekdays 6:00~22:00
2	Travel speed	<ul style="list-style-type: none"> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>Corridor 1 : between Blok M and Kota</li> <li>Corridor 6 : between Ragunan and Budaran HI</li> </ul>	Three weekdays 6:00~22:00
3	WTP (Willingness To Pay)	<ul style="list-style-type: none"> <li>Grasp the attitude and behavior change of car users when ERP is introduced in Jakarta and consider the appropriate charge price</li> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>Car users on Corridor 1 and Corridor 6</li> </ul>	1,200 samples
4	Jockey interview	<ul style="list-style-type: none"> <li>Grasp the price drivers pay to Jockeys to consider the price into account for ERP charge setting</li> </ul>	<ul style="list-style-type: none"> <li>Jockeys on 3-in-1 restriction road</li> </ul>	120 samples

### 6.2 Traffic Counting Survey

#### 6.2.1 Outline

##### Survey period and survey day

- Survey period : 6:00~22:00
- Survey day : Tue, 11 and Wed, 12 March 2014

##### Type of vehicles

Vehicles are classified as follows;

- Ordinary lane (count separately on the fast lane and the slow lane if physically divided)
  - Motorcycles
  - Passenger cars (e.g. sedan, jeep, MPV)
  - Taxis
  - Large public buses
  - Large private buses (e.g. commuter bus, tour bus)
  - Small public buses 1 (e.g. Kopaja, MetroMini)
  - Small public buses 2 (e.g. bemo, mikrolet, angkutan kota)
  - Small private buses (e.g. school bus)
  - Large goods vehicles
  - Small goods vehicles, pickup trucks
- Transjakarta lane
  - The permitted (Transjakarta, APTB and Kopaja AC)
  - Illegal passage (passenger car, taxi, bus, truck, motorcycle)

### Survey method

- Video recording of the target vehicles was done from the pedestrian bridge for Transjakarta station.
- Traffic volumes were counted every 15 minutes by observing the video image.

Note: Manual traffic counts were conducted at the survey stations where video recordings could not be implemented due to obstructions and/or no suitable place for the video recording.

### Survey location

Survey locations are shown in Table 6-2-1.

**Table6-2-1 Location of Traffic Count Survey**

No.	Transjakarta Corridor	Section	Location
1	1	Blok M - Bundaran Senayan	Al-Azhar Station
2	1	Bundaran Senayan – Semanggi	GBK Station
3	1	Semanggi - Karet	Benhil Station
4	1	Karet - Dukuh Atas	Setiabudi Station
5	1	Dukuh Atas - HI	Tosari Station
6	1	HI - Bank Indonesia	Sarinah Station
7	1	Bank Indonesia – Harmoni	Indosat pedestrian bridgre
8	1	Harmoni – Mangga Besar	Harmoni Station
9	1	Mangga Besar – Kota	Olimo Station
10	6	Ragunan - JORR	Deptan Station
11	6	JORR - Pejaten	SMKN 57 Station
12	6	Pejaten – Duren Tiga Bangka	Philips Station
13	6	Duren Tiga Bangka - Tandean	Duren Tiga Station
14	6	Tandean - Kuningan	Mampang Pedestrian Bridge
15	6	Kuningan - Casablanca	Kuningan Station
16	6	Casablanca - Flyover Menteng	Setiabudi Utara Aini Station
17	6	Flyover Menteng - Bundaran HI	Graha Mandiri Junction

## **6.2.2 Survey Results**

Table 6.2-2 and Table 6.2-3 show the results of the traffic count survey (16 hours total).

Table6-2-2 Results of Traffic Count Survey (Northbound: veh. /16h)

Survey Date and Location	Slow Lane										Fast Lane/Regular Lane										Slow Lane + Fast Lane/Regular Lane										Transjakarta Lane									
	Passenger Car		Large Bus		Small Bus			Laden Car		Motor cycles	Passenger Car		Large Bus		Small Bus			Laden Car		Motor cycles	Passenger Car		Large Bus		Small Bus			Laden Car		Motor cycles	Legal		Illegal							
	Private	Taxi	Public	Other	Kopaja/ MM/Kop ami	Angkot	Other	Truck	Pickup/ Box		Private	Taxi	Public	Other	Kopaja/ MM/Kop ami	Angkot	Other	Truck	Pickup/ Box		Private	Taxi	Public	Other	Kopaja/ MM/Kop ami	Angkot	Other	Truck	Pickup/ Box		Trans Jakarta	APTBB/ KTB/Kop aja AC	Private	Taxi	Bus	Laden Car	Motor cycles			
Day1	1	3,682	1,557	224	34	492	3	33	53	344	21,758	6,630	1,515	13	4	5	0	4	3	3	0	10,312	3,072	237	38	497	3	37	56	347	21,758	318	105	1	0	0	0	0	0	
	2	12,235	7,009	695	40	997	61	81	104	738	65,513	26,648	7,875	95	53	78	0	158	27	38	70	38,883	14,884	790	93	1,075	61	239	131	776	65,583	419	147	0	0	0	0	0	0	
	3	11,038	5,531	187	9	721	21	32	226	442	51,250	37,095	11,658	486	17	728	3	42	28	7	78	48,133	17,189	673	26	1,449	24	74	254	449	51,328	441	408	0	0	0	0	0	0	
	4	12,978	7,599	352	5	1,062	24	44	141	683	63,704	37,531	9,170	192	87	138	0	77	19	37	40	50,509	16,769	544	92	1,200	24	121	160	720	63,744	398	155	0	0	0	0	0	0	
	5	0	0	0	0	0	0	0	0	0	0	42,968	16,458	435	30	1,247	59	143	381	408	66,280	42,968	16,458	435	30	1,247	59	143	381	408	66,280	485	376	0	0	0	0	0	0	
	6	0	0	0	0	0	0	0	0	0	0	22,002	9,649	295	37	888	63	127	85	509	39,263	22,002	9,649	295	37	888	63	127	85	509	39,263	532	351	0	0	0	0	0	0	
	7	0	0	0	0	0	0	0	0	0	0	16,835	6,715	14	231	0	7	202	55	347	36,789	16,835	6,715	14	231	0	7	202	55	347	36,789	503	177	0	0	0	0	0	0	
	8	0	0	0	0	0	0	0	0	0	0	23,188	5,363	215	6	0	1,141	67	399	1,079	63,454	23,188	5,363	215	6	0	1,141	67	399	1,079	63,454	1,328	57	1	0	0	0	0	10	
	9	0	0	0	0	0	0	0	0	0	0	20,892	4,671	35	18	0	2,402	36	279	3,469	83,644	20,892	4,671	35	18	0	2,402	36	279	3,469	83,644	327	36	96	4	1	3	1,302	0	
	10	0	0	0	0	0	0	0	0	0	0	6,132	978	18	12	64	406	44	70	219	20,866	6,132	978	18	12	64	406	44	70	219	20,866	337	168	34	0	0	0	0	124	
	11	0	0	0	0	0	0	0	0	0	0	11,135	1,692	45	16	165	1,208	31	297	565	37,444	11,135	1,692	45	16	165	1,208	31	297	565	37,444	367	227	11	0	18	0	1,184	0	
	12	0	0	0	0	0	0	0	0	0	0	15,894	2,700	29	12	543	11	34	293	606	41,541	15,894	2,700	29	12	543	11	34	293	606	41,541	309	266	5	0	5	2	357	0	
	13	0	0	0	0	0	0	0	0	0	0	13,919	2,961	29	41	855	7	130	196	845	48,531	13,919	2,961	29	41	855	7	130	196	845	48,531	284	301	45	2	56	1	857	0	
	14	0	0	0	0	0	0	0	0	0	0	17,482	3,518	149	36	200	8	33	232	867	55,717	17,482	3,518	149	36	200	8	33	232	867	55,717	275	273	4	1	52	4	21	0	
	15	8,600	2,169	10	21	583	0	33	216	529	58,057	18,202	2,552	6	3	25	0	27	108	363	15	26,802	4,721	16	24	608	0	60	324	892	58,072	303	164	2	0	0	0	57	0	
	16	12,816	4,788	14	2	639	3	69	212	508	47,283	22,213	4,133	34	3	62	0	62	108	564	10,881	35,029	8,921	48	5	701	3	131	320	1,072	58,164	303	149	0	1	0	0	2	0	
	17	0	0	0	0	0	0	0	0	0	0	12,342	3,361	155	21	5	0	77	47	255	24,399	12,342	3,361	155	21	5	0	77	47	255	24,399	0	0	0	0	0	0	0	0	
Day2	1	4,236	1,616	164	17	484	9	4	13	209	18,046	7,873	1,856	10	3	1	1	4	2	3	6	12,109	3,472	174	20	485	10	8	15	212	18,052	334	100	1	0	3	0	0	0	
	2	13,786	5,803	619	113	888	48	56	96	682	69,474	28,768	7,328	44	15	2	2	115	18	35	35	42,554	13,131	663	128	890	50	171	114	717	69,509	416	106	3	0	0	0	0	0	
	3	10,140	4,342	180	24	623	8	22	53	402	41,996	32,670	10,540	248	59	215	2	236	44	23	146	42,810	14,882	428	83	838	10	258	97	425	42,142	409	306	3	0	2	0	0	0	
	4	9,574	4,791	225	32	1,150	55	72	121	597	56,786	34,512	8,526	293	30	205	7	192	30	29	195	44,086	13,317	518	62	1,355	62	264	151	626	56,981	450	299	3	2	8	0	2	0	
	5	0	0	0	0	0	0	0	0	0	0	34,973	14,104	345	159	1,069	16	64	176	543	46,849	34,973	14,104	345	159	1,069	16	64	176	543	46,849	416	286	1	2	2	0	0	4	0
	6	0	0	0	0	0	0	0	0	0	0	22,437	7,487	314	67	1,015	58	182	41	428	44,659	22,437	7,487	314	67	1,015	58	182	41	428	44,659	432	243	0	0	0	0	0	1	0
	7	0	0	0	0	0	0	0	0	0	0	17,333	6,516	209	29	55	68	104	146	373	30,434	17,333	6,516	209	29	55	68	104	146	373	30,434	490	239	0	0	0	0	0	9	0
	8	0	0	0	0	0	0	0	0	0	0	25,828	3,825	253	52	0	1,599	50	153	1,387	54,609	25,828	3,825	253	52	0	1,599	50	153	1,387	54,609	1,122	40	1	0	0	0	2	7	0
	9	0	0	0	0	0	0	0	0	0	0	16,246	3,196	51	2	4	2,165	15	313	1,917	59,246	16,246	3,196	51	2	4	2,165	15	313	1,917	59,246	261	78	47	2	0	1	902	0	
	10	0	0	0	0	0	0	0	0	0	0	7,849	899	31	3	115	468	34	94	226	21,096	7,849	899	31	3	115	468	34	94	226	21,096	281	188	40	3	2	1	88	0	
	11	0	0	0	0	0	0	0	0	0	0	13,347	1,988	43	22	155	1,238	47	334	587	42,166	13,347	1,988	43	22	155	1,238	47	334	587	42,166	278	283	58	2	25	4	1,351	0	
	12	0	0	0	0	0	0	0	0	0	0	18,250	2,226	9	24	512	19	53	434	505	39,367	18,250	2,226	9	24	512	19	53	434	505	39,367	266	278	15	1	1	1	402	0	
	13	0	0	0	0	0	0	0	0	0	0	15,118	2,791	7	11	939	8	131	246	843	42,536	15,118	2,791	7	11	939	8	131	246	843	42,536	276	270	74	8	38	11	3,063	0	
	14	0	0	0	0	0	0	0	0	0	0	18,561	3,187	95	3	325	12	68	281	563	54,803	18,561	3,187	95	3	325	12	68	281	563	54,803	292	154	25	2	1	0	1,041	0	
	15	9,369	2,314	26	58	562	0	68	179	656	62,424	18,052	2,464	2	20	4	4	65	78	313	8	27,421	4,778	28	78	566	4	133	257	969	62,432	267	156	0	0	1	0	3	0	
	16	14,678	3,357	22	2	632	6	69	124	486	60,382	30,387	4,867	49	0	155	3	21	239	563	28,243	45,065	8,224	71	2	787	9	90	363	1,049	88,625	265	151	3	0	0	1	0	0	
	17	0	0	0	0	0	0	0	0	0	0	12,144	2,977	163	11	2	1	90	53	293	20,173	12,144	2,977	163	11	2	1	90	53	293	20,173	0	0	0	0	0	0	0	0	
Average	1	3,959	1,587	194	26	488	6	19	33	277	19,902	7,252	1,686	12	4	3	1	4	3	3	11,211	3,272	206	29	491	7	23	36	280	19,905	326	103	1	0	2	0	0	0		
	2	13,011	6,406	657	77	943	55	69	100	710	67,494	27,708	7,602	70	34	40	1	137	23	37	53	40,719	14,008	727	111	983	56	205	123	747	67,546	418	127	2	0	0	0	0	0	
	3	10,589	4,937	184	17	672	15	27	140	422	46,623	34,883	11,099	367	38	472	3	139	36	15	112	45,472	16,036	551	55	1,144	17	166	176	437	46,735	425	357	2	0	1	0	0	0	
	4	11,276	6,195	289	19	1,106	40	58	131	640	60,245	36,022	8,848	243	59	172	4	135	25	33	118	47,298	15,043	531	77	1,278	43	193	156	673	60,363	424	227	2	1	4	0	1	0	

Table6-2-3 Results of Traffic Count Survey (Southbound: veh. /16h)

Survey Date and Location	Slow Lane										Fast Lane/Regular Lane										Slow Lane + Fast Lane/Regular Lane										Transjakarta Lane								
	Passenger Car		Large Bus		Small Bus			Laden Car		Motorcycles	Passenger Car		Large Bus		Small Bus			Laden Car		Motorcycles	Passenger Car		Large Bus		Small Bus			Laden Car		Motorcycles	Legal		Illegal						
	Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	Motorcycles	Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	Motorcycles	Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	Motorcycles	Trans Jakarta	APTBB/KTB/Kopaja AC	Private	Taxi	Bus	Truk/Box/Pickup	Motorcycles		
Day1	1	5,082	2,273	363	16	300	2	34	34	216	23,501	7,843	1,885	6	3	10	0	6	0	2	8	12,925	4,158	369	19	310	2	40	34	218	23,509	319	128	0	0	0	0	0	0
	2	14,153	6,257	465	24	796	28	15	209	384	55,910	26,151	8,839	160	59	66	4	104	8	7	66	40,304	15,096	625	83	862	32	119	217	391	55,976	393	128	3	1	2	0	0	0
	3	11,947	6,974	222	27	1,012	78	38	121	611	61,740	36,716	10,226	398	28	622	7	287	33	31	428	48,663	17,200	620	55	1,634	85	325	154	642	62,168	358	326	0	0	0	0	0	0
	4	14,803	7,897	347	53	1,033	15	80	194	747	55,476	28,807	8,886	233	25	323	0	479	19	10	102	43,610	16,783	580	78	1,356	15	559	213	757	55,578	470	363	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	33,754	16,695	569	81	1,315	35	172	269	628	58,221	33,754	16,695	569	81	1,315	35	172	269	628	58,221	461	372	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	29,851	11,495	267	18	784	21	141	77	520	41,569	29,851	11,495	267	18	784	21	141	77	520	41,569	422	237	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0	0	21,902	10,238	154	154	4	71	258	174	429	48,329	21,902	10,238	154	154	4	71	258	174	429	48,329	605	318	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	21,339	5,502	86	6	97	14	11	249	910	62,202	21,339	5,502	86	6	97	14	11	249	910	62,202	914	149	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	19,645	5,752	194	97	5	3,028	198	510	3,138	41,231	19,645	5,752	194	97	5	3,028	198	510	3,138	41,231	366	16	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	7,195	1,584	5	14	115	478	9	118	347	41,492	7,195	1,584	5	14	115	478	9	118	347	41,492	333	191	97	9	5	3	1,593	0
	11	0	0	0	0	0	0	0	0	0	0	11,609	1,991	55	28	198	1,545	20	327	652	43,796	11,609	1,991	55	28	198	1,545	20	327	652	43,796	379	225	17	3	7	3	202	0
	12	0	0	0	0	0	0	0	0	0	0	14,186	2,075	11	10	524	17	44	353	557	38,325	14,186	2,075	11	10	524	17	44	353	557	38,325	395	225	3	0	52	2	58	0
	13	0	0	0	0	0	0	0	0	0	0	14,594	2,875	31	24	870	25	63	310	671	55,239	14,594	2,875	31	24	870	25	63	310	671	55,239	340	300	10	0	50	0	2,263	0
	14	0	0	0	0	0	0	0	0	0	0	18,220	2,726	61	8	469	6	40	242	673	55,907	18,220	2,726	61	8	469	6	40	242	673	55,907	298	323	188	53	0	2	64	0
	15	0	0	0	0	0	0	0	0	0	0	18,683	2,605	92	20	600	2	74	243	621	36,479	18,683	2,605	92	20	600	2	74	243	621	36,479	285	156	6	0	29	0	2	0
	16	13,010	5,134	95	13	781	0	26	217	687	50,132	21,958	2,954	24	26	15	0	19	108	500	107	34,968	8,088	119	39	796	0	45	325	1,187	50,239	421	191	0	0	1	3	31	0
	17	0	0	0	0	0	0	0	0	0	0	4,733	1,833	132	17	40	0	22	48	87	8,914	4,733	1,833	132	17	40	0	22	48	87	8,914	0	0	0	0	0	0	0	0
Day2	1	5,390	1,913	306	0	300	0	1	35	166	21,725	8,252	2,116	4	7	3	0	20	6	5	17	13,642	4,029	310	7	303	0	21	41	171	21,742	337	118	0	0	0	0	0	0
	2	14,332	6,180	574	55	984	6	208	223	600	52,766	27,574	7,753	179	59	84	0	124	14	12	66	41,906	13,933	753	114	1,068	6	332	237	612	52,832	402	137	15	0	5	0	0	0
	3	11,356	4,247	409	29	582	50	66	112	460	56,467	30,106	6,961	93	89	145	0	154	30	33	43	41,462	11,208	502	118	727	50	220	142	493	56,510	407	318	17	2	0	1	1	0
	4	17,491	6,990	209	18	970	35	11	140	525	64,152	26,831	7,830	282	182	358	9	100	18	32	115	44,322	14,820	491	200	1,328	44	111	158	557	64,267	407	314	19	1	4	0	4	0
	5	0	0	0	0	0	0	0	0	0	0	34,229	13,923	464	52	1,477	29	88	78	384	47,786	34,229	13,923	464	52	1,477	29	88	78	384	47,786	378	294	2	0	1	0	1	0
	6	0	0	0	0	0	0	0	0	0	0	19,555	8,536	302	52	863	15	87	52	335	38,235	19,555	8,536	302	52	863	15	87	52	335	38,235	446	265	1	0	1	0	1	0
	7	0	0	0	0	0	0	0	0	0	0	31,117	10,809	274	40	8	95	258	151	357	52,037	31,117	10,809	274	40	8	95	258	151	357	52,037	886	199	0	0	0	1	1	0
	8	0	0	0	0	0	0	0	0	0	0	16,257	5,283	128	6	15	53	158	114	986	42,083	16,257	5,283	128	6	15	53	158	114	986	42,083	1,286	41	1	0	0	1	1	0
	9	0	0	0	0	0	0	0	0	0	0	18,224	5,490	19	40	27	2,675	29	913	2,803	53,173	18,224	5,490	19	40	27	2,675	29	913	2,803	53,173	284	101	10	2	0	2	510	0
	10	0	0	0	0	0	0	0	0	0	0	6,826	1,189	16	14	106	470	35	142	449	37,694	6,826	1,189	16	14	106	470	35	142	449	37,694	273	179	174	26	9	5	1,825	0
	11	0	0	0	0	0	0	0	0	0	0	12,922	1,655	31	25	178	1,402	37	300	613	49,457	12,922	1,655	31	25	178	1,402	37	300	613	49,457	283	172	4	0	1	0	33	0
	12	0	0	0	0	0	0	0	0	0	0	15,461	1,881	10	23	437	18	47	430	505	28,877	15,461	1,881	10	23	437	18	47	430	505	28,877	346	303	0	0	13	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	14,997	2,720	14	2	811	12	32	334	483	50,167	14,997	2,720	14	2	811	12	32	334	483	50,167	277	316	14	1	45	0	2,890	0
	14	0	0	0	0	0	0	0	0	0	0	18,857	3,612	54	18	497	1	30	221	829	65,736	18,857	3,612	54	18	497	1	30	221	829	65,736	278	303	0	0	0	0	0	4
	15	0	0	0	0	0	0	0	0	0	0	18,477	2,397	101	18	512	1	62	186	483	35,100	18,477	2,397	101	18	512	1	62	186	483	35,100	254	177	3	0	3	0	2	0
	16	13,512	2,689	78	7	596	1	20	173	633	48,919	26,174	2,150	44	4	15	0	5	103	354	66	39,686	4,839	122	11	611	1	25	276	987	48,985	334	188	28	1	8	0	32	0
	17	0	0	0	0	0	0	0	0	0	0	5,933	2,135	129	1	14	1	34	38	94	8,119	5,933	2,135	129	1	14	1	34	38	94	8,119	0	0	0	0	0	0	0	0
Average	1	5,236	2,093	335	8	300	1	18	35	191	22,613	8,048	2,001	5	5	7	0	13	3	4	13	13,284	4,094	340	13	307	1	31	38	195	22,626	328	123	0	0	0	0	0	0
	2	14,243	6,219	520	40	890	17	112	216	492	54,338	26,863	8,296	170	59	75	2	114	11	10	66	41,105	14,515	689	99	965	19	226	227	502	54,404	398	133	9	1	4	0	0	0
	3	11,652	5,611	316	28	797	64	52	117	536	59,104	33,411	8,594	246	59	384	4	221	32	32	236	45,063	14,204	561	87	1,181	68	273	148	568	59,339	383	322	9	1	0	1	1	0
	4	16,147	7,444	278	36	1,002	25	46	167	636	59,814	27,819	8,358	258	104	341	5	290	19	21	109	43,966	15,802	536	139	1,342	30	335	186	657	59,923	439	339	10	1	2	0	2	0
	5	0	0	0	0																																		

### 6.3 Travel Speed Survey

#### 6.3.1 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 as shown in Figure 6-3-1.

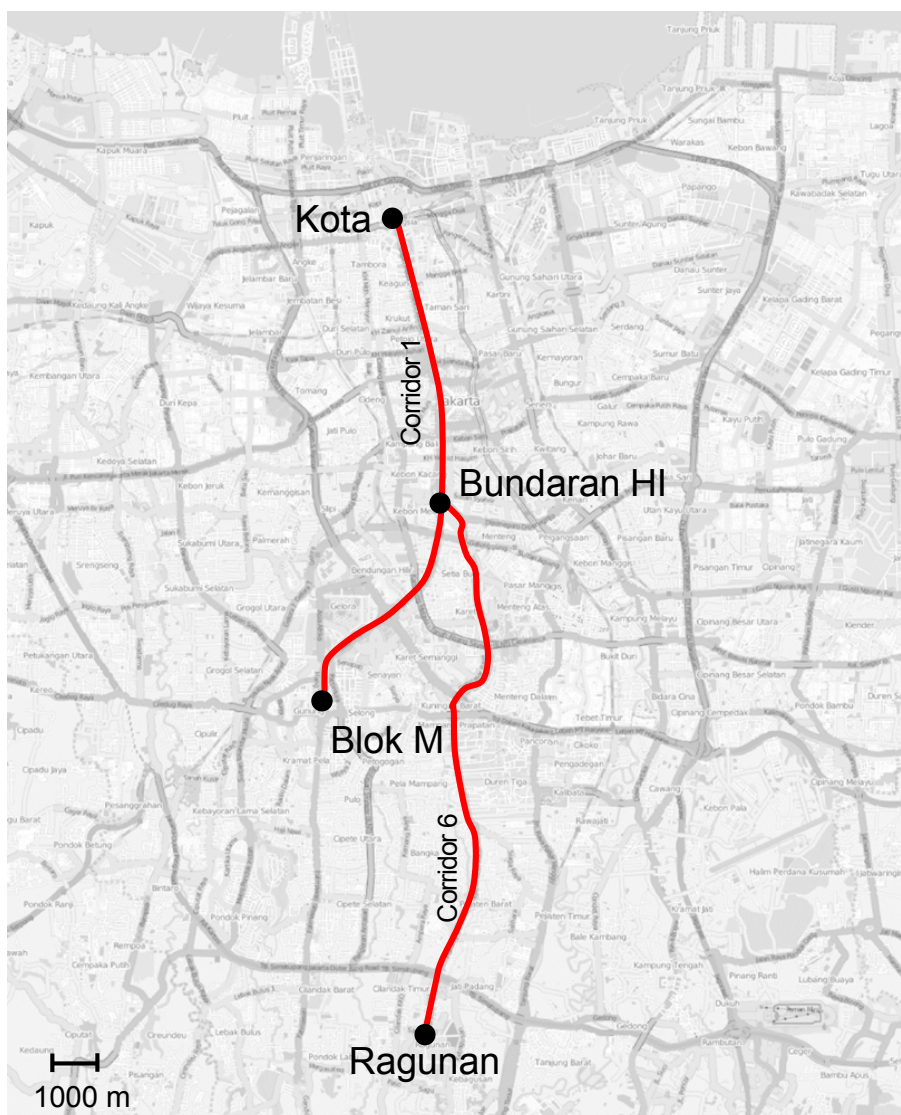


Figure6-3-1 Travel Speed Survey Route

### 6.3.2 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.

**Table6-3-1 Average Travel Speed by Time Period**

#### Corridor 1 (from Blok M to Kota)

North to South

Section	Distance (km)	6:00	7:00	8:00	9:00	11:00	13:00	15:00	17:00	19:00	21:00
		-7:00	-8:00	-9:00	-11:00	-13:00	-15:00	-16:00	-18:00	-21:00	-22:00
Jl. Jembatan 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 Atas	0.85	25	35	30	19	6	4	8	6	13	—
Jembatan Dukuh Atas - 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	8:00	9:00	11:00	13:00	15:00	17:00	19:00	21:00
		-7:00	-8:00	-9:00	-11:00	-13:00	-15:00	-16:00	-18:00	-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 Atas	1.44	31	13	47	21	16	11	12	53	—	45
Jembatan Dukuh Atas - 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. Jembatan Batu	1.30	28	25	26	16	8	9	6	9	18	17

#### Corridor 6 (from Blok M to Kota)

North to South

Section	Distance (km)	6:00	7:00	8:00	9:00	11:00	13:00	15:00	17:00	19:00	21:00
		-7:00	-8:00	-9:00	-11:00	-13:00	-15:00	-16:00	-18:00	-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

Section	Distance (km)	6:00	7:00	8:00	9:00	11:00	13:00	15:00	17:00	19:00	21:00
		-7:00	-8:00	-9:00	-11:00	-13:00	-15:00	-16:00	-18:00	-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.



## (2) Bottlenecks

Figure 6-3-2 illustrates major bottlenecks on Corridor 1 and Corridor 6 based on the travel speed survey results. The major bottlenecks on Corridor 1 are Glodok, Sawah Besar, Harmoni, Bundaran HI, Tosari, Semanggi, and Bundaran Senayan and those on Corridor 6 are GOR Sumantri, Kuningan, Mampang, Pejaten Mall, Jati Padang, and Deptan. The transition of traffic flow around the major bottlenecks is shown in from Figure 6-3-3 to Figure 6-3-6.

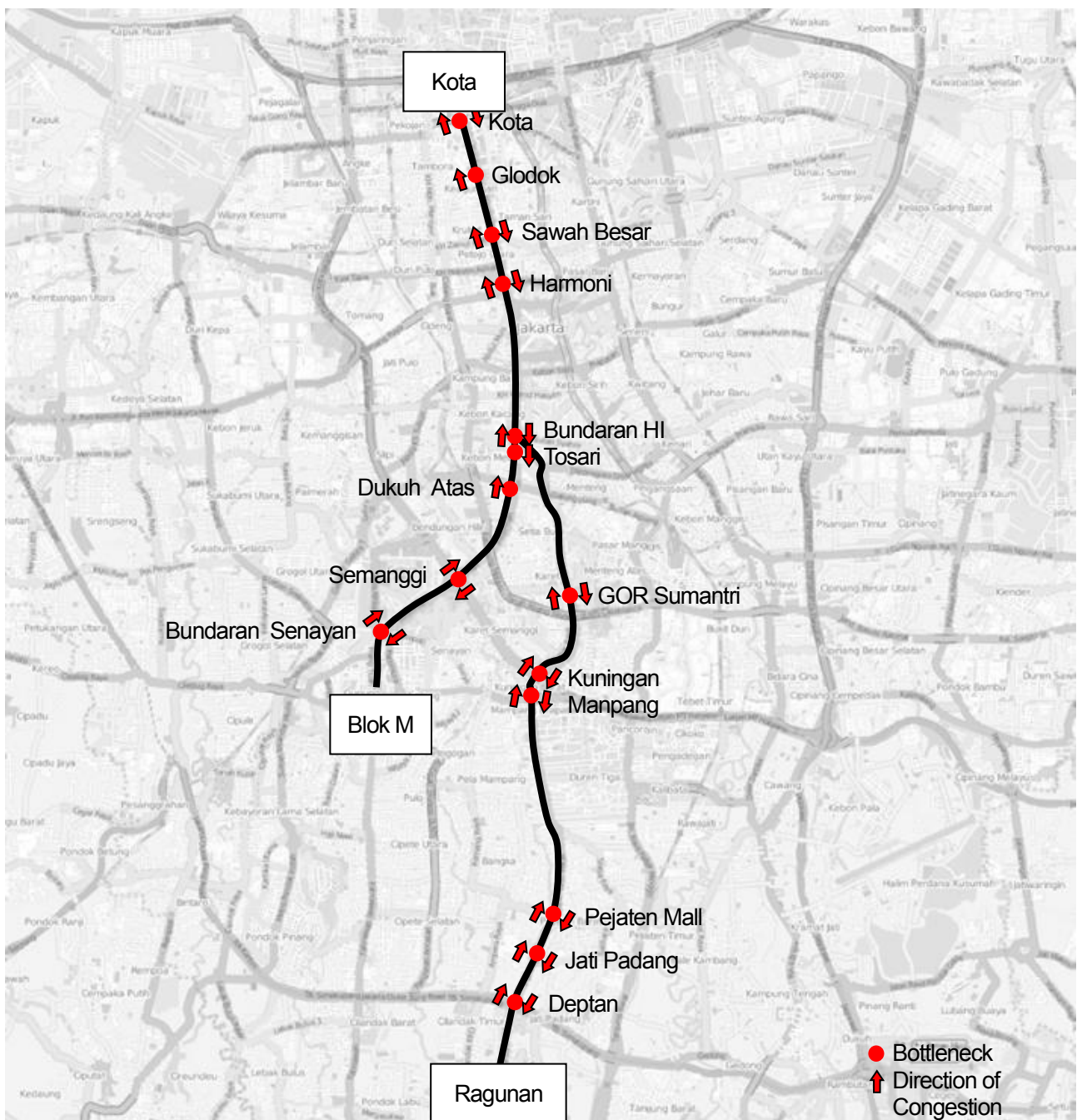


Figure6-3-2 Major Bottlenecks on Corridor 1 and 6



Corridor 1 (Southward : Kota → Blok M)

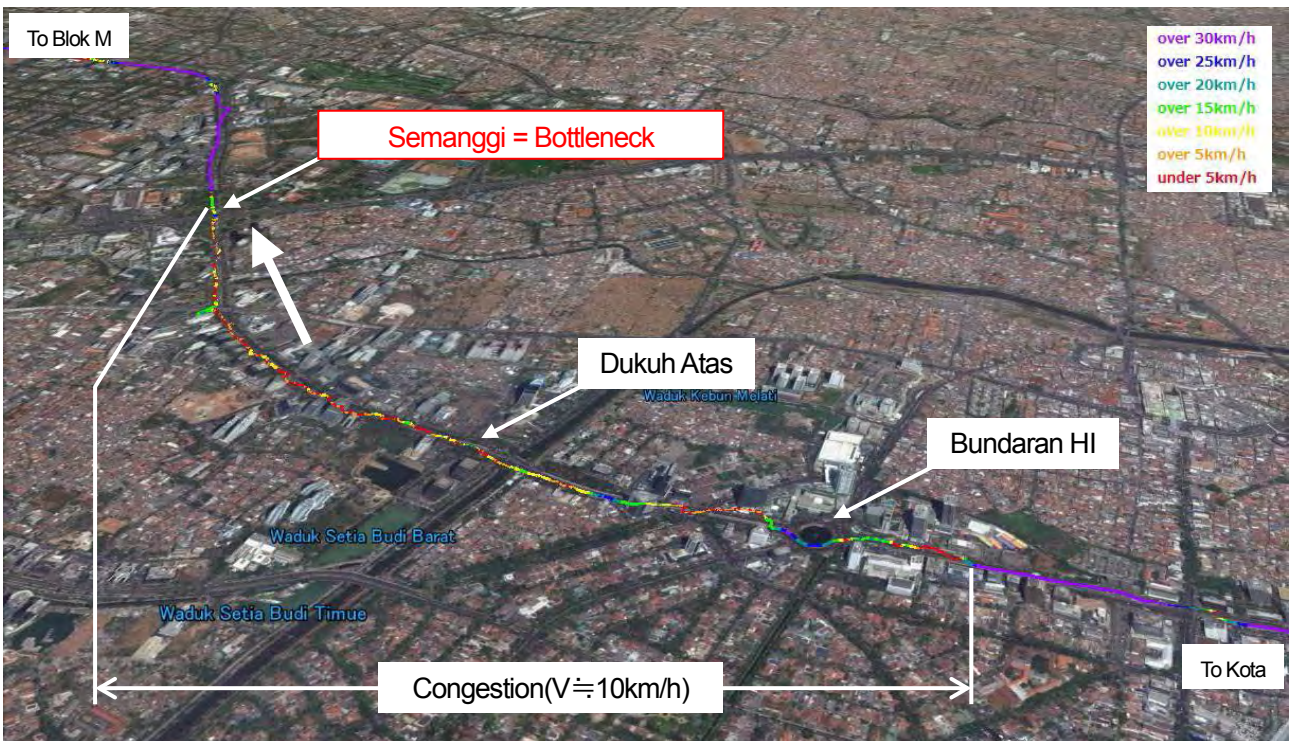
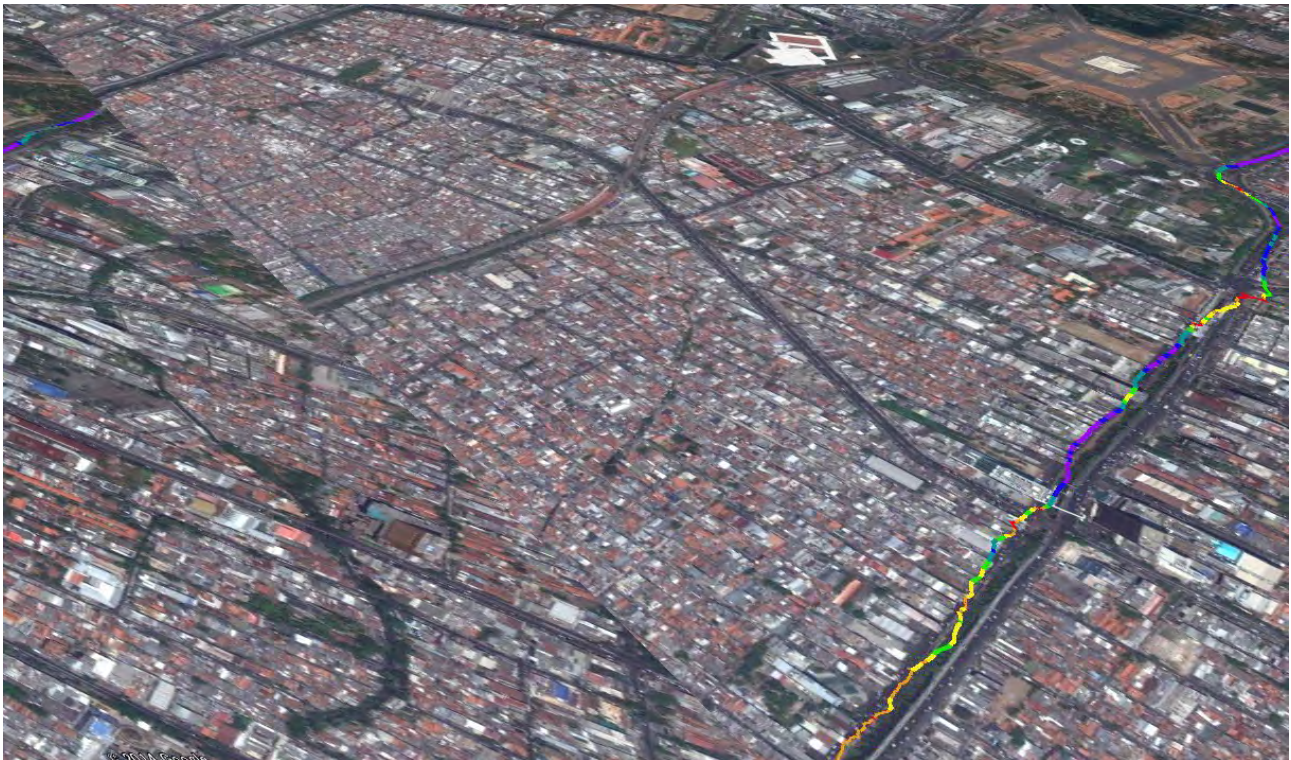


Figure6-3-3 Major Bottlenecks (Corridor 1 / Southward : Kota→Blok M)



Corridor 1 (Northward : Blok M → Kota)

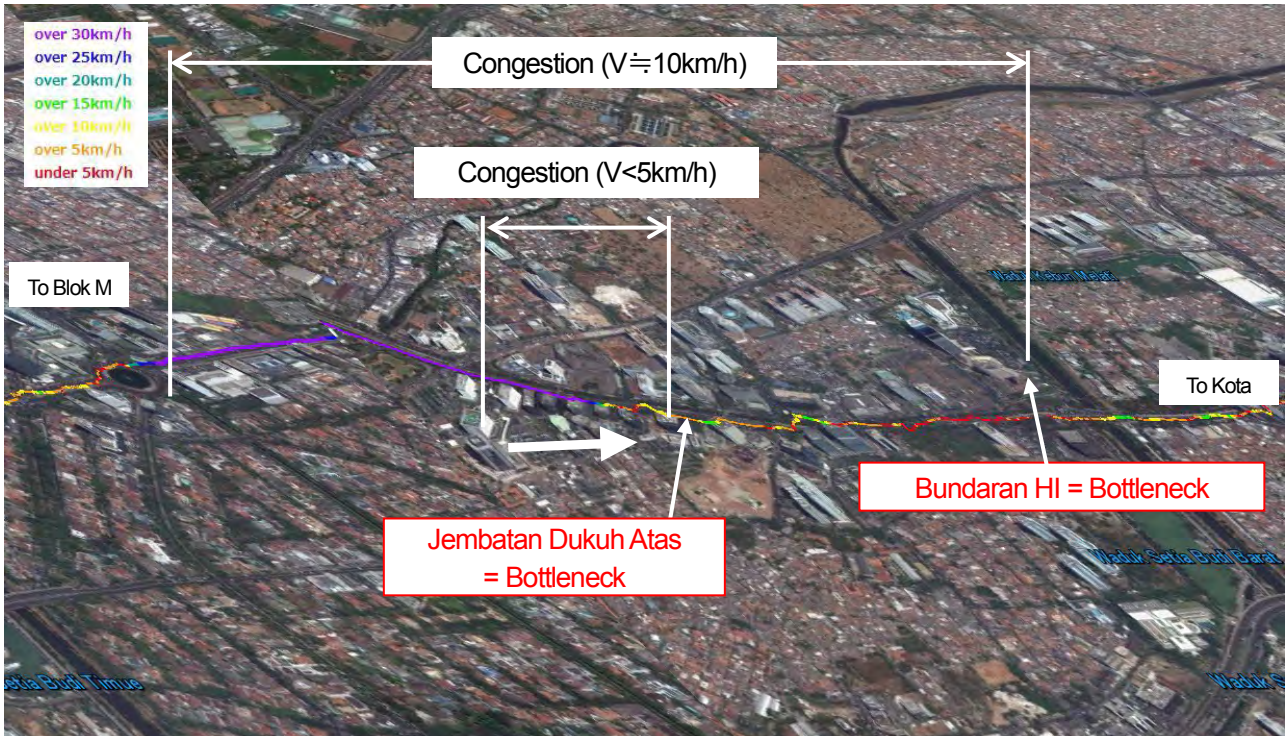
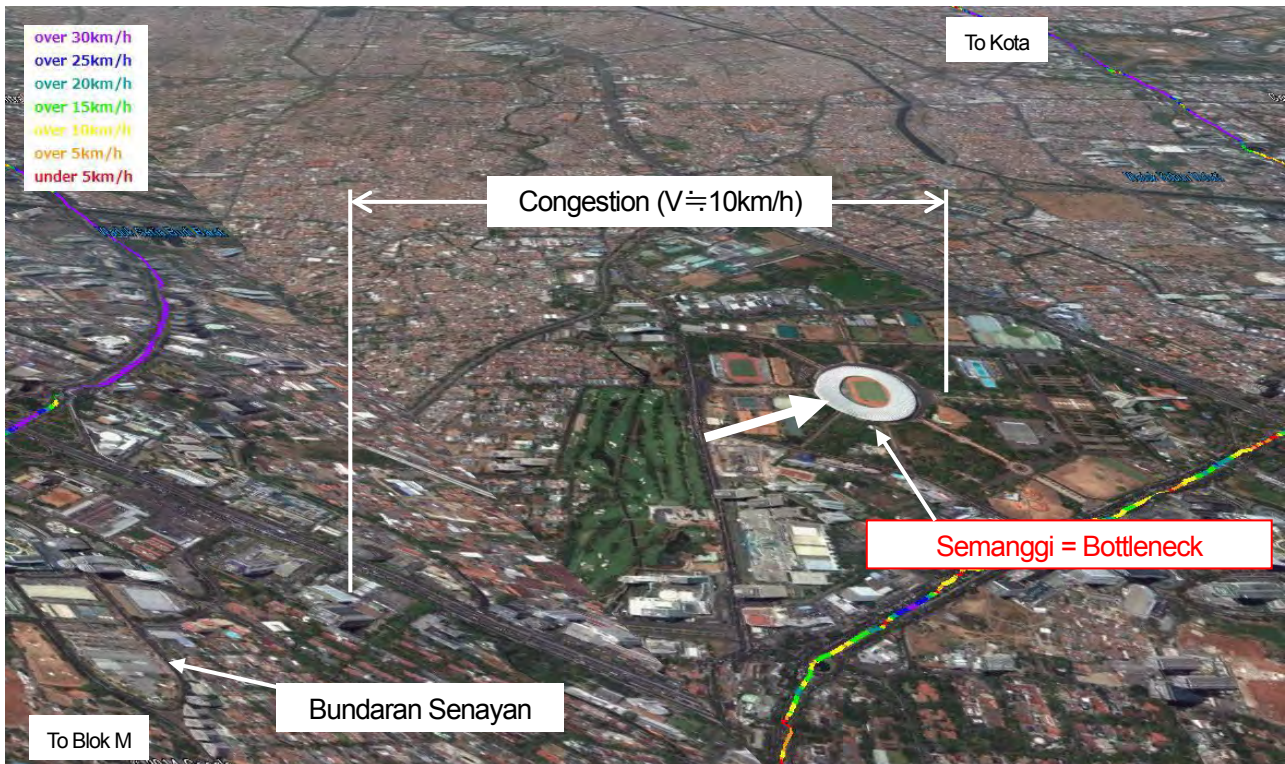


Figure6-3-4 Major Bottlenecks (Corridor 1 / Northward : Blok M→Kota)



Corridor 6 (Southward : Bundaran HI → Ragunan)

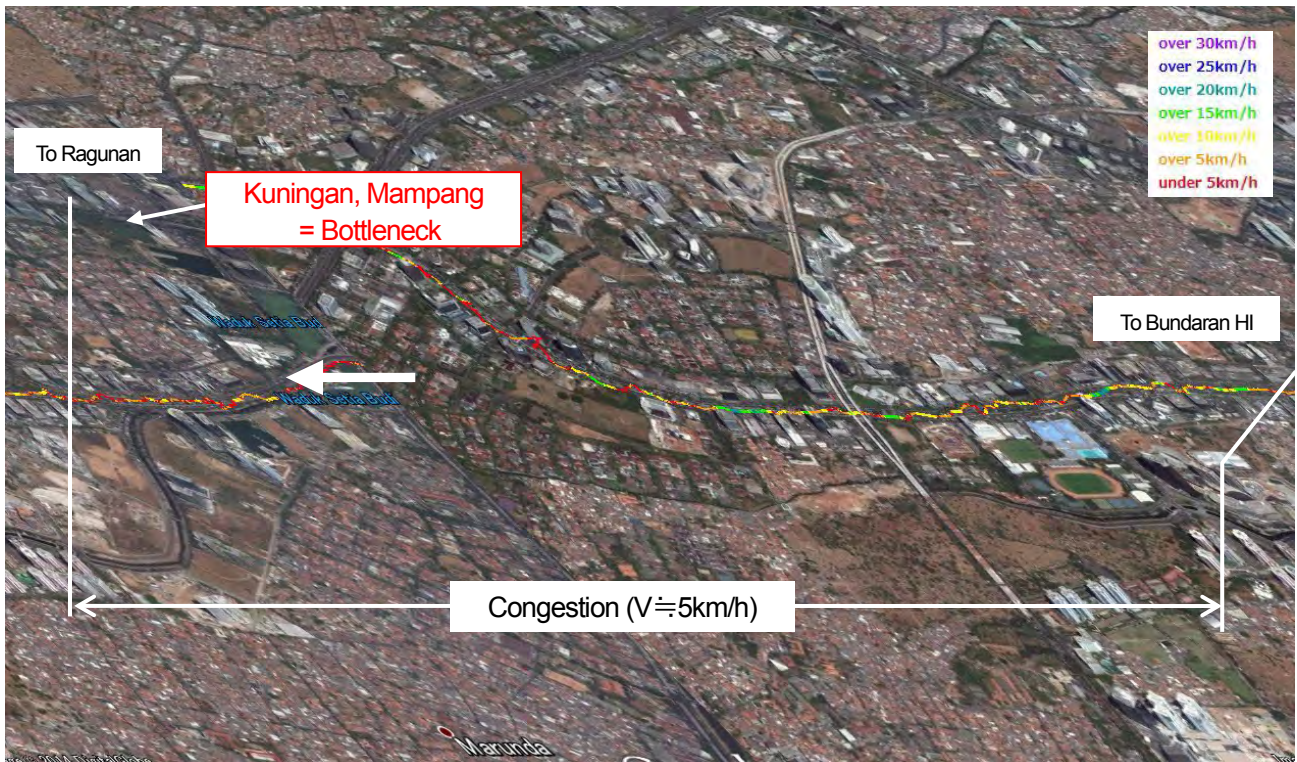


Figure6-3-5 Major Bottlenecks (Corridor 6 / Westward : Bundaran HI→Ragunan)



Corridor 6 (Northward : Ragunan → Bundaran HI)

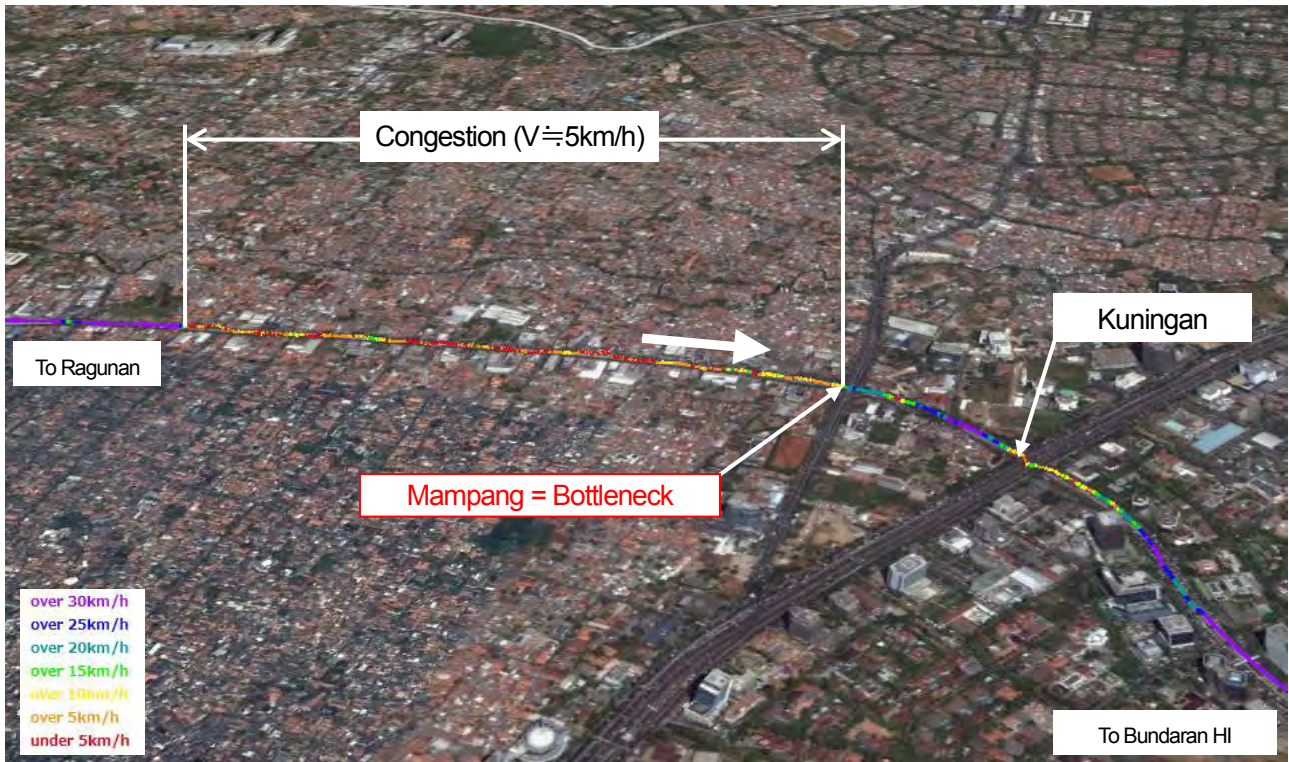


Figure6-3-6 Major Bottlenecks (Corridor 6 / Northward : Ragunan→Bundaran HI)



## 6.4 WTP (Willingness To Pay) Survey

### 6.4.1 Survey Method

#### 6.4.1.1 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. Figure 6-4-1 shows an example of WTP survey.



Figure6-4-1 WTP Survey

#### 6.4.1.2 Survey location and sample number

The survey location and the number of samples are shown in Table 6-4-1. The target respondents were car users on Corridor 1 and Corridor 6. To avoid sampling bias, each corridor was divided into some sections and the number of samples was set by each section corresponding to each traffic demand. The interview was conducted at some restaurants, car parks, bus terminals, public institutions and surrounding areas on each section.

It was assumed that there was a difference in the tendency of the willingness to pay and the attitude and behavior change by trip purpose. Therefore, the interview was conducted to ensure 400 samples of each purpose for "commuting", "return home" and "business, private and other" as shown in Table 6-4-2.

**Table6-4-1 Survey Location and Sample Number**

Corridor	Section	Location	Samples
Corridor 1	Simpang Kota - Harmoni	Harmoni	82
	Harmoni - Bunderan HI	Sarinah	131
	Bunderan HI - Semanggi	Setia budi, GI	280
	Semanggi - Sisingamangaraja	Ratu Plaza, FX	307
	Subtotal		800
Corridor 6	Bundaran HI - Fly Over Menteng	Menteng Plaza	80
	Flyover Menteng - Kuningan	Pasar Festival	160
	Kuningan - Pejaten	Imigrasi	80
	Pejaten - Ragunan	Pejaten Village	80
	Subtotal		400
Grand Total			1,200

**Table6-4-2 Number of Respondents by Trip Purpose**

Trip Purpose	Corridor 1		Corridor 6		Total	
	No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
To work	150	7%	82	7%	232	7%
To school	115	5%	53	4%	168	5%
<b>Subtotal 1</b>	<b>265</b>	<b>12%</b>	<b>135</b>	<b>11%</b>	<b>400</b>	<b>12%</b>
Home from work	179	8%	91	7%	270	8%
Home from school	81	4%	43	4%	124	4%
<b>Subtotal 2</b>	<b>260</b>	<b>12%</b>	<b>134</b>	<b>11%</b>	<b>394</b>	<b>12%</b>
Business	182	9%	101	8%	283	8%
Shopping/Lunch/Dinner	77	4%	28	2%	105	3%
Others	16	1%	2	0%	18	1%
<b>Subtotal 3</b>	<b>275</b>	<b>13%</b>	<b>131</b>	<b>11%</b>	<b>406</b>	<b>12%</b>
<b>Total</b>	<b>800</b>	<b>38%</b>	<b>400</b>	<b>33%</b>	<b>1,200</b>	<b>36%</b>

## 6.4.2 Survey Results

### 6.4.2.1 Attribution of respondents

The attribution of the respondents is shown from Table 6-4-3 to Table 6-4-7. Gender results were obtained approximately the same number of male and female, however it is inferred that it is not the composition ratio of the driver itself, but the fact is the woman was easily obtained cooperation for the interview. 28% of the respondents are in the age of 21 to 29, which accounts for most of the total. Then, 25% are in the 30s and 21% are in the 40s. The proportion of these three generations accounts for 74%.

As for the district of residence, 36% of the respondents live in South Jakarta. The respondents who live in Jakarta province account for 75%, which is shown that the car users relatively close area consist of large portion.

While company employees such as office staffs, managers account for large, the car utilization of students is relatively high, 23% of the respondents. Regarding the household income, 21% of the respondents earn incomes ranging between 5 and 7.5 million rupiah per month. 63% of respondents earn incomes less than one million rupiah per month.

**Table6-4-3 Gender**

Gender		No. of Respondents	%
1	Male	623	52%
2	Female	577	48%
<b>Total</b>		<b>1,200</b>	<b>100%</b>

**Table6-4-4 Age**

Age		No. of Respondents	%
1	16 or less	47	4%
2	17	23	2%
3	18	56	5%
4	19-20	120	10%
5	21-29	338	28%
6	30-39	296	25%
7	40-49	249	21%
8	50-59	62	5%
9	60-69	8	1%
10	70-79	1	0%
11	80 or more	0	0%
<b>Total</b>		<b>1,200</b>	<b>100%</b>

**Table6-4-5 Place of Residence**

Place		Corridor 1		Corridor 6		Total	
		No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
1	Jakarta Pusat (Center)	87	11%	39	10%	126	11%
2	Jakarta Utara (North)	44	6%	9	2%	53	4%
3	Jakarta Timur (East)	92	12%	44	11%	136	11%
4	Jakarta Selatan (South)	263	33%	174	44%	437	36%
5	Jakarta Barat (West)	99	12%	48	12%	147	12%
Inside Jakarta		585	73%	314	79%	899	75%
6	Kota Bogor	3	0.4%	2	1%	5	0.4%
7	Kota Depok	53	7%	32	8%	85	7%
8	Kota Tangerang	34	4%	6	2%	40	3%
9	Kota Tangerang Selatan	56	7%	10	3%	66	6%
10	Kota Bekasi	43	5%	23	6%	66	6%
11	Kab. Bogor	13	2%	6	2%	19	2%
12	Kab. Tangerang	5	1%	1	0.3%	6	1%
13	Kab. Bekasi	7	1%	6	2%	13	1%
14	Others	1	0.1%	0	0%	1	0.1%
Outside Jakarta		215	27%	86	22%	301	25%
<b>Total</b>		<b>800</b>	<b>100%</b>	<b>400</b>	<b>100%</b>	<b>1,200</b>	<b>100%</b>

**Table6-4-6 Occupation**

Occupation		No. of Respondents	%
1	Teacher	14	1%
2	Director level	4	0.3%
3	Manager level	72	6%
4	Assistant manager / Supervisor	172	14%
5	Office staff	261	22%
6	Office supporting staff (SPG, security, driver etc.)	47	4%
7	Employee (cleaning service, labor etc.)	3	0.3%
8	Entrepreneur with 1-5 employees	125	10%
9	Entrepreneur with >5 employees	43	4%
10	Housewife	39	3%
11	Student	270	23%
12	Not working	0	0%
13	Civil servant	49	4%
14	Others	101	8%
<b>Total</b>		<b>1,200</b>	<b>100%</b>

**Table6-4-7 Household Income ('000 rupiahs/month)**

Income		No. of Respondents	%
1	less than 2,500	125	10%
2	2,500-	202	17%
3	5,000-	254	21%
4	7,500-	178	15%
5	10,000-	182	15%
6	12,500-	70	6%
7	15,000-	67	6%
8	17,500-	26	2%
9	20,000-	49	4%
10	30,000 or more	44	4%
11	no answer	3	0%
<b>Total</b>		<b>1,200</b>	<b>100%</b>

#### 6.4.2.2 Trip characteristics

The composition of trip purpose is shown in Table 6-4-8. The compositions have no big difference between Corridor 1 and Corridor 6. 60% of the trips are for the purpose of daily routine such as commuting, going to school and returning home. Business trips and private trips such as shopping account for approximately 30%.

**Table6-4-8 Composition by Trip Purpose and Trip Rate of Car Users**

Trip Purpose		Corridor 1		Corridor 6		Total	
		No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
1	To work	430	20%	264	21%	694	21%
2	Home from work	473	22%	276	22%	749	22%
3	To school	232	11%	125	10%	357	11%
4	Home from school	235	11%	124	10%	359	11%
5	Business	311	15%	206	17%	517	15%
6	Shopping/Lunch/Dinner	396	19%	199	16%	595	18%
7	Others	44	2%	34	3%	78	2%
<b>Total</b>		<b>2,121</b>	<b>100%</b>	<b>1,228</b>	<b>100%</b>	<b>3,349</b>	<b>100%</b>
<b>Number of samples</b>		<b>800</b>		<b>400</b>		<b>1,200</b>	
<b>Average trip rate (trips/day)</b>		<b>2.65</b>		<b>3.07</b>		<b>2.79</b>	

Table 6-4-9 shows OD (Origin and Destination) characteristics of the trips. 80% of trips are inner trips moving only inside Jakarta. On the other hand, the trips from/to outside Jakarta account for only 20%.



**Table6-4-9 Characteristics of OD (Origin and Destination)**

OD		Corridor 1		Corridor 6		Total	
		No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
1	Jakarta – Jakarta	1,620	76%	977	80%	2,597	78%
2	Jakarta – Outer area	501	24%	251	20%	756	22%
3	Outer area – Outer area	0	0%	0	0%	0	0%
<b>Total</b>		<b>2,121</b>	<b>100%</b>	<b>1,228</b>	<b>100%</b>	<b>3,349</b>	<b>100%</b>

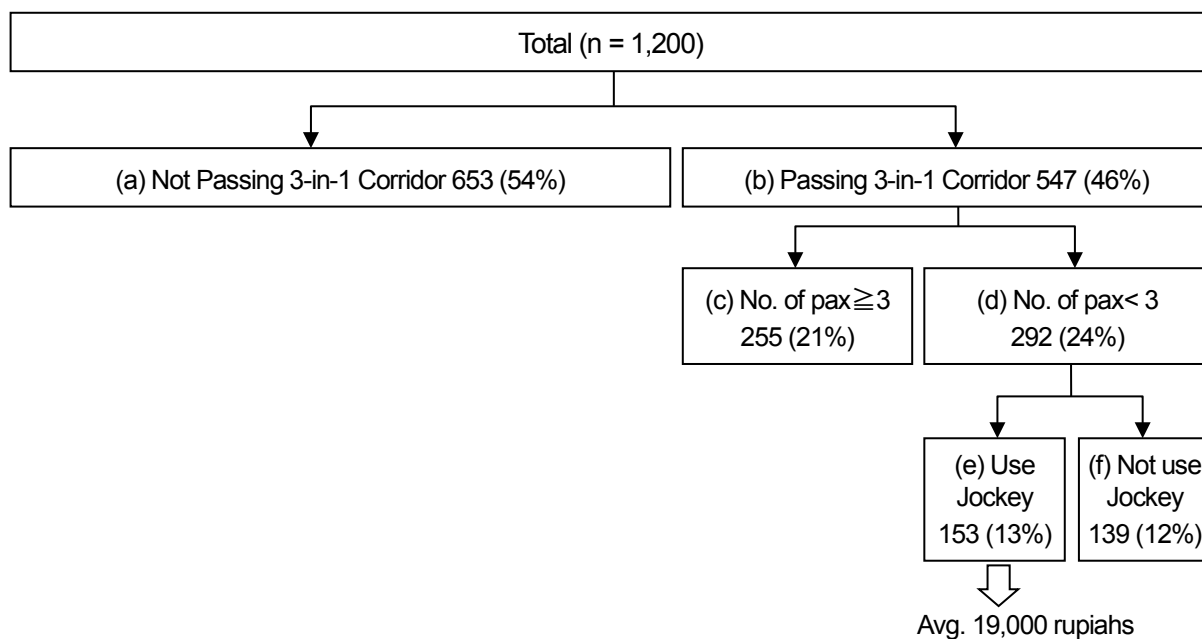
**Table6-4-10 Average Trip Length on ERP corridor (km/trip)**

	To Work	Home from work	To school	Home from school	Business	Shopping/ Lunch/Dinner	Others	All purpose
Corridor 1	3.4	3.0	2.8	3.2	4.4	2.9	2.2	3.3
Corridor 6	4.5	4.9	3.0	3.9	4.3	5.2	3.5	4.4

Note: the results do not show the trip length between the origin and the destination but the distance of corridor 1 and corridor 6 used by the trip.

#### 6.4.2.3 Driver's behavior during 3-in-1 hour

3-in-1 is a regulation that prohibits vehicles with passengers less than 3 persons to pass certain major roads (e.g. Harmoni - Thamrin - Sudirman - Gatot Subroto) during rush hour (7am - 10am, 4:30pm-7pm). 54% of the respondents do not use the 3-in-1 corridor during the 3-in-1 restriction hour, (a) in Fig. 7-4-2. On the other hand, 46% of the respondents use the 3-in-1 corridor during the 3-in-1 restriction hour, (b). While 21% of the respondents use 3-in-1 corridor during the 3-in-1 hour with 3 or more passengers according to the rule, (c), it is a fact that 24% of the respondents pass the corridor with less than 3 passengers or cheat the rule by paying Jockeys, (e, f). Group (a) may be a cause of congestion outside 3-in-1 hour due to time shift or congestion on some detours. To facilitate modal shift to public transport for group (a), the extension of the restriction hour and corridor should be taken into account. As for group (c), price elasticity would be smaller by sharing ERP charge with passengers. Since group (e) already pays for road usage even though their act is illegal, ERP charge less than 19,000 rupiahs could not change their attitude and behavior. However, group (f) accounts for only 13% and it is not necessary to set ERP charge more than 19,000 rupiahs. To tackle group (f), it is necessary to apply strong enforcement system when ERP will be installed.



**Figure6-4-2 Driver's Behavior during 3-in-1 Hour**

Note: Percentage shows the proportion for total (n=1,200)

#### 6.4.2.4 WTP: Willingness To Pay

The respondents were asked to choose an option from the list of alternative behaviors against ERP as shown in Table 6-4-10 under the following assumptions;

[Assumptions]

- Charging road : Corridor 1 and Corridor 6
- Charging day/period : 7:00 to 20:00 on weekdays
- Charged vehicle : Motorized vehicles except for public transport, taxi, motorcycles
- Charging frequency : 1 charge for 1 trip
- OBU (On Board Unit) : Free distribution
- Presented charge : 5, 10, 15, 20, 25, 30, 35, 40, 50, 60 ('000 rupiahs)

**Table6-4-11 Assumed Change of Attitude and Behavior on ERP**

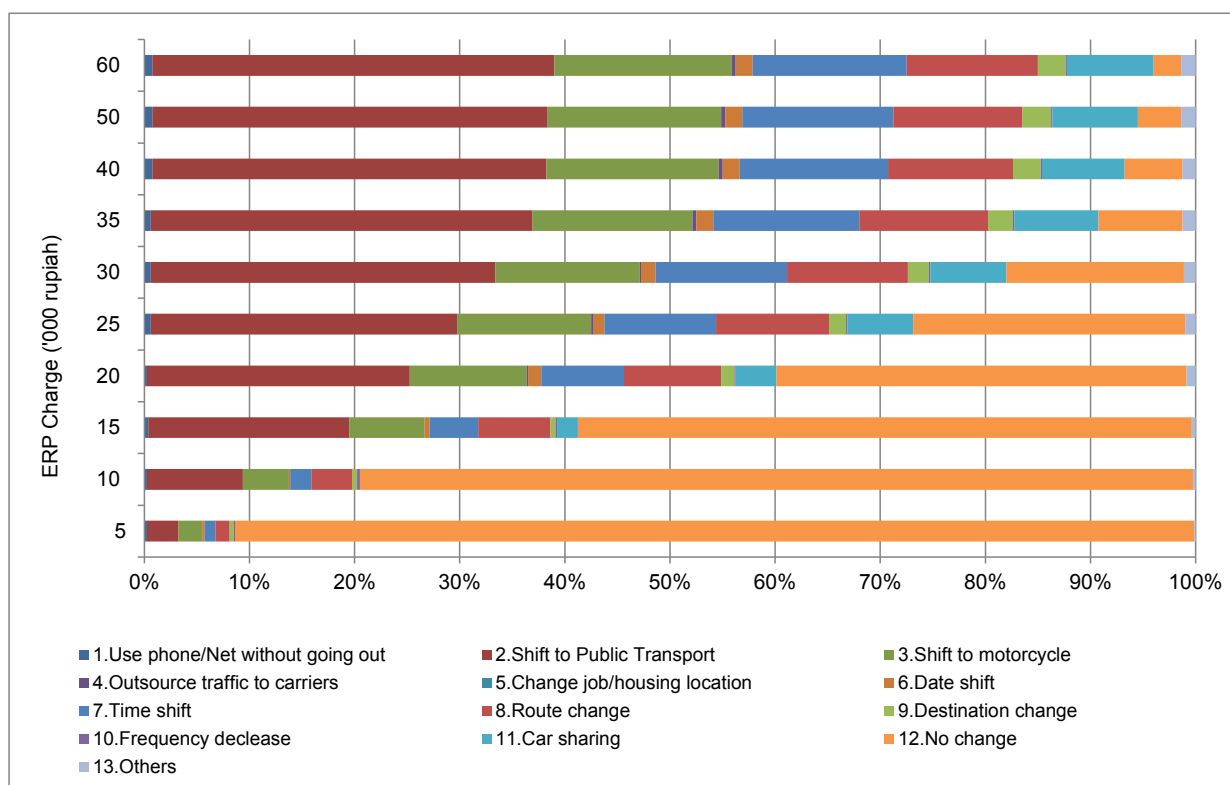
Option		
Stop using a car	1	Use telephone, e-mail (SMS, BBM, Line etc.), Fax, Online shopping etc. instead of going out
	2	Shift to Public Transportation
	3	Shift to motorcycle (Including Ojek)
	4	Outsource your traffic to carriers
	5	Change job, workplace including SOHO, housing location so as not to pay the charge
Continue to use a car	6	Change the schedule to weekend and holiday so as not to pay
	7	Shift the departure time so as not to pay the charge
	8	Change route so as not to pay the charge
	9	Change the destination so as not to pay the charge
	10	Decrease in the frequency of visiting the destination
	11	Share your car with your friends/acquaintances so as to lessen the cost per person
	12	No change behavior (Pay the charge)
Other	13	Free answer

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.

**Table6-4-12 Impact of ERP on Driver Behavior (Corridor 1)**

Option		ERP Charge ('000 Rupiah)									
		5	10	15	20	25	30	35	40	50	60
Stop Using Car	1 Use phone/Net without going out	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
	2 Shift to Public Transport	3%	9%	19%	25%	29%	33%	36%	38%	38%	38%
	3 Shift to motorcycle	2%	4%	7%	11%	13%	14%	15%	16%	17%	17%
	4 Outsource traffic to carriers	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	5 Change job/housing location	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Continue to use car	6 Date shift	0%	0%	1%	1%	1%	1%	2%	2%	2%	2%
	7 Time shift	1%	2%	5%	8%	11%	13%	14%	14%	14%	15%
	8 Route change	1%	4%	7%	9%	11%	12%	12%	12%	12%	13%
	9 Destination change	0%	1%	1%	1%	2%	2%	2%	3%	3%	3%
	10 Frequency decrease	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	11 Car sharing	0%	0%	2%	4%	6%	7%	8%	8%	8%	8%
	12 No change	91%	79%	58%	39%	26%	17%	8%	6%	4%	3%
Other	13 Others	0%	0%	0%	1%	1%	1%	1%	1%	1%	
Total		100%	100%	100%	100%	100%	100%	100%	100%	100%	

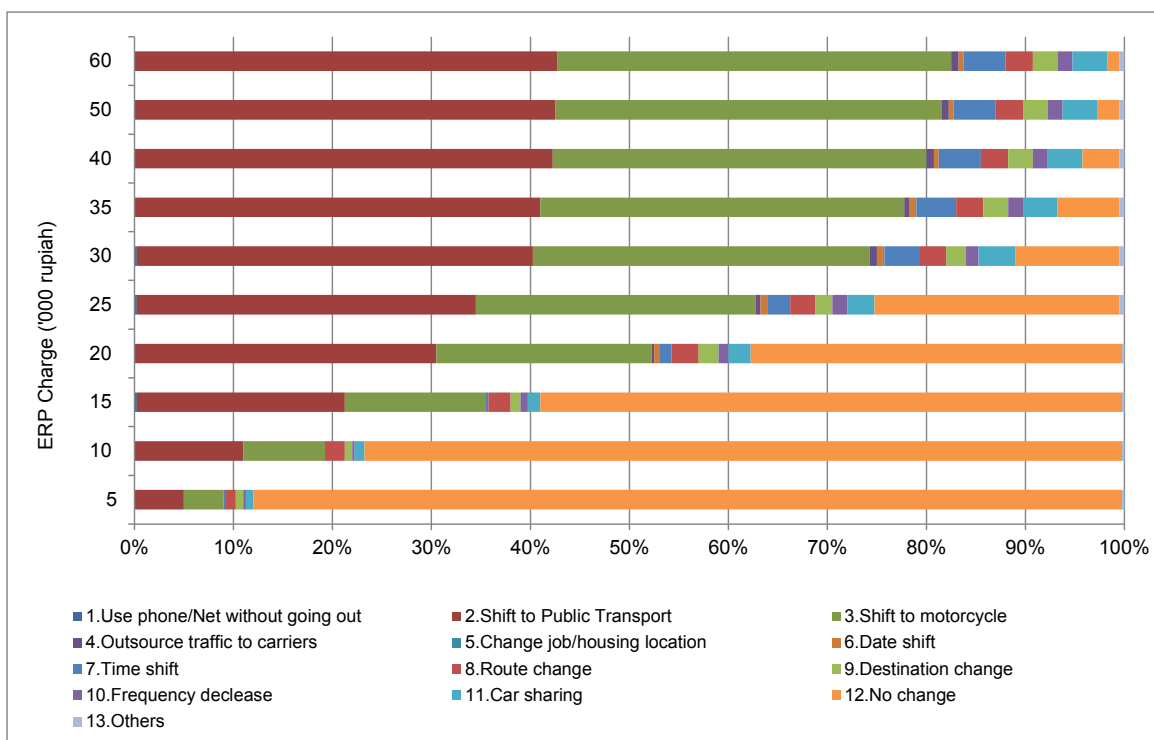


**Figure6-4-3 Impact of ERP on Driver Behavior (Corridor 1)**

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.

**Table6-4-13 Impact of ERP on Driver Behavior (Corridor 6)**

Option		ERP Charge ('000 Rupiah)									
		5	10	15	20	25	30	35	40	50	60
Stop Using Car	1 Use phone/Net without going out	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2 Shift to Public Transport	5%	11%	21%	31%	34%	40%	41%	42%	43%	43%
	3 Shift to motorcycle	4%	8%	14%	22%	28%	34%	37%	38%	39%	40%
	4 Outsource traffic to carriers	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
	5 Change job/housing location	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Continue to use car	6 Date shift	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%
	7 Time shift	0%	0%	0%	1%	2%	4%	4%	4%	4%	4%
	8 Route change	1%	2%	2%	3%	3%	3%	3%	3%	3%	3%
	9 Destination change	1%	1%	1%	2%	2%	2%	3%	3%	3%	3%
	10 Frequency decrease	0%	0%	1%	1%	2%	1%	2%	2%	2%	2%
	11 Car sharing	1%	1%	1%	2%	3%	4%	4%	4%	4%	4%
	12 No change	88%	77%	59%	38%	25%	11%	6%	4%	2%	1%
Other	13 Others	0%	0%	0%	0%	1%	1%	1%	1%	1%	
Total		100%	100%	100%	100%	100%	100%	100%	100%	100%	



**Figure6-4-4 Impact of ERP on Driver Behavior (Corridor 6)**

Note: In general, road pricing policy has two functions. One is "internalization of external diseconomies" and the other is "reduction of traffic demand." Because ERP charge is regarded as "traffic control retribution" in Indonesia, ERP in Jakarta could not have the former function and the latter function is mostly expected. Needless to say, the objective of "Reduction of traffic demand" is to alleviate the traffic congestion by discouraging the road user to use a car by charging and it is necessary to set the charge amount for realizing the traffic environment of the target. In this sense, calculation of mean and median WTP for the population as a CVM general approach does not make sense and also there is concern that it would cause some misunderstandings. Therefore, WTP shall not be estimated in this study. In addition, since ERP is aimed to reduce the traffic demand by charging and to shift the car users to public transport which does not cost as much as car use, ATP (Ability To Pay) shall not be calculated either.

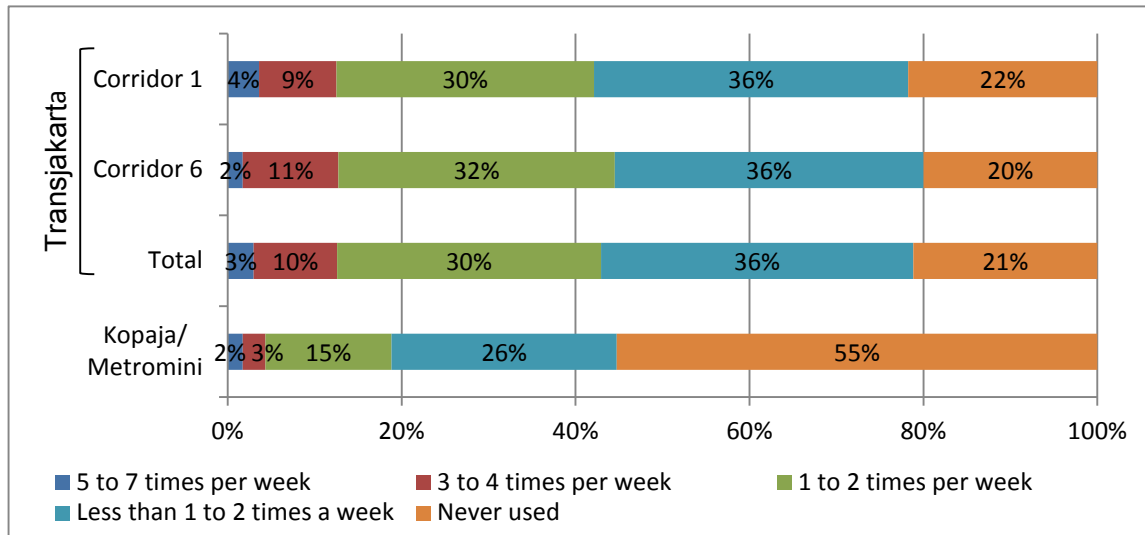
### 6.4.2.5 Opinion survey for public transport

To consider improvement measures for public transport which will be the conversion destination from cars, an opinion survey of car users on public transport was carried out. In this survey, the frequency of public transport use, the reason not to use or seldom use public transport and the necessary measures for improvement to shift to public transport were asked.

Table 6-4-14 and Figure 6-4-5 shows the frequency of public transport use. While 43% of the respondents use Transjakarta regularly, more than once a week, Kopaja or MetroMini are used by only 19% of the respondents.

**Table6-4-14 Frequency of public transport use**

Item	Transjakarta						Kopaja/ Metromini	
	Corridor 1		Corridor 6		Total		No. of Respondants	%
	No. of Respondants	%	No. of Respondants	%	No. of Respondants	%		
1 5 to 7 times per week	29	4%	7	2%	36	3%	21	2%
2 3 to 4 times per week	71	9%	44	11%	115	10%	31	3%
3 1 to 2 times per week	237	30%	127	32%	364	30%	174	15%
<b>Regular user</b>	<b>337</b>	<b>42%</b>	<b>178</b>	<b>45%</b>	<b>515</b>	<b>43%</b>	<b>226</b>	<b>19%</b>
4 Less than 1 to 2 times a week	289	36%	142	36%	431	36%	311	26%
5 Never used	174	22%	80	20%	254	21%	663	55%
<b>Non-regular user</b>	<b>463</b>	<b>58%</b>	<b>222</b>	<b>56%</b>	<b>685</b>	<b>57%</b>	<b>974</b>	<b>81%</b>
<b>Total</b>	<b>800</b>	<b>100%</b>	<b>400</b>	<b>100%</b>	<b>1,200</b>	<b>100%</b>	<b>1,200</b>	<b>100%</b>



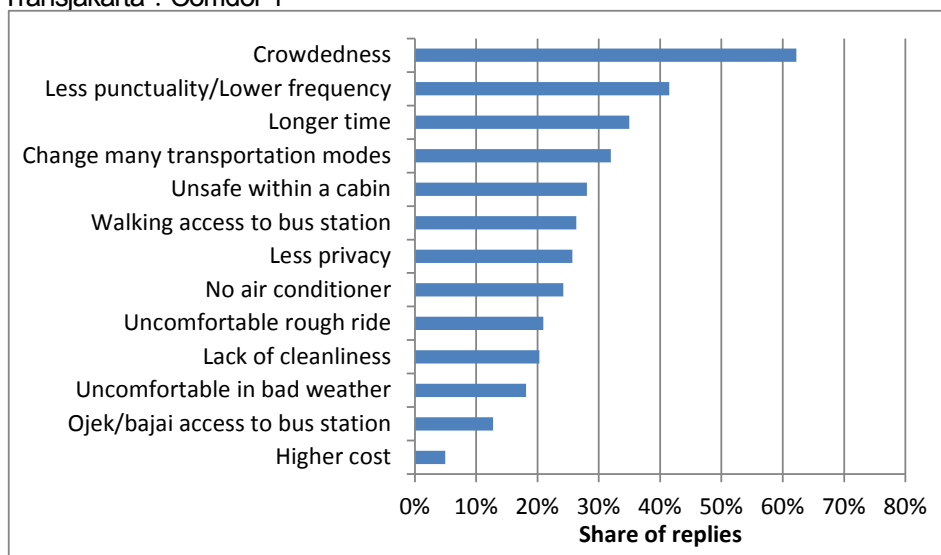
**Figure6-4-5 Use frequency of public transport**

The reason not to use public transport is shown in Table 6-4-15 and Figure 6-4-6. As for Transjakarta both Corridor 1 and Corridor 6, the reasons at the top are congestion, dissatisfaction with regard to the inconvenience such as poor punctuality and service frequency, high frequency of transfer and long travel time. On the other hand, regarding Kopaja and MetroMini, approximately 80% of respondents claimed the lack of safety, and it is said that the minimum standard as a public transport is not met.

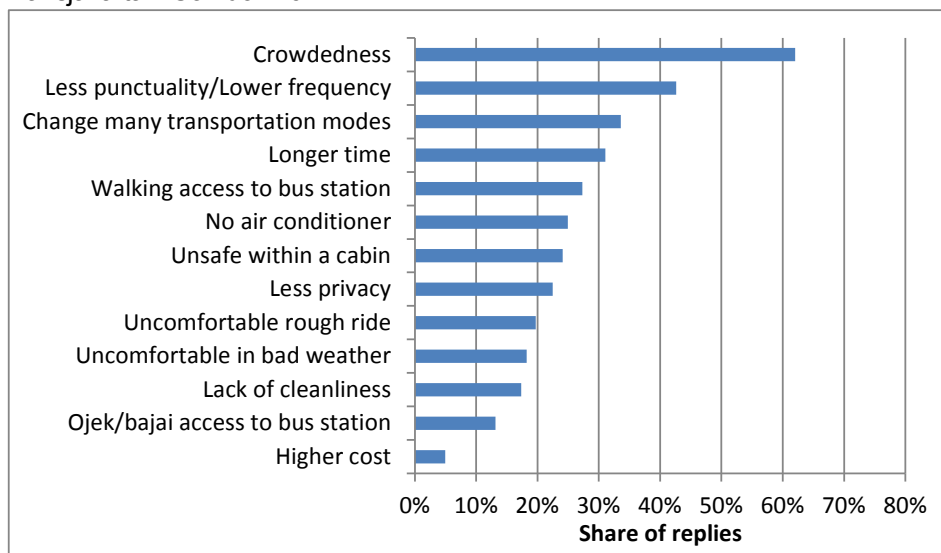
**Table6-4-15 Reason not to use or seldom use public transport**

Item	Transjakarta						Kopaja/ Metromini (N=974)	
	Corridor 1 (N=463)		Corridor 6 (N=222)		Total (N=685)		No. of Respondants	%
	No. of Respondants	%	No. of Respondants	%	No. of Respondants	%		
1 Longer time	162	35%	51	23%	213	31%	212	22%
2 Higher cost	23	5%	11	5%	34	5%	56	6%
3 Less punctuality/Lower frequency	192	41%	100	45%	292	43%	260	27%
4 Walking access to bus station	122	26%	65	29%	187	27%	140	14%
5 Ojek/bajai access to bus station	59	13%	31	14%	90	13%	96	10%
6 Change many transportation modes	148	32%	82	37%	230	34%	252	26%
7 Crowdedness	288	62%	137	62%	425	62%	621	64%
8 Lack of cleanliness	94	20%	25	11%	119	17%	576	59%
9 Unsafe within a cabin	130	28%	35	16%	165	24%	755	78%
10 No air conditioner	112	24%	59	27%	171	25%	477	49%
11 Uncomfortable rough ride	97	21%	38	17%	135	20%	317	33%
12 Uncomfortable in bad weather	84	18%	41	18%	125	18%	141	14%
13 Less privacy	119	26%	35	16%	154	22%	198	20%

Transjakarta : Corridor 1



Transjakarta : Corridor 6



Kopaja/MetroMini

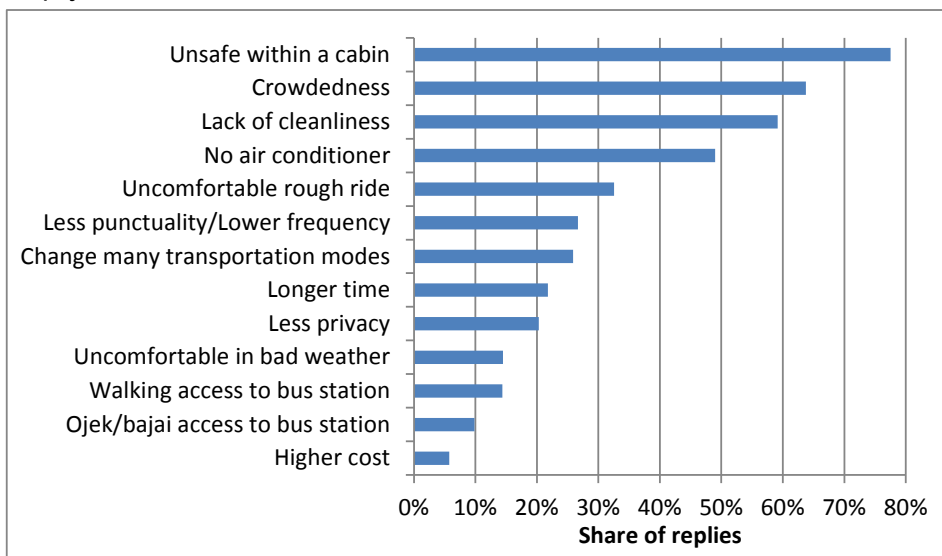


Figure6-4-6 Reason not to use or seldom use public transport

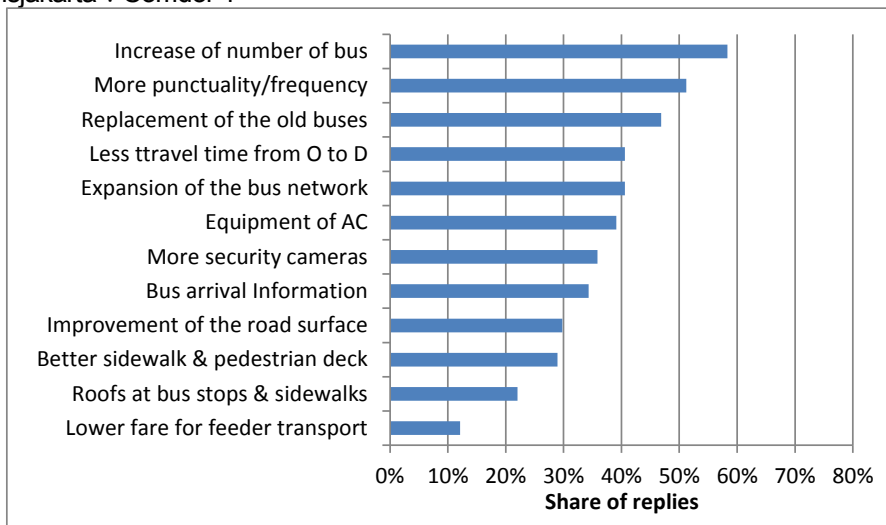
As shown in Table 6-4-16 and Figure 6-4-7, most of the respondents require increasing the number of buses (55%), securing punctuality (49%), updating of old vehicle (43%), in the descending order of necessary measures in order to shift to Transjakarta from private cars. On the other hand, regarding Kopaja and MetroMini, updating of the old vehicle (61%), then the introduction of air conditioning (48%) are required.

Table6-4-16 Improvement Measures for Public Transport

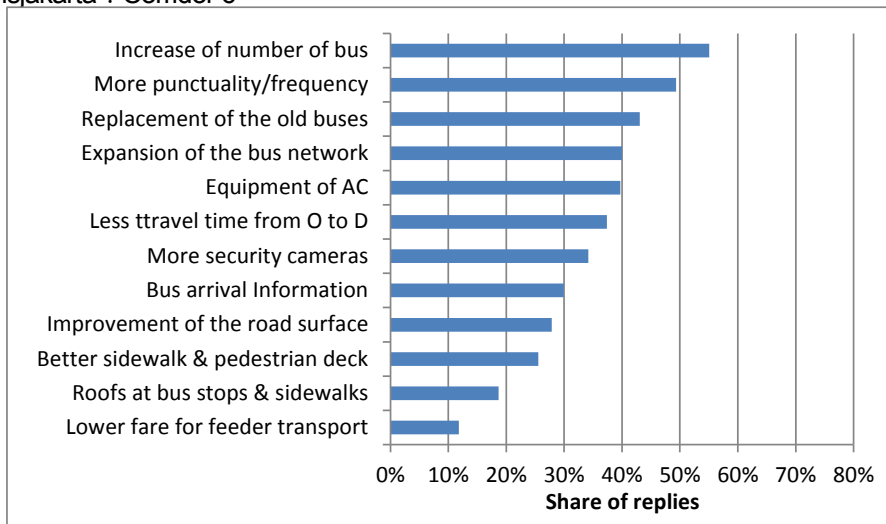
Item	Transjakarta						Kopaja/ Metromini	
	Corridor 1 (N=463)		Corridor 6 (N=222)		Total (N=685)		(N=974)	
	No. of Respondants	%	No. of Respondants	%	No. of Respondants	%	No. of Respondants	%
1 Never use even if any improvement	39	8%	15	7%	54	8%	127	13%
2 Less travel time from O to D	188	41%	68	31%	256	37%	256	26%
3 Lower fare for feeder transport	56	12%	25	11%	81	12%	76	8%
4 More punctuality/frequency	237	51%	101	45%	338	49%	332	34%
5 Bus arrival Information	159	34%	46	21%	205	30%	194	20%
6 Better sidewalk & pedestrian deck	134	29%	41	18%	175	26%	193	20%
7 Roofs at bus stops & sidewalks	102	22%	26	12%	128	19%	182	19%
8 Expansion of the bus network	188	41%	86	39%	274	40%	442	45%
9 Increase of number of bus	270	58%	107	48%	377	55%	431	44%
10 Replacement of the old buses	217	47%	78	35%	295	43%	594	61%
11 More security cameras	166	36%	68	31%	234	34%	270	28%
12 Equipment of AC	181	39%	91	41%	272	40%	471	48%
13 Improvement of the road surface	138	30%	53	24%	191	28%	199	20%



Transjakarta : Corridor 1



Transjakarta : Corridor 6



Kopaja/MetroMini

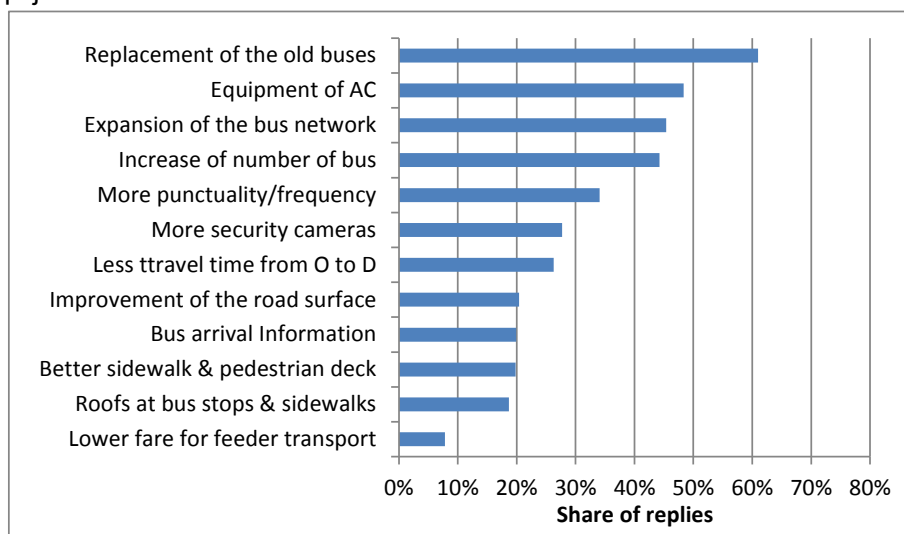


Figure6-4-7 Improvement measures for public transport expected by users

## 6.5 Jockey Interview

### 6.5.1 Methodology

#### 6.5.1.1 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.

#### 6.5.1.2 Survey location and sample number

The survey locations and the number of samples are shown in Table 6-5-1. The survey locations were selected from almost all major places where many Jockeys were standing along 3-in-1 corridors in order to grasp the Jockey price by the section. Although 3-in-1 restriction has already been lifted between Harmoni and Kota section, the surveyor was dispatched to the section just in case. However, no Jockey was observed.

**Table6-5-1 Survey Location and Sample Number**

Location		Number of Respondents	Jockey Type	
			Single	Jockey with Baby
1	Blok M	16	11	5
2	GBK	16	12	4
3	Semanggi	16	11	5
4	Dukuh Atas	16	7	9
5	Bundaran HI	16	9	7
6	BI	10	8	2
7	Harmoni	22	8	14
8	Kota	0	0	0
9	TVRI	16	6	10
10	Kuningan	16	14	2
Total		144	86	58

## 6.5.2 Survey Results

### 6.5.2.1 Attribution of the respondents

The attribution of the respondents is shown in Table 6-5-2 to Table 6-5-7. 61% of respondents are female and 39% are male, as with the similar percentage observed on the street. There are two types of Jockey. One is “Single Jockey” who is working alone, and the other is “Jockey with baby” who works with her kid/baby. The percentage of the former is 60% and that of the latter is 40%. 32% of the respondents are in the age of 21 to 29 which accounts for most of the total. Then, 27% are in the 30s and 17% are in the 40s. The proportion of these three generations is 77%. 31% of the respondents have another job. On the other hand, 67% of them make a living only as Jockey.

While the highest percentage (35%) of the respondents started Jockey within a year, the proportion of those who are continuing to be a Jockey for 5 or more years is relatively high, 20%.

**Table6-5-2 Gender**

Gender		No. of Respondents	%
1	Male	56	39%
2	Female	88	61%
Total		144	100%

**Table6-5-3 Jockey Type**

Jockey Type		No. of Respondents	%
1	Single Jockey	86	60%
2	Jockey with baby	58	40%
Total		144	100%



Single Jockey



Jockey with baby

**Figure6-5-1 Jockey Type**

**Table6-5-4 Age**

Age		No. of Respondents	%
1	13 or less	2	1%
2	14	7	5%
3	15	5	3%
4	16	3	2%
5	17	3	2%
6	18	1	1%
7	19-20	8	6%
8	21-29	46	32%
9	30-39	39	27%
10	40-49	25	17%
11	50-59	1	1%
12	60-69	4	3%
13	70 or more	0	0%
<b>Total</b>		<b>144</b>	<b>100%</b>

**Table6-5-5 Other Occupations**

Other Occupation		No.	%
1	Having	45	31%
2	Not having	97	67%
3	No answer	2	1%
<b>Total</b>		<b>144</b>	<b>100%</b>

**Table6-5-6 Career as a Jockey**

Career as a Jockey		No. of Respondents	%
1	3 months and below	22	15%
2	6 month	15	10%
3	1 year	15	10%
4	2 years	25	17%
5	3 years	20	14%
6	4 years	7	5%
7	5 years	11	8%
8	more than 5 years	29	20%
<b>Total</b>		<b>144</b>	<b>100%</b>

### 6.5.2.2 Income as a Jockey

As shown in Table 6-5-7, the average number of the customers whom one Jockey (one single or one pair of Jockey with baby) acquires per day is 2.3 in the morning and 1.8 in the afternoon. It is assumed that the customers in the afternoon are less than those in the morning because it takes longer time to make a Jockey trip in the afternoon due to heavy congestion. In fact, the interview results shows that 18% of the respondents do not work as a Jockey in the afternoon and some Jockeys mentioned they were involved with other works in the afternoon because the turnover rate of afternoon is less than that of morning.

As for the income per day as a Jockey, the range between 30,000 and 80,000 rupiahs accounts for 80% of the total as shown in Table 6-5-8. The average daily income is 55,000 rupiahs. The average Jockey fee per trip which is calculated by dividing the daily income by the number of customers is 16,500 rupiahs as shown in Table 6-5-9. Regarding the Jockey fee by Jockey type, the fee of Jockey with baby is slightly higher than that of single Jockey, however it is not double simply in proportion to the number of people.

As shown in Table 6-5-10, 81% of the respondents work as a Jockey every day except Saturday and Sunday when 3-in-1 regulation is not implemented.

The monthly income of Jockey is calculated by multiplying the number of customers per day by the average Jockey fee per time by the number of the working days. The distribution of monthly income is shown in Table 6-5-11. 32% of Jockey have income between 500,000 and 1,000,000 rupiahs and 32% of them have income between 1,000,000 and 1,500,000 rupiahs. It is said that Jockeys make money not small even compared to the average monthly income in Indonesia (1.63 million rupiah in 2011, Indonesia Bureau of Statistics).

**Table6-5-7 Number of Customers**

Item		No. of Respondents	%
Morning	1 time	12	8%
	2 times	73	51%
	3 times	34	24%
	4 times	10	7%
	5 times	1	1%
	Not working	14	10%
	Total	144	100%
	Average	2.3 times	
Afternoon	1 time	47	33%
	2 times	53	37%
	3 times	16	11%
	4 times	2	1%
	5 times	0	0%
	Not working	26	18%
	Total	144	100%
	Average	1.8 times	

**Table6-5-8 Income per Day**

Item		No. of Respondents	%
1	10,000 rupiahs	1	1%
2	20,000	8	6%
3	30,000	20	14%
4	40,000	24	17%
5	50,000	36	25%
6	60,000	19	13%
7	70,000	9	6%
8	80,000	12	8%
9	90,000	1	1%
10	100,000	8	6%
11	110,000	1	1%
12	120,000	2	1%
13	130,000	0	0%
14	140,000	0	0%
15	150,000	2	1%
Total		144	100%
Average		55,000 rupiahs	

**Table6-5-9 Average Jockey Fee**

Jockey Type	Price (rupiahs/trip)
Single Jockey	15,500
Jockey with baby	18,000
All	16,500

Note: Average Jockey fee were calculated with two factors, the daily income and the number of the customer per day. Both of factors depend on the sense of the respondent; therefore they are not always correct. On the other hand, the average Jockey prices in Table 6-5-13 were asked directly to Jockeys.

**Table6-5-10 Working Day in a week**

Item		No. of Respondents	%
Morning	1 day	0	0%
	2 days	3	2%
	3 days	3	2%
	4 days	8	6%
	5 days	116	81%
	Not working	14	10%
	Total	144	100%
	<b>Average</b>	<b>4.4 days</b>	
Afternoon	1 time	0	0%
	2 times	4	3%
	3 times	5	3%
	4 times	7	5%
	5 times	102	71%
	Not working	26	18%
	Total	144	100%
	<b>Average</b>	<b>3.9 days</b>	

**Table6-5-11 Monthly Income**

Item			No. of Respondents	%
1		500,000	14	10%
2	500,000 or more	1,000,000 less	46	32%
3	1,000,000	1,500,000	57	40%
4	1,500,000	2,000,000	13	9%
5	2,000,000	2,500,000	11	8%
6	2,500,000	3,000,000	0	0%
7	3,000,000	3,500,000	3	2%
8	3,500,000		0	0%
Total			144	100%
Average			1,080,000 rupiahs	

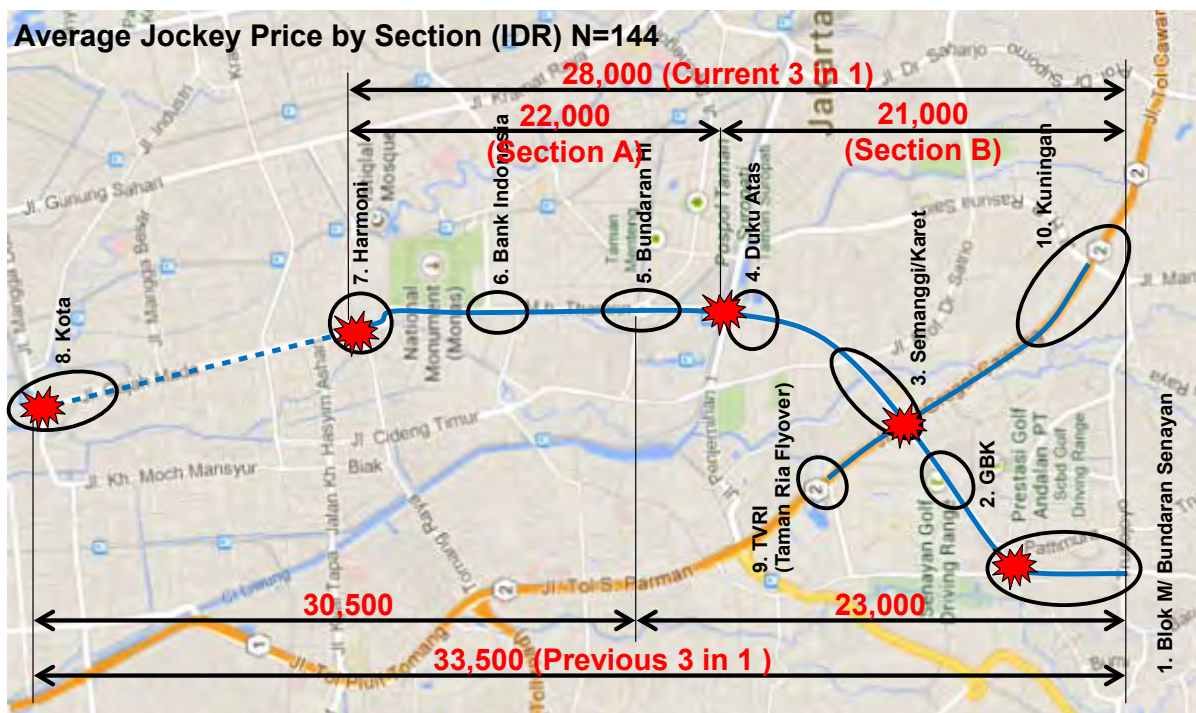
### 6.5.2.3 Jockey Price

The Jockey price for each section was asked in the interview. Table 6-5-12 shows the tabulation result and Figure 6-5-2 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 6-4-2. Therefore, it can be said that when setting the ERP charge it is not highly necessary to consider the Jockey price.

**Table 6-5-12 Average Jockey Price (rupiahs)**

	1	2	3	4	5	6	7	8	9	10
1. Blok M/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.



**Figure 6-5-2 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.

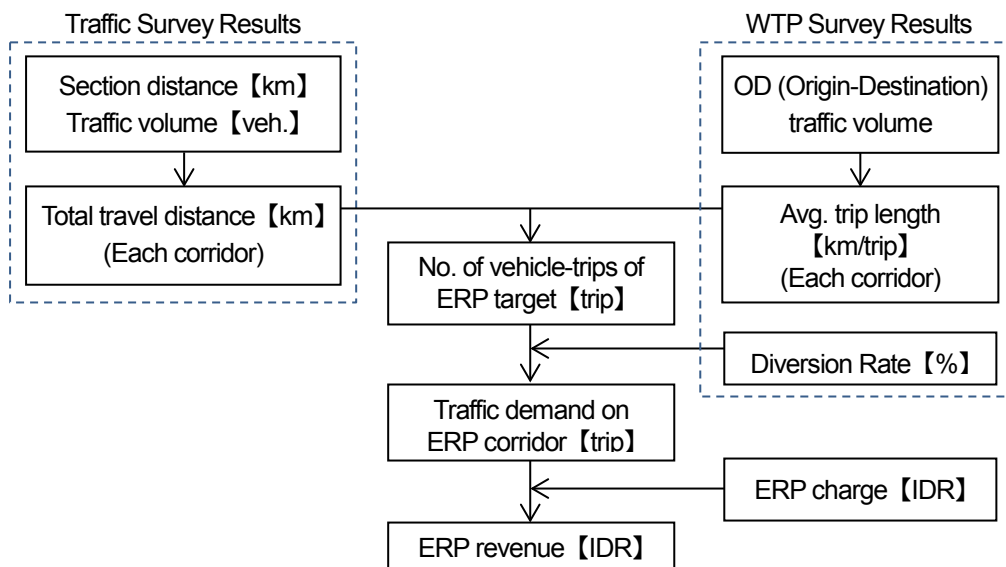


Figure7-1-1 Procedure of Traffic Demand Forecast

## 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.

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

**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
<b>Total</b>	<b>245</b>	<b>52</b>	<b>52</b>	<b>16</b>	<b>365</b>

## (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.

**Table7-2-3 Travel Speed Survey Results**

**Corridor 1 (from Blok M to Kota)**

North to South

Section	Distance (km)	6:00	7:00	8:00	9:00	11:00	13:00	15:00	17:00	19:00	21:00
		-7:00	-8:00	-9:00	-11:00	-13:00	-15:00	-16:00	-18:00	-21:00	-22:00
Jl. Jembatan 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 Atas	0.85	25	35	30	19	6	4	8	6	13	—
Jembatan Dukuh Atas - 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	8:00	9:00	11:00	13:00	15:00	17:00	19:00	21:00
		-7:00	-8:00	-9:00	-11:00	-13:00	-15:00	-16:00	-18:00	-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 Atas	1.44	31	13	47	21	16	11	12	53	—	45
Jembatan Dukuh Atas - 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. Jembatan Batu	1.30	28	25	26	16	8	9	6	9	18	17

**Corridor 6 (from Blok M to Kota)**

North to South

Section	Distance (km)	(km/h)									
		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 Selatai	2.15	23	35	19	16	19	18	15	9	12	24
Jl. Duren Tiga Selatai - 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

Section	Distance (km)	(km/h)									
		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 Selatai	2.36	17	13	34	18	24	22	23	16	30	24
Jl. Duren Tiga Selatai - 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

**(3) ERP Section**

Article 4 of PP97/2012 stipulates that the corridors where ERP can be imposed should have two (2) road directions with at least two (2) lanes each and mass public transport network and service are available in the route.

Meanwhile, the beginning and ending point of ERP corridor need to be located at major intersections in order to give drivers an opportunity to select the other alternative routes.

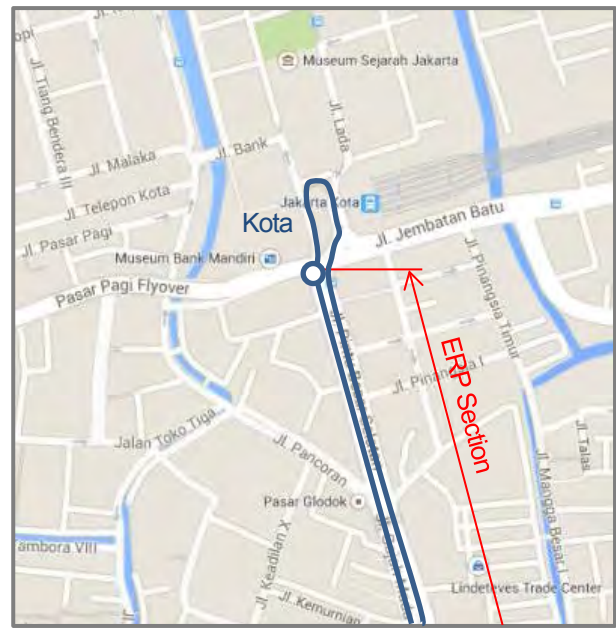
Thus, ERP sections of Corridor 1 and Corridor 6 are proposed as follows:

- Corridor 1 : From Blok M (crossing Jl. Sisingamangaraja and Jl. Trunojoyo) to Kota (crossing Jl. Pintu Besar Selatan and Jl. Jembatan Batu)
- Corridor 6 : From Deptan (crossing Jl. Taman Margasatwa and JORR) to Setia Budi (crossing Jl. H. R. Rasuna Said and Jl. Setiabudi Utara)

Southern end (Blok M)

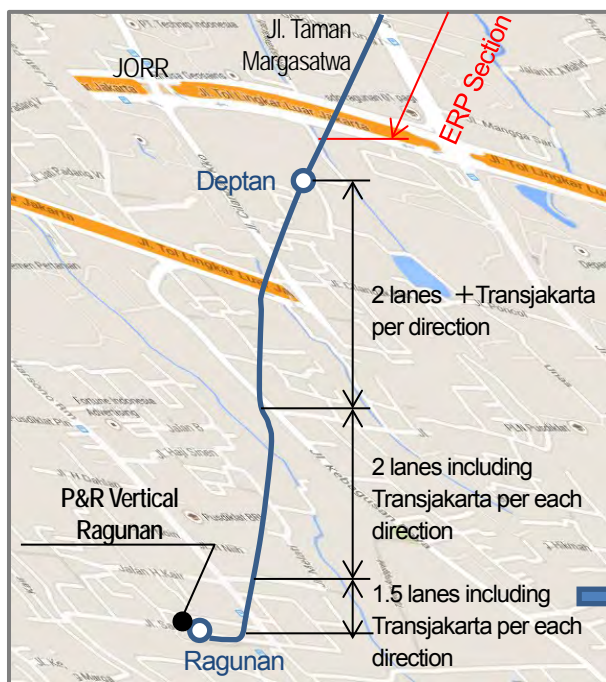


Northern end (Kota)



**Figure7-2-1 Proposed ERP Section (Corridor 1)**

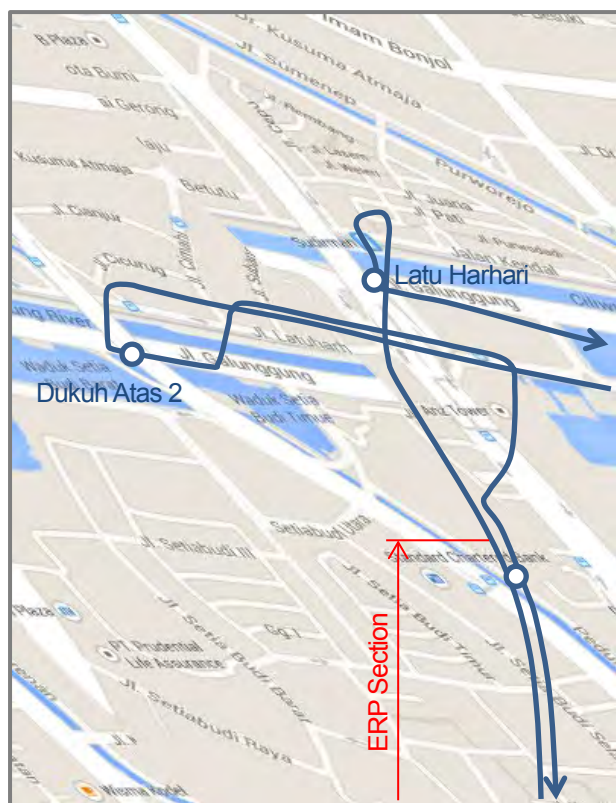
Southern end (Deptan)



Between Deptan and Ragunan, ERP cannot be imposed since this section does not meet the criteria of number of lanes regulated by PP97/2012: the ERP corridors should have at least two lanes per each direction.

This section should not be imposed ERP from another reason: vehicles going to P&R Vertical Ragunan from JORR to transit to Transjakarta should not be charged.





**Figure7-2-2 Proposed ERP Section (Corridor 6)**

#### **(4)Types of Vehicle for ERP**

According to the Article 3 of PP 97/2012, the types of vehicles on which ERP is charged are defined as follows:

##### Charged

- Private passenger cars
- Private buses (commuter buses, school buses, tourist buses etc.)
- Goods vehicles
- Public vehicles except for emergency vehicles (fire engine, ambulance, police etc.)

##### Non-charged

- Motorcycles
- Taxis
- Public buses (Transjakarta, APTB, Kopaja (AC), Metro Mini, Bemo, Mikrolet, Angkutan kota etc. )
- Emergency vehicles (fire engine, ambulance, police etc.)

#### **(5)ERP System**

The trip-based charging system is adopted for this traffic demand forecast. The assumptions used in this ERP System and the actual operation system of ERP are shown in the following table:

**Table7-2-4 The Assumption and Actual Operation System of ERP**

The assumptions used for ERP Charging System	The actual operation system of ERP
Charge once for a trip (without considering travelling time of one trip)	Every hour of driving period is regarded as 1 trip in the actual ERP system (For example, a 1.5-hour trip is regarded as charged twice.)
A trip using Corridor 1 and Corridor 6 consecutively is counted as two trips.	Such a trip may be regarded as 1 trip in the actual ERP system while the percentage of such trips is supposed to be small.
Flat charge is applied throughout the ERP charging hour. (The amount of ERP charge does not change throughout whole day)	The flexible charge based on the congestion condition needs to be considered in the actual situation. (ERP charge can be changed depending on the congestion status in a day)

#### (6) Passenger Car Equivalents (PCE)

Passenger car equivalents (PCE) used in the traffic demand forecast are as shown in Table 7-2-5.

**Table7-2-5 Passenger Car Equivalent (PCE)**

Type	Passenger Car	Large Bus	Small Bus	Truck	Motorcycle
PCE	1.0	2.0	1.5	1.5	0.15

#### PCE of motorcycle

Usually, PCE of motorcycles is set at 0.25 to 0.30. In Indonesia, since there are a huge number of motorcycles on roads, even a small difference in PCE of motorcycles results in a great difference of the result of traffic demand forecast and the evaluation of measurements. Therefore, PCE of motorcycles needs to be set diligently, considering the actual traffic condition of the target roads. In this study, PCE of motorcycles is set at 0.15 considering the actual condition of motorcycles on Corridor 1 and Corridor 6 observed through the video survey as summarized below:

- As shown in the left-side photo of Figure 7-2-3, motorcycles are running on the road shoulder and are not increasing the traffic congestion. Thus, the PCE is assumed to be very small.
- In the right-side photo, it is seen that 6 to 8 motorcycles occupy a space equivalent to a space which one passenger car occupies. Therefore, the PCE is estimated at 0.13 to 0.17.

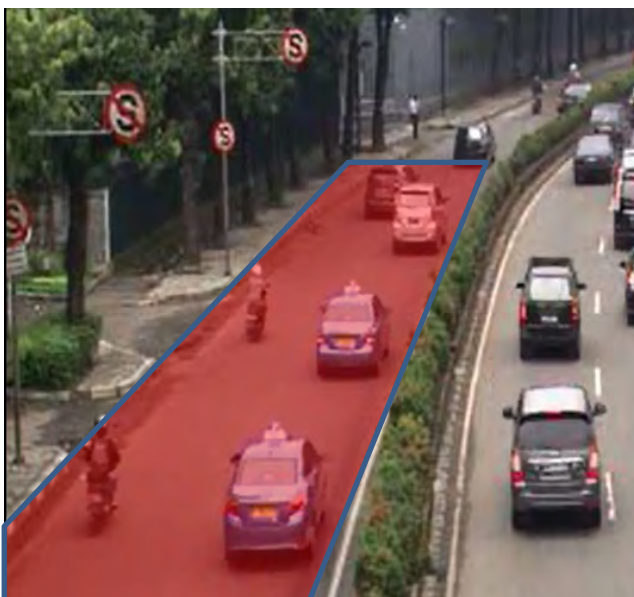




Setiabudi Station (left) and Duren Tiga station (Northbound 7:30)

**Figure7-2-3 Comparison of Road Occupancy Spaces of Motorcycles and Passenger Cars**

Further, many motorcycles can pass a lane at the same time while only one car can pass through a lane. As shown in the following photos, 20 motorcycles are passing in the space where only 3 cars can travel. Thus, the PCE of motorcycles is estimated at 0.15. (PCE of a motorcycle can be smaller in wider lane.)



3 passenger vehicles/lane



40 motorcycles/2 lanes=20 motorcycles/lane

(Jl. H.R. Rasuna Said, Kuningan Timur Station, Northward, at 15:30)

**Figure7-2-4 Comparison of Number of Motorcycles and Passenger Cars which can Travel in One Lane**

### (7) Trip Length Distribution on ERP Corridors

The trip length distribution and the average trip length in ERP area obtained from the OD table and the OD distance are shown in Figure 7-2-5. The OD table and the OD distance have been compiled based on the WTP Survey Results. Relatively short trips account for a large portion on both Corridor 1 and Corridor 6 and the average trip length of them are 3.3 km and 4.4 km, respectively. (Refer to Table 7-4-10)

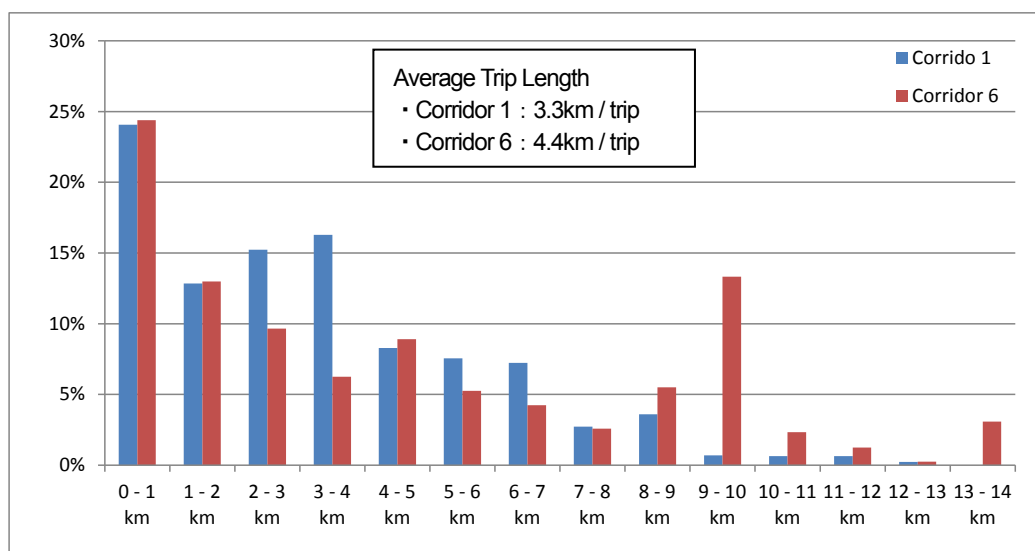


Figure7-2-5 Trip Length Distribution on ERP Corridors

### (8) Occupancy Rate

The occupancy rate of a passenger car is estimated based on the WTP survey results as shown in Table 7-2-6. The occupancy rate of a motorcycle is estimated based on the video survey results and the occupancy rates of the other vehicle types are quoted from the relevant study as shown in Table 7-2-7.

Table7-2-6 Occupancy Rate of Passenger Car

	Occupancy Rate (person/vehicle)
Corridor 1	2.06
Corridor 6	2.41

Note: including a driver

Table7-2-7 Occupancy Rate of Other Vehicles

Motorcycle	Taxi	Pickup	Truck	Angkot	Metromini Kopaja	Large Bus
1.18	1.71	1.77	1.94	7.63	22.82	51.48



### 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) Diversion Rate by ERP

Based on the travel behavior diversion results in accordance with ERP charge obtained from the WTP survey, the diversion rates (reduction amount from the target of corridor / ERP charged vehicles) in PCU are calculated. Table 7-3-2 shows how to calculate the diversion ratio by the diverted travel behaviors, and Table 7-3-3 shows the results of the calculation.

For example, in the case of ERP charge is 15,000 Rupiahs per trip in Corridor 1, it is calculated that 39.8 % of the vehicles will be reduced. Considering that 7.1 % of car users who will shift to motorcycles, the net diversion ratio is estimated change to 35.5 % in PCU. However, this diversion ratio which has been estimated regarding to the ERP target vehicle as a denominator and the actual diversion ratio considering non ERP target vehicle such as taxis will be decrease.

The government of DKI Jakarta seems to be considering restriction of the passage of motorcycles on ERP corridor. However, the restriction will not be considered in this study because this measure is independent from ERP.

**Table7-3-2 Assumption for Estimation of Diversion Ratio of Travel Attitude and Behavior**

Attitude and Behavior on ERP			Assumption for Estimation of Diversion Rate
Stop using a car	1	Use telephone, e-mail (SMS, BBM, Line etc.), Fax, Online shopping etc. instead of going out	All of the respondents who selected this behavior will be diverted.
	2	Shift to public transportation	
	3	Shift to motorcycle (Including Ojek)	All of the respondents who selected this behavior will be diverted. Note: recalculate the diversion rate by considering an increase in the numbers of motorcycles which shift from private vehicles
	4	Outsource your traffic to carriers	
	5	Change job, workplace including SOHO, housing location so do not have to pay the charge	
Continue to use a car	6	Change the schedule to weekend and holiday so as not to pay	All of the respondents who selected this behavior will be diverted. Note: since non-charged date, routes, and destinations would be selected, such vehicles would not use the target roads.
	7	Shift the departure time so as not to pay the charge	
	8	Change route so as not to pay the charge	
	9	Change the destination so as not to pay the charge	
	10	Reduce the frequency of visiting the destination	Recalculate the diversion rate by considering the frequency based on WTP survey results
	11	Share your car with your friends/acquaintances so it can reduce the cost per person	Recalculate the diversion rate by considering the number of the sharing persons based on WTP survey results.
	12	No change behavior (Pay the charge)	No diversion
Other	13	Other	No diversion

**Table7-3-3 Diversion Rate by ERP**

All Purpose		Case1	Case2	Case3	Case4	Case5	Case6	Case7
ERP Charge	(Rupiah/trip)	5,000	7,500	10,000	12,500	15,000	17,500	20,000
Corridor 1	Decrease ratio of vehicles	8.5%	14.4%	20.3%	30.0%	39.8%	48.5%	57.3%
	Diversion ratio to motorcycles	2.3%	3.3%	4.4%	5.8%	7.1%	9.1%	11.1%
	Net decrease ratio	7.2%	12.4%	17.7%	26.6%	35.5%	43.0%	50.6%
Corridor 6	Decrease ratio of vehicles	11.3%	16.9%	22.4%	31.0%	39.6%	49.8%	59.9%
	Diversion ratio to motorcycles	4.0%	6.1%	8.3%	11.3%	14.3%	18.0%	21.8%
	Net decrease ratio	9.2%	13.7%	18.1%	25.2%	32.2%	40.5%	48.7%

Business Purpose		Case1	Case2	Case3	Case4	Case5	Case6	Case7
ERP Charge	Rupiah/trip	5,000	7,500	10,000	12,500	15,000	17,500	20,000
Corridor 1	Decrease ratio of vehicles	11.0%	15.1%	19.2%	26.4%	33.5%	42.9%	52.2%
	Diversion ratio to motorcycles	3.8%	4.4%	4.9%	5.5%	6.0%	8.2%	10.4%
	Net decrease ratio	8.7%	12.5%	16.3%	23.1%	29.9%	37.9%	45.9%
Corridor 6	Decrease ratio of vehicles	13.1%	20.5%	28.0%	38.1%	48.3%	54.9%	61.5%
	Diversion ratio to motorcycles	3.0%	6.9%	10.9%	13.4%	15.8%	18.3%	20.8%
	Net decrease ratio	11.6%	17.0%	22.3%	31.2%	40.1%	45.5%	50.8%

### (3) Target Decrease Ratio of Traffic Demand

The target decrease ratio of traffic demand by ERP is planned considering the traffic condition after ERP implementation.

Article 5 of PP 97/2012 stipulates that ERP can be imposed in the case where VCR is more than 0.9 or the

average travel speed is less than 10km/h. Therefore, the target situation of traffic is for VCR less than 0.9 or the average travel speed is more than 10km/h. In this study, "the average speed, which shows the traffic condition more directly than VCR is adopted as the target situation.

**Target Travel Speed : 10km/h**

As shown in Table 7.2-3, the traffic situation with the travel speed less than 10 km/h on the southbound sections between Bundaran HI and Semanggi junction on Corridor 1 is frequently observed. The decrease ratio of traffic demand needed for overcoming this situation can be summarized as follows:

In general, only a small reduction of vehicle trips, such as 10%, can drastically reduce traffic congestion. However, this theory is applicable only in the case where the concentration rate of traffic demand, which mainly consists of daily regular trips such as commuting and going to school, is relatively high. Since the duration of traffic congestion is relatively long and the congested level is very high in DKI Jakarta, the decrease target of 10% is not sufficient to mitigate the traffic congestion. Therefore, the target of decrease ratio is planned as follows:

Assumption: 3-km waiting queue is formed from Semanggi junction to Bunderan H.I. on Jl. Jenderal Sudirman and Jl. M.H. Thamrin in an hour.

- The queue length is converted to the number of vehicles per lane:

$$\text{Queue length: } 3 \text{ [km /lane]} \div \text{Average space headway : } 6 \text{ [m /veh]} = 500 \text{ [veh/lane]}$$

- In this section, the maximum flow rate is 2,200 veh /lane, which is saturation flow rate per lane. When the above storage traffic volume is added to this value, the total traffic demand can be estimated as below:

$$500 \text{ [veh/lane]} + 2,200 \text{ [veh/lane]} = 2,700 \text{ [veh/lane]}$$

- VCR (volume capacity ratio) is estimated:

$$2,700 \text{ [veh/lane]} \div 2,200 \text{ [veh/lane]} = 1.4$$

- The target of volume reduction to achieve VCR of 0.9 is estimated:

$$2,700 \text{ [veh/lane]} - (2,200 \text{ [veh/lane]} \times 0.9) = 720 \text{ [veh/lane]}$$

- And the target decrease is estimated as 30% of total traffic demand.

$$720 \text{ [veh/lane]} \div 2,700 \text{ [veh/lane]} \doteq 30 \text{ [%]}$$

The above estimation is assumed in the peak hour and it is expected that the congestion can be substantially mitigated by 10 % to 30% reduction in traffic demand. Thus, the daily average target of decrease ratio is set at 20%, and ERP charge would be flexibly changed between 10 to 30% adjusted to the congestion situation.

**Target of Reduction Ratio : 10%~30% (20% on average)**

**(4) Results of Traffic Demand Forecast**

The predicted traffic demand and increase-decrease volume/ratio of traffic demand by ERP charge are listed in Table 7-3-4 to Table 7-3-6. ERP charge of 10,000 to 17,500 rupiahs per trip could achieve the target of reduction ratio of 10% to 30%. ERP charge of 15,000 rupiahs per trip could achieve the target of reduction ratio of 20% on daily average.

Table 7-3-7 shows the revenue from each ERP charging case. The revenue can be maximized in the case where ERP charge is 15,000 Rupiahs per trip and amounts to 782,855 million Rupiahs per year.

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

**Table7-3-4 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

**Table7-3-5 Increase-Decrease Volume of Traffic Demand by ERP Charge**

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

Location	Increase-Decrease Volume of 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	-	-	-915	-1,068	-1,552	-1,817	-2,190	-2,566	-3,256	-3,820	-4,324	-5,075	-5,267	-6,180	-6,212	-7,285
2 GBK Station	-	-	-3,293	-3,314	-5,597	-5,634	-7,900	-7,957	-11,753	-11,842	-15,609	-15,728	-19,013	-19,153	-22,415	-22,580
3 Benhil Station	-	-	-3,639	-3,618	-6,198	-6,157	-8,755	-8,696	-13,036	-12,947	-17,318	-17,199	-21,085	-20,941	-24,855	-24,684
4 Setiabudi Station	-	-	-3,805	-3,547	-6,474	-6,032	-9,141	-8,516	-13,606	-12,675	-18,074	-16,834	-22,009	-20,503	-25,945	-24,171
5 Tosari Station	-	-	-3,152	-2,747	-5,355	-4,668	-7,561	-6,591	-11,252	-9,809	-14,942	-13,028	-18,198	-15,868	-21,454	-18,706
6 Sarinah Station	-	-	-1,803	-1,993	-3,063	-3,389	-4,321	-4,783	-6,430	-7,121	-8,536	-9,457	-10,398	-11,517	-12,261	-13,578
7 JPO Indosat Monas	-	-	-1,395	-2,147	-2,365	-3,649	-3,337	-5,148	-4,964	-7,660	-6,590	-10,174	-8,028	-12,392	-9,467	-14,609
8 Harmoni Station	-	-	-2,101	-1,606	-3,532	-2,702	-4,962	-3,798	-7,361	-5,635	-9,761	-7,472	-11,909	-9,117	-14,058	-10,761
9 Olimo Station	-	-	-1,806	-1,927	-2,972	-3,148	-4,137	-4,367	-6,097	-6,418	-8,054	-8,470	-9,866	-10,388	-11,678	-12,309
10 Deptan Station	-	-	-739	-783	-1,100	-1,169	-1,462	-1,553	-2,024	-2,152	-2,588	-2,749	-3,230	-3,418	-3,872	-4,088
11 SMKN 57	-	-	-1,348	-1,355	-2,014	-2,023	-2,677	-2,693	-3,705	-3,727	-4,735	-4,762	-5,886	-5,916	-7,038	-7,071
12 Pejaten Philips Station	-	-	-1,830	-1,609	-2,727	-2,399	-3,625	-3,192	-5,020	-4,418	-6,415	-5,645	-7,993	-7,027	-9,573	-8,408
13 Duren Tiga Station	-	-	-1,593	-1,600	-2,377	-2,384	-3,161	-3,170	-4,374	-4,390	-5,590	-5,611	-6,954	-6,987	-8,318	-8,362
14 JPO Tendean	-	-	-1,924	-1,982	-2,866	-2,953	-3,809	-3,924	-5,275	-5,435	-6,742	-6,946	-8,406	-8,662	-10,069	-10,378
15 Kuningan Timur Station	-	-	-2,853	-1,947	-4,250	-2,899	-5,844	-3,852	-7,820	-5,336	-9,996	-6,822	-12,477	-8,518	-14,958	-10,214
16 Setiabudi Aini Station	-	-	-4,156	-3,885	-6,184	-5,782	-8,215	-7,677	-11,380	-10,639	-14,548	-13,599	-18,185	-16,995	-21,820	-20,389
17 Halte BBD	-	-	-1,254	-547	-1,863	-813	-2,474	-1,078	-3,429	-1,494	-4,383	-1,912	-5,485	-2,392	-6,589	-2,872

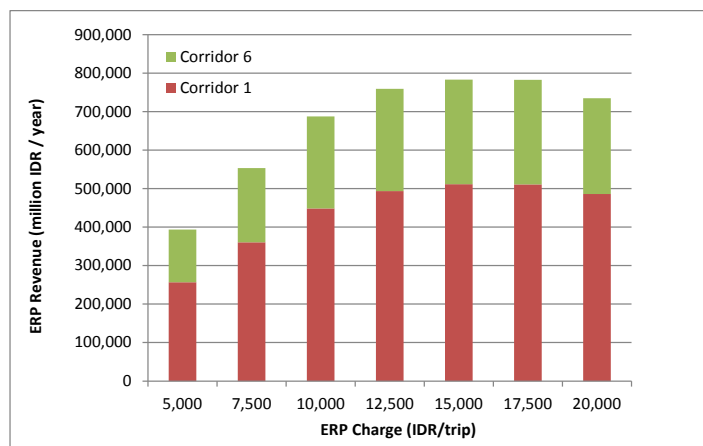
**Table7-3-6 Increase-Decrease Ratio of Traffic Demand by ERP Charge**

(ERP Charge : IDR/Trip)

Location		Increase-Decrease Ratio of Traffic Demand by Case of ERP Charge															
		Existing		Case1 5,000		Case2 7,500		Case3 10,000		Case4 12,500		Case5 15,000		Case6 17,500		Case7 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	-	-	-5%	-5%	-8%	-8%	-11%	-12%	-17%	-17%	-23%	-23%	-28%	-28%	-33%	-33%
2	GBK Station	-	-	-5%	-5%	-8%	-8%	-11%	-12%	-17%	-17%	-23%	-23%	-27%	-28%	-32%	-33%
3	Benhil Station	-	-	-5%	-5%	-9%	-8%	-12%	-12%	-18%	-18%	-24%	-24%	-29%	-29%	-34%	-34%
4	Setiabudi Station	-	-	-5%	-5%	-9%	-8%	-12%	-12%	-18%	-17%	-24%	-23%	-29%	-28%	-34%	-33%
5	Tosari Station	-	-	-5%	-4%	-8%	-8%	-11%	-11%	-17%	-16%	-22%	-21%	-27%	-26%	-32%	-30%
6	Sarinah Station	-	-	-4%	-5%	-8%	-8%	-11%	-11%	-16%	-16%	-21%	-22%	-26%	-27%	-31%	-31%
7	JPO Indosat Monas	-	-	-5%	-5%	-8%	-8%	-11%	-11%	-17%	-17%	-22%	-22%	-27%	-27%	-31%	-32%
8	Harmoni Station	-	-	-5%	-5%	-8%	-8%	-12%	-11%	-17%	-17%	-23%	-22%	-28%	-27%	-33%	-32%
9	Olimo Station	-	-	-4%	-5%	-7%	-8%	-10%	-11%	-15%	-16%	-20%	-21%	-25%	-26%	-29%	-30%
10	Depthan Station	-	-	-6%	-5%	-9%	-7%	-12%	-10%	-16%	-13%	-21%	-17%	-26%	-21%	-31%	-25%
11	SMKN 57	-	-	-6%	-5%	-9%	-8%	-11%	-11%	-16%	-15%	-20%	-19%	-25%	-24%	-30%	-28%
12	Pejaten Philips Station	-	-	-7%	-7%	-10%	-10%	-13%	-13%	-18%	-18%	-23%	-24%	-29%	-29%	-35%	-35%
13	Duren Tiga Station	-	-	-6%	-6%	-9%	-8%	-12%	-11%	-16%	-15%	-20%	-20%	-25%	-25%	-30%	-29%
14	JPO Tendean	-	-	-6%	-6%	-9%	-9%	-12%	-12%	-17%	-16%	-21%	-21%	-27%	-26%	-32%	-31%
15	Kuningan Timur Station	-	-	-7%	-7%	-10%	-10%	-13%	-14%	-18%	-19%	-23%	-24%	-29%	-30%	-34%	-36%
16	Setiabudi Ani Station	-	-	-7%	-7%	-10%	-11%	-13%	-14%	-18%	-20%	-23%	-25%	-29%	-31%	-35%	-38%
17	Halte BBD	-	-	-6%	-6%	-10%	-9%	-13%	-12%	-18%	-16%	-22%	-21%	-28%	-26%	-34%	-32%

**Table7-3-7 ERP Revenue**

Case	ERP Charge	ERP Revenue (Million Rupiah/year)		
	(IDR/trip)	Corridor 1	Corridor 6	Total
Case1	5,000	256,743	136,947	393,690
Case2	7,500	360,736	192,430	553,166
Case3	10,000	448,482	239,249	687,730
Case4	12,500	493,408	265,726	759,133
Case5	15,000	511,447	271,408	782,855
Case6	17,500	511,033	271,408	782,441
Case7	20,000	486,140	248,569	734,710



**Figure7-3-1 ERP Revenue**

**(5) Impact of ERP**

The effect of traffic demand reduction in the case where ERP charge is 15,000 Rupiahs/trip is shown in Table 7.3-8. It is estimated that PCU-kilometer of cars decreases by 29.8%. While PCU-kilometer of motorcycles increases by 11.6% due to the shifting to motorcycles, PCU-kilometers decrease by 22.5% as a whole. The reduction of fuel consumption, the improvement of air quality and the reduction of greenhouse gas emissions by reducing the total vehicle kilometers can be expected.

**Table7-3-8 Effect of Traffic Demand Reduction (ERP Charge : IDR 15,000/trip)**

	Vehicle-km (veh*km/16h)		PCU-km (PCU*km/16h)		
	Cars	Motocycles	Cars	Motocycles	Total
Without (Existing)	1,706,178	2,480,164	1,749,818	372,025	2,121,843
With (Case 5)	1,188,134	2,767,770	1,229,228	415,165	1,644,393
With - Without	-518,044	287,606	-520,591	43,141	-477,450
Rate of Change	-30.4 %	11.6 %	-29.8 %	11.6 %	-22.5 %

Note: Vehicle(PCU)-km=Total of “traffic demand by section and direction\*(PCE)\*section length” of vehicles driving on Corridor 1 and Corridor 6 (except for Transjakarta)

The average travel speed will be improved by 7% to 30% as shown in Table 7.3-9. As the results, the total travel time will be reduced on Corridor 1 and Corridor 6 by 21.5%. By reducing the total vehicle kilometers, the enhancement of economic activities will be expected as well as the effect of energy conservation and environmental improvement. (Refer to “9.5 Economic Analysis”)

**Table7-3-9 Improvement of Average Travel Speed (ERP Charge : IDR 15,000/ trip)**

	Corridor 1		Corridor 6	
	Northbound	Southbound	Northbound	Southbound
Without (Existing)	18.5 km/h	12.5 km/h	13.8 km/h	12.5 km/h
With (Case 5)	19.7 km/h	16.3 km/h	16.9 km/h	15.6 km/h
Rate of Change	7 %	30 %	23 %	25 %

Note: Without (Existing) travel speed survey results, With (Case 5) : estimated by assuming the travel speed on the section where the travel speed survey conducted is less than 10 km/h and will be improved to 10 km/h.

**Table7-3-10 Reduction of Total Travel Time (ERP Charge : IDR 15,000/trip)**

	Person-hour (person*hr/16h)			
	Cars	Motocycle	Transjakarta	Total
Without (Existing)	316,848	194,898	—	511,746
With (Case 5)	202,365	179,875	19,351	401,592
With - Without	-114,483	-15,022	19,351	-110,154
Rate of Change	-36.1%	-7.7%	—	-21.5%

Note: Total travel time =  $\sum$  (Traffic volume by section and vehicle type) × (occupancy rate by vehicle type) × (section length ÷ average travel speed by direction and section)

Table7-3-11 Results of Traffic Demand Forecast (1)

16 hours total (6:00-22:00)

Existing

(veh/16h)

Survey Date and Location		To North												To South														
		Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motor cycles	Vehicles Total (PCU /16h)	Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motorcycles	Vehicles Total (PCU /16h)	
		Private	Taxi	Public	Other	Kopaja/MMKopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			Private	Taxi	Public	Other	Kopaja/MMKopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			
Average	1	Masjid Agung Station	11,212	3,272	206	29	493	7	23	36	280	15,558	16,073	19,905	19,058	13,284	4,094	340	13	307	1	31	38	195	18,303	18,845	22,626	22,238
	2	GBK Station	40,721	14,008	727	111	983	56	205	123	747	57,681	59,203	67,546	69,334	41,114	14,516	689	99	969	19	226	227	502	58,361	59,870	54,404	68,030
	3	Benhil Station	45,474	16,036	551	55	1,145	17	166	176	437	64,057	65,415	46,735	72,425	45,072	14,205	561	87	1,181	68	273	148	569	62,164	63,647	59,340	72,548
	4	Setiabudi Station	47,300	15,044	531	77	1,282	43	193	156	673	65,299	66,744	60,364	75,799	43,976	15,803	536	139	1,344	30	335	186	657	63,006	64,629	59,925	73,617
	5	Tosari Station	38,972	15,282	390	95	1,159	38	104	279	476	56,795	58,070	56,567	66,555	33,993	15,309	517	67	1,397	32	130	174	506	52,125	53,576	53,005	61,526
	6	Sarinah Station	22,220	8,568	305	52	952	61	155	63	469	32,845	33,818	41,962	40,112	24,704	10,016	285	35	825	18	114	65	428	36,490	37,321	39,903	43,306
	7	JPO Indosat Monas	17,084	6,616	112	130	28	38	153	101	360	24,622	25,024	33,617	30,067	26,510	10,524	214	97	6	83	258	163	394	38,249	38,815	50,184	46,343
	8	Harmoni Station	24,509	4,594	234	29	0	1,370	59	276	1,234	32,305	33,421	59,041	42,277	18,799	5,393	107	6	56	34	85	182	949	25,611	25,903	52,144	33,724
	9	Olimo Station	18,641	3,937	43	10	3	2,284	26	296	2,695	27,935	29,293	72,547	40,175	18,940	5,622	107	69	16	2,852	114	712	2,972	31,404	33,427	47,457	40,546
	10	Deptan Station	7,028	941	25	8	91	437	39	82	224	8,875	9,233	21,087	12,396	7,147	1,405	11	14	118	474	22	130	402	9,723	10,120	41,302	16,315
	11	SMKN 57	12,276	1,841	44	19	182	1,223	39	316	578	16,518	17,461	41,073	23,622	12,277	1,825	43	27	192	1,474	29	314	635	16,816	17,891	46,745	24,902
	12	Pejaten Philips Station	17,082	2,464	19	18	531	15	44	364	558	21,095	21,609	40,834	27,734	14,826	1,978	11	17	514	18	46	392	532	18,334	18,847	33,630	23,892
	13	Duren Tiga Station	14,579	2,881	18	26	944	8	131	221	850	19,658	20,354	47,494	27,478	14,808	2,799	23	13	889	19	48	322	577	19,498	20,173	55,280	28,465
	14	JPO Tendean	18,037	3,355	122	20	290	10	51	257	717	22,859	23,305	55,791	31,674	18,633	3,196	58	13	483	4	35	232	752	23,406	23,854	60,856	32,982
	15	Kuningan Timur Station	27,113	4,750	22	51	588	2	97	291	931	33,845	34,407	60,282	43,449	18,585	2,501	97	19	572	2	68	215	552	22,611	23,156	35,792	28,524
	16	Setiabudi Aini Station	40,049	8,574	60	4	744	6	111	342	1,062	50,952	51,618	73,396	62,627	37,341	6,465	121	25	709	1	35	301	1,089	46,087	46,756	49,644	54,203
	17	Halte BBD	12,243	3,169	159	16	4	1	84	50	274	16,000	16,245	22,286	19,587	5,333	1,984	131	9	27	1	28	43	91	7,647	7,837	8,517	9,114

After ERP Implementation in Case 1

5,000 rupiah/trip

Survey Date and Location		To North												To South														
		Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motor cycles	Vehicles Total (PCU /16h)	Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motorcycles	Vehicles Total (PCU /16h)	
		Private	Taxi	Public	Other	Kopaja/MMKopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			Private	Taxi	Public	Other	Kopaja/MMKopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			
Average	1	Masjid Agung Station	10,256	3,272	206	29	493	7	23	32	249	14,567	15,080	20,425	18,143	12,151	4,094	340	13	307	1	31	34	174	17,145	17,685	23,242	21,171
	2	GBK Station	37,248	14,008	727	111	983	56	205	109	665	54,112	55,627	69,433	66,042	37,607	14,516	689	99	969	19	226	202	447	54,774	56,270	56,310	64,716
	3	Benhil Station	41,595	16,036	551	55	1,145	17	166	157	389	60,111	61,460	48,843	68,786	41,228	14,205	561	87	1,181	68	273	132	506	58,241	59,716	61,429	68,930
	4	Setiabudi Station	43,266	15,044	531	77	1,282	43	193	139	599	61,174	62,611	62,556	71,994	40,225	15,803	536	139	1,344	30	335	166	585	59,163	60,776	61,963	70,070
	5	Tosari Station	35,648	15,282	390	95	1,159	38	104	248	424	53,388	54,648	58,373	63,404	31,094	15,309	517	67	1,397	32	130	155	450	49,151	50,592	54,581	58,779
	6	Sarinah Station	20,325	8,568	305	52	952	61	155	56	417	30,891	31,860	42,992	38,309	22,597	10,016	285	35	825	18	114	58	381	34,329	35,157	41,048	41,314
	7	JPO Indosat Monas	15,627	6,616	112	130	28	38	153	90	320	23,114	23,511	34,409	28,672	24,249	10,524	214	97	6	83	258	145	351	35,927	36,484	51,413	44,196
	8	Harmoni Station	22,419	4,594	234	29	0	1,370	59	246	1,098	30,049	31,150	60,177	40,176	17,196	5,393	107	6	56	34	85	162	845	23,884	24,166	53,015	32,118
	9	Olimo Station	17,051	3,937	43	10	3	2,284	26	263	2,399	26,016	27,357	73,411	38,369	17,325	5,622	107	69	16	2,852	114	634	2,645	29,384	31,368	48,335	38,618
	10	Deptan Station	6,233	941	25	8	91	437	39	71	195	8,040	8,392	21,764	11,657	6,339	1,405	11	14	118	474	22	113	349	8,845	9,234	41,991	15,532
	11	SMKN 57	10,888	1,841	44	19	182	1,223	39	275	502	15,013	15,936	42,256	22,274	10,889	1,825	43	27	192	1,474	29	273	552	15,304	16,358	47,929	23,547
	12	Pejaten Philips Station	15,150	2,464	19	18	531	15	44	316	485	19,042	19,532	42,481	25,904	13,149	1,978	11	17	514	18	46	341	462	16,536	17,024	35,059	22,282
	13	Duren Tiga Station	12,930	2,881	18	26	944	8	131	192	739	17,869	18,551	48,899	25,885	13,133	2,799	23	13	889	19	48	280	501	17,705	18,359	56,707	26,865
	14	JPO Tendean	15,997	3,355	122	20	290	10	51	223	623	20,691	21,120	57,530	29,749	16,526	3,196	58	13	483	4	35	202	653	21,170	21,603	62,652	31,001
	15	Kuningan Timur Station	24,047	4,750	22	51	588	2	97	253	809	30,619	31,162	62,896	40,596	16,483	2,501	97	19	572	2	68	187	480	20,409	20,940	37,584	26,577
	16	Setiabudi Aini Station	35,520	8,574	60	4	744	6	111	297	923	46,239	46,882	77,257	58,471	33,118	6,465	121	25	709	1	35	262	946	41,682	42,332	53,244	50,318
	17	Halte BBD	10,858	3,169	159	16	4	1	84	43	238	14,572	14,813	23,466	18,333	4,730	1,984	131	9	27	1	28	37	79	7,026	7,213	9,031	8,567

Table7-3-12 Results of Traffic Demand Forecast (2)

After ERP Implementation in Case 2

7,500 rupiah/trip

Survey Date and Location		To North												To South													
		Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motor cycles	Vehicles Total (PCU /16h)	Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motorcycles	Vehicles Total (PCU /16h)
		Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)		
Average	1 Masjid Agung Station	9,595	3,272	206	29	493	7	23	31	238	13,894	14,406	20,670	17,507	11,369	4,094	340	13	307	1	31	32	166	16,353	16,892	23,532	20,421
	2 GBK Station	34,849	14,008	727	111	983	56	205	104	634	51,677	53,189	70,325	63,738	35,186	14,516	689	99	969	19	226	193	426	52,323	53,815	57,210	62,396
	3 Benhil Station	38,917	16,036	551	55	1,145	17	166	149	371	57,407	58,752	49,838	66,227	38,573	14,205	561	87	1,181	68	273	126	483	55,557	57,029	62,416	66,391
	4 Setiabudi Station	40,480	15,044	531	77	1,282	43	193	132	571	58,353	59,786	63,592	69,325	37,635	15,803	536	139	1,344	30	335	158	558	56,538	58,147	62,926	67,585
	5 Tosari Station	33,353	15,282	390	95	1,159	38	104	237	404	51,062	52,316	59,226	61,200	29,092	15,309	517	67	1,397	32	130	148	430	47,122	48,560	55,325	56,858
	6 Sarinah Station	19,016	8,568	305	52	952	61	155	53	398	29,560	30,528	43,478	37,049	21,142	10,016	285	35	825	18	114	55	363	32,853	33,679	41,589	39,917
	7 JPO Indosat Monas	14,621	6,616	112	130	28	38	153	86	306	22,090	22,485	34,783	27,702	22,687	10,524	214	97	6	83	258	138	334	34,341	34,895	51,993	42,693
	8 Harmoni Station	20,975	4,594	234	29	0	1,370	59	234	1,048	28,543	29,638	60,713	38,745	16,088	5,393	107	6	56	34	85	155	806	22,730	23,008	53,427	31,022
	9 Olimo Station	15,953	3,937	43	10	3	2,284	26	251	2,288	24,795	26,130	73,819	37,203	16,209	5,622	107	69	16	2,852	114	604	2,523	28,116	30,085	48,749	37,397
	10 Deptan Station	5,844	941	25	8	91	437	39	65	178	7,628	7,977	22,124	11,296	5,943	1,405	11	14	118	474	22	103	319	8,409	8,793	42,357	15,146
	11 SMKN 57	10,207	1,841	44	19	182	1,223	39	251	459	14,265	15,176	42,885	21,608	10,208	1,825	43	27	192	1,474	29	250	505	14,553	15,596	48,557	22,879
	12 Pejaten Philips Station	14,204	2,464	19	18	531	15	44	289	443	18,027	18,504	43,356	25,007	12,328	1,978	11	17	514	18	46	312	423	15,647	16,120	35,819	21,493
	13 Duren Tiga Station	12,122	2,881	18	26	944	8	131	176	675	16,981	17,655	49,646	25,101	12,313	2,799	23	13	889	19	48	256	459	16,819	17,461	57,466	26,081
	14 JPO Tendean	14,998	3,355	122	20	290	10	51	204	570	19,620	20,040	58,453	28,808	15,493	3,196	58	13	483	4	35	184	598	20,064	20,488	63,606	30,029
	15 Kuningan Timur Station	22,544	4,750	22	51	588	2	97	231	740	29,025	29,557	64,284	39,200	15,453	2,501	97	19	572	2	68	171	439	19,322	19,845	38,535	25,625
	16 Setiabudi Aini Station	33,301	8,574	60	4	744	6	111	272	844	43,916	44,547	79,308	56,443	31,049	6,465	121	25	709	1	35	239	865	39,509	40,147	55,156	48,420
	17 Halte BBD	10,180	3,169	159	16	4	1	84	40	218	13,871	14,111	24,093	17,724	4,434	1,984	131	9	27	1	28	34	72	6,720	6,905	9,304	8,301

After ERP Implementation in Case 3

10,000 rupiah/trip

Survey Date and Location		To North												To South													
		Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motor cycles	Vehicles Total (PCU /16h)	Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motorcycles	Vehicles Total (PCU /16h)
		Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)		
Average	1 Masjid Agung Station	8,935	3,272	206	29	493	7	23	29	226	13,220	13,731	20,915	16,868	10,586	4,094	340	13	307	1	31	31	158	15,561	16,099	23,823	19,672
	2 GBK Station	32,451	14,008	727	111	983	56	205	99	603	49,243	50,753	71,216	61,435	32,764	14,516	689	99	969	19	226	183	405	49,870	51,357	58,109	60,073
	3 Benhil Station	36,239	16,036	551	55	1,145	17	166	142	353	54,704	56,045	50,833	63,670	35,918	14,205	561	87	1,181	68	273	120	460	52,873	54,342	63,402	63,852
	4 Setiabudi Station	37,694	15,044	531	77	1,282	43	193	126	544	55,534	56,964	64,627	66,658	35,045	15,803	536	139	1,344	30	335	150	531	53,913	55,518	63,888	65,101
	5 Tosari Station	31,057	15,282	390	95	1,159	38	104	225	384	48,734	49,982	60,079	58,994	27,089	15,309	517	67	1,397	32	130	141	409	45,091	46,525	56,069	54,935
	6 Sarinah Station	17,707	8,568	305	52	952	61	155	51	379	28,230	29,197	43,965	35,791	19,687	10,016	285	35	825	18	114	53	346	31,379	32,204	42,129	38,523
	7 JPO Indosat Monas	13,614	6,616	112	130	28	38	153	82	291	21,064	21,457	35,157	26,730	21,126	10,524	214	97	6	83	258	132	318	32,758	33,309	52,573	41,194
	8 Harmoni Station	19,532	4,594	234	29	0	1,370	59	223	997	27,038	28,127	61,250	37,314	14,981	5,393	107	6	56	34	85	147	767	21,576	21,850	53,838	29,926
	9 Olimo Station	14,855	3,937	43	10	3	2,284	26	239	2,177	23,574	24,903	74,227	36,037	15,094	5,622	107	69	16	2,852	114	575	2,400	26,849	28,804	49,164	36,178
	10 Deptan Station	5,454	941	25	8	91	437	39	59	161	7,215	7,561	22,484	10,934	5,547	1,405	11	14	118	474	22	94	290	7,975	8,354	42,723	14,762
	11 SMKN 57	9,527	1,841	44	19	182	1,223	39	228	416	13,519	14,418	43,514	20,945	9,528	1,825	43	27	192	1,474	29	226	457	13,801	14,832	49,186	22,209
	12 Pejaten Philips Station	13,257	2,464	19	18	531	15	44	262	402	17,012	17,475	44,230	24,110	11,506	1,978	11	17	514	18	46	282	383	14,755	15,213	36,578	20,700
	13 Duren Tiga Station	11,314	2,881	18	26	944	8	131	159	612	16,093	16,758	50,393	24,317	11,492	2,799	23	13	889	19	48	232	416	15,931	16,561	58,224	25,295
	14 JPO Tendean	13,998	3,355	122	20	290	10	51	185	517	18,548	18,958	59,377	27,865	14,461	3,196	58	13	483	4	35	167	542	18,959	19,375	64,561	29,059
	15 Kuningan Timur Station	21,042	4,750	22	51	588	2	97	210	671	27,433	27,955	65,673	37,805	14,423	2,501	97	19	572	2	68	155	398	18,235	18,750	39,487	24,673
	16 Setiabudi Aini Station	31,081	8,574	60	4	744	6	111	246	765	41,591	42,209	81,359	54,412	28,980	6,465	121	25	709	1	35	217	785	37,338	37,965	57,068	46,525
	17 Halte BBD	9,502	3,169	159	16	4	1	84	36	197	13,168	13,406	24,720	17,114	4,139	1,984	131	9	27	1	28	31	66	6,416	6,600	9,577	8,036



Table7-3-13 Results of Traffic Demand Forecast (3)

After ERP Implementation in Case 4

12,500 rupiah/trip

Survey Date and Location			To North											To South														
			Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motor cycles	Vehicles Total (PCU /16h)	Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motorcycles	Vehicles Total (PCU /16h)
			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)		
Average	1	Masjid Agung Station	7,844	3,272	206	29	493	7	23	27	206	12,107	12,617	21,233	15,802	9,294	4,094	340	13	307	1	31	28	144	14,252	14,789	24,199	18,418
	2	GBK Station	28,489	14,008	727	111	983	56	205	91	550	45,220	46,726	72,369	57,581	28,764	14,516	689	99	969	19	226	167	370	45,819	47,298	59,274	56,189
	3	Benhil Station	31,814	16,036	551	55	1,145	17	166	130	322	50,236	51,571	52,121	59,389	31,533	14,205	561	87	1,181	68	273	109	419	48,436	49,900	64,679	59,601
	4	Setiabudi Station	33,092	15,044	531	77	1,282	43	193	115	496	50,873	52,298	65,967	62,193	30,766	15,803	536	139	1,344	30	335	137	484	49,574	51,172	65,134	60,942
	5	Tosari Station	27,265	15,282	390	95	1,159	38	104	205	350	44,888	46,126	61,183	55,303	23,782	15,309	517	67	1,397	32	130	128	373	41,735	43,163	57,031	51,717
	6	Sarinah Station	15,545	8,568	305	52	952	61	155	46	345	26,029	26,993	44,594	33,682	17,283	10,016	285	35	825	18	114	48	315	28,939	29,762	42,829	36,186
	7	JPO Indosat Monas	11,952	6,616	112	130	28	38	153	74	265	19,368	19,757	35,641	25,103	18,547	10,524	214	97	6	83	258	120	290	30,139	30,684	53,324	38,682
	8	Harmoni Station	17,147	4,594	234	29	0	1,370	59	203	909	24,545	25,624	61,944	34,916	13,152	5,393	107	6	56	34	85	134	699	19,666	19,934	54,371	28,089
	9	Olimo Station	13,041	3,937	43	10	3	2,284	26	218	1,984	21,546	22,865	74,755	34,078	13,251	5,622	107	69	16	2,852	114	524	2,188	24,743	26,672	49,700	34,127
	10	Deptan Station	4,850	941	25	8	91	437	39	51	139	6,581	6,923	22,992	10,372	4,932	1,405	11	14	118	474	22	80	249	7,305	7,677	43,240	14,163
	11	SMKN 57	8,472	1,841	44	19	182	1,223	39	196	358	12,374	13,257	44,401	19,917	8,473	1,825	43	27	192	1,474	29	194	393	12,650	13,665	50,074	21,176
	12	Pejaten Philips Station	11,789	2,464	19	18	531	15	44	225	345	15,450	15,895	45,465	22,714	10,232	1,978	11	17	514	18	46	243	329	13,388	13,827	37,650	19,474
	13	Duren Tiga Station	10,062	2,881	18	26	944	8	131	137	526	14,733	15,387	51,447	23,104	10,220	2,799	23	13	889	19	48	199	357	14,567	15,181	59,295	24,075
	14	JPO Tendean	12,448	3,355	122	20	290	10	51	159	444	16,899	17,296	60,681	26,398	12,859	3,196	58	13	483	4	35	144	465	17,257	17,661	65,908	27,547
	15	Kuningan Timur Station	18,712	4,750	22	51	588	2	97	180	576	24,978	25,485	67,633	35,629	12,826	2,501	97	19	572	2	68	133	342	16,560	17,064	40,831	23,188
	16	Setiabudi Aini Station	27,640	8,574	60	4	744	6	111	212	657	38,008	38,609	84,254	51,247	25,771	6,465	121	25	709	1	35	186	674	33,987	34,599	59,768	43,564
	17	Halte BBD	8,449	3,169	159	16	4	1	84	31	170	12,083	12,318	25,605	16,159	3,681	1,984	131	9	27	1	28	27	56	5,944	6,126	9,963	7,620

After ERP Implementation in Case 5

15,000 rupiah/trip

Survey Date and Location			To North											To South														
			Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motor cycles	Vehicles Total (PCU /16h)	Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motorcycles	Vehicles Total (PCU /16h)
			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)		
Average	1	Masjid Agung Station	6,753	3,272	206	29	493	7	23	24	186	10,993	11,502	21,551	14,734	8,001	4,094	340	13	307	1	31	25	130	12,942	13,477	24,576	17,163
	2	GBK Station	24,527	14,008	727	111	983	56	205	82	497	41,196	42,697	73,523	53,725	24,763	14,516	689	99	969	19	226	151	334	41,766	43,237	60,439	52,302
	3	Benhil Station	27,389	16,036	551	55	1,145	17	166	117	291	45,767	47,096	53,409	55,107	27,147	14,205	561	87	1,181	68	273	98	378	43,998	45,456	65,955	55,349
	4	Setiabudi Station	28,489	15,044	531	77	1,282	43	193	104	447	46,210	47,629	67,306	57,725	26,487	15,803	536	139	1,344	30	335	124	437	45,235	46,827	66,380	56,783
	5	Tosari Station	23,473	15,282	390	95	1,159	38	104	185	316	41,042	42,270	62,287	51,613	20,474	15,309	517	67	1,397	32	130	116	336	38,378	39,800	57,994	48,499
	6	Sarinah Station	13,383	8,568	305	52	952	61	155	42	312	23,830	24,792	45,223	31,576	14,879	10,016	285	35	825	18	114	43	285	26,500	27,320	43,529	33,849
	7	JPO Indosat Monas	10,290	6,616	112	130	28	38	153	67	239	17,673	18,058	36,125	23,477	15,967	10,524	214	97	6	83	258	108	262	27,519	28,058	54,075	36,169
	8	Harmoni Station	14,762	4,594	234	29	0	1,370	59	183	820	22,051	23,120	62,638	32,516	11,323	5,393	107	6	56	34	85	121	631	17,756	18,017	54,903	26,252
	9	Olimo Station	11,228	3,937	43	10	3	2,284	26	197	1,792	19,520	20,828	75,283	32,120	11,408	5,622	107	69	16	2,852	114	473	1,976	22,637	24,541	50,237	32,076
	10	Deptan Station	4,246	941	25	8	91	437	39	42	116	5,945	6,283	23,501	9,808	4,318	1,405	11	14	118	474	22	67	208	6,637	7,003	43,756	13,566
	11	SMKN 57	7,417	1,841	44	19	182	1,223	39	163	299	11,227	12,094	45,289	18,887	7,418	1,825	43	27	192	1,474	29	162	328	11,498	12,497	50,961	20,141
	12	Pejaten Philips Station	10,321	2,464	19	18	531	15	44	188	288	13,888	14,314	46,700	21,319	8,958	1,978	11	17	514	18	46	203	275	12,020	12,439	38,722	18,247
	13	Duren Tiga Station	8,809	2,881	18	26	944	8	131	114	439	13,370	14,013	52,501	21,888	8,947	2,799	23	13	889	19	48	166	298	13,202	13,799	60,365	22,854
	14	JPO Tendean	10,898	3,355	122	20	290	10	51	133	371	15,250	15,634	61,985	24,932	11,258	3,196	58	13	483	4	35	120	389	15,556	15,948	67,255	26,036
	15	Kuningan Timur Station	16,382	4,750	22	51	588	2	97	150	481	22,523	23,015	69,593	33,453	11,229	2,501	97	19	572	2	68	111	285	14,884	15,377	42,175	21,703
	16	Setiabudi Aini Station	24,198	8,574	60	4	744	6	111	177	549	34,423	35,006	87,150	48,078	22,562	6,465	121	25	709	1	35	156	563	30,637	31,234	62,468	40,604
	17	Halte BBD	7,397	3,169	159	16	4	1	84	26	142	10,998	11,231	26,491	15,204	3,222	1,984	131	9	27	1	28	22	47	5,471	5,650	10,348	7,202

Table7-3-14 Results of Traffic Demand Forecast (4)

After ERP Implementation in Case 6

17,500 rupiah/trip

Survey Date and Location			To North											To South														
			Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motor cycles	Vehicles Total (PCU /16h)	Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motorcycles	Vehicles Total (PCU /16h)
			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)		
Average	1	Masjid Agung Station	5,771	3,272	206	29	493	7	23	21	160	9,982	10,489	22,013	13,791	6,837	4,094	340	13	307	1	31	22	111	11,756	12,290	25,123	16,058
	2	GBK Station	20,959	14,008	727	111	983	56	205	70	427	37,546	39,041	75,201	50,321	21,162	14,516	689	99	969	19	226	130	287	38,097	39,557	62,132	48,877
	3	Benhil Station	23,406	16,036	551	55	1,145	17	166	101	250	41,727	43,048	55,283	51,340	23,199	14,205	561	87	1,181	68	273	85	325	39,984	41,436	67,812	51,607
	4	Setiabudi Station	24,346	15,044	531	77	1,282	43	193	89	385	41,990	43,402	69,255	53,790	22,635	15,803	536	139	1,344	30	335	106	375	41,303	42,886	68,191	53,114
	5	Tosari Station	20,059	15,282	390	95	1,159	38	104	159	272	37,558	38,773	63,893	48,357	17,496	15,309	517	67	1,397	32	130	99	289	35,336	36,749	59,395	45,658
	6	Sarinah Station	11,437	8,568	305	52	952	61	155	36	268	21,834	22,793	46,139	29,714	12,715	10,016	285	35	825	18	114	37	245	24,290	25,107	44,547	31,789
	7	JPO Indosat Monas	8,793	6,616	112	130	28	38	153	58	206	16,134	16,515	36,828	22,039	13,645	10,524	214	97	6	83	258	93	225	25,145	25,676	55,167	33,951
	8	Harmoni Station	12,615	4,594	234	29	0	1,370	59	158	705	19,764	20,821	63,648	30,368	9,676	5,393	107	6	56	34	85	104	542	16,003	16,256	55,678	24,607
	9	Olimo Station	9,595	3,937	43	10	3	2,284	26	169	1,540	17,607	18,901	76,051	30,309	9,749	5,622	107	69	16	2,852	114	407	1,698	20,634	22,505	51,017	30,157
	10	Deptan Station	3,531	941	25	8	91	437	39	37	101	5,210	5,545	24,136	9,165	3,591	1,405	11	14	118	474	22	59	181	5,875	6,237	44,402	12,897
	11	SMKN 57	6,168	1,841	44	19	182	1,223	39	143	261	9,920	10,777	46,398	17,736	6,169	1,825	43	27	192	1,474	29	142	286	10,187	11,176	52,071	18,986
	12	Pejaten Philips Station	8,583	2,464	19	18	531	15	44	164	252	12,090	12,504	48,244	19,741	7,449	1,978	11	17	514	18	46	177	240	10,450	10,856	40,062	16,865
	13	Duren Tiga Station	7,325	2,881	18	26	944	8	131	100	383	11,816	12,452	53,818	20,524	7,440	2,799	23	13	889	19	48	145	260	11,636	12,223	61,704	21,478
	14	JPO Tendean	9,063	3,355	122	20	290	10	51	116	323	13,350	13,726	63,615	23,268	9,362	3,196	58	13	483	4	35	105	339	13,595	13,980	68,939	24,320
	15	Kuningan Timur Station	13,623	4,750	22	51	588	2	97	131	420	19,684	20,166	72,044	30,973	9,338	2,501	97	19	572	2	68	97	249	12,943	13,429	43,854	20,007
	16	Setiabudi Aini Station	20,123	8,574	60	4	744	6	111	154	479	30,255	30,827	90,769	44,442	18,762	6,465	121	25	709	1	35	136	491	26,745	27,332	65,843	37,208
	17	Halte BBD	6,152	3,169	159	16	4	1	84	23	124	9,732	9,963	27,597	14,103	2,680	1,984	131	9	27	1	28	19	41	4,920	5,098	10,830	6,722

After ERP Implementation in Case 7

20,000 rupiah/trip

Survey Date and Location			To North											To South														
			Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motor cycles	Vehicles Total (PCU /16h)	Passenger Car		Large Bus		Small Bus			Laden Car		Cars Total		Motorcycles	Vehicles Total (PCU /16h)
			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)			Private	Taxi	Public	Other	Kopaja/MM/Kopami	Angkot	Other	Truck	Pickup/Box	(Veh /16h)	(PCU /16h)		
Average	1	Masjid Agung Station	4,789	3,272	206	29	493	7	23	17	134	8,970	9,475	22,475	12,846	5,674	4,094	340	13	307	1	31	18	93	10,571	11,103	25,670	14,953
	2	GBK Station	17,392	14,008	727	111	983	56	205	59	357	33,898	35,388	76,878	46,919	17,560	14,516	689	99	969	19	226	109	240	34,427	35,877	63,826	45,450
	3	Benhil Station	19,422	16,036	551	55	1,145	17	166	84	209	37,685	38,997	57,157	47,570	19,251	14,205	561	87	1,181	68	273	71	272	35,969	37,414	69,669	47,864
	4	Setiabudi Station	20,202	15,044	531	77	1,282	43	193	75	322	37,769	39,174	71,204	49,854	18,782	15,803	536	139	1,344	30	335	89	314	37,372	38,946	70,003	49,446
	5	Tosari Station	16,645	15,282	390	95	1,159	38	104	133	228	34,074	35,276	65,498	45,101	14,519	15,309	517	67	1,397	32	130	83	242	32,296	33,701	60,795	42,820
	6	Sarinah Station	9,490	8,568	305	52	952	61	155	30	224	19,837	20,793	47,054	27,851	10,551	10,016	285	35	825	18	114	31	205	22,080	22,894	45,565	29,729
	7	JPO Indosat Monas	7,297	6,616	112	130	28	38	153	48	172	14,594	14,970	37,532	20,599	11,323	10,524	214	97	6	83	258	78	188	22,771	23,295	56,259	31,733
	8	Harmoni Station	10,468	4,594	234	29	0	1,370	59	132	590	17,476	18,520	64,658	28,218	8,029	5,393	107	6	56	34	85	87	454	14,251	14,495	56,452	22,963
	9	Olimo Station	7,962	3,937	43	10	3	2,284	26	141	1,288	15,694	16,974	76,819	28,497	8,089	5,622	107	69	16	2,852	114	340	1,421	18,630	20,467	51,798	28,237
	10	Deptan Station	2,816	941	25	8	91	437	39	32	86	4,475	4,808	24,771	8,523	2,864	1,405	11	14	118	474	22	50	155	5,113	5,470	45,048	12,227
	11	SMKN 57	4,919	1,841	44	19	182	1,223	39	122	223	8,612	9,458	47,508	16,584	4,920	1,825	43	27	192	1,474	29	121	245	8,876	9,854	53,180	17,831
	12	Pejaten Philips Station	6,845	2,464	19	18	531	15	44	140	215	10,291	10,693	49,788	18,161	5,941	1,978	11	17	514	18	46	151	205	8,881	9,274	41,401	15,484
	13	Duren Tiga Station	5,842	2,881	18	26	944	8	131	85	327	10,262	10,890	55,136	19,160	5,934	2,799	23	13	889	19	48	124	222	10,071	10,647	63,042	20,103
	14	JPO Tendean	7,228	3,355	122	20	290	10	51	99	276	11,451	11,818	65,246	21,605	7,466	3,196	58	13	483	4	35	89	290	11,634	12,011	70,623	22,604
	15	Kuningan Timur Station	10,864	4,750	22	51	588	2	97	112	359	16,845	17,318	74,494	28,492	7,447	2,501	97	19	572	2	68	83	213	11,002	11,481	45,534	18,311
	16	Setiabudi Aini Station	16,048	8,574	60	4	744	6	111	132	409	26,088	26,649	94,389	40,807	14,963	6,465	121	25	709	1	35	116	420	22,855	23,432	69,217	33,814
	17	Halte BBD	4,906	3,169	159	16	4	1	84	19	106	8,464	8,693	28,703	12,999	2,137	1,984	131	9	27	1	28	17	35	4,369	4,546	11,312	6,242

**Table7-3-15 Traffic Demand, Vehicle-km and ERP Revenue by Case (ERP Target Vehicle Only)**

**Traffic Volume (ERP-Charged)**

Corridor	Survey Location	Distance (km)	Traffic Volume (veh/both ways/16h)																							
			Exsting			Case 1			Case 2			Case 3			Case 4			Case 5			Case 6			Case 7		
			To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total
1	1 Masjid Agung Station	1.21	11,580	13,561	25,141	10,589	12,403	22,992	9,916	11,611	21,527	9,242	10,819	20,061	8,129	9,510	17,639	7,015	8,200	15,215	6,004	7,014	13,018	4,992	5,829	10,821
1	2 GBK Station	1.80	41,907	42,168	84,075	38,338	38,581	76,919	35,903	36,130	72,033	33,469	33,677	67,146	29,446	29,626	59,072	25,422	25,573	50,995	21,772	21,904	43,676	18,124	18,234	36,358
1	3 Benhil Station	0.85	46,308	46,149	92,457	42,362	42,226	84,588	39,658	39,542	79,200	36,955	36,858	73,813	32,487	32,421	64,908	28,018	27,983	56,001	23,978	23,969	47,947	19,936	19,954	39,890
1	4 Setiabudi Station	1.44	48,399	45,293	93,692	44,274	41,450	85,724	41,453	38,825	80,278	38,634	36,200	74,834	33,973	31,861	65,834	29,310	27,522	56,832	25,090	23,590	48,680	20,869	19,659	40,528
1	5 Tosari Station	0.85	39,926	34,870	74,796	36,519	31,896	68,415	34,193	29,867	64,060	31,865	27,836	59,701	28,019	24,480	52,499	24,173	21,123	45,296	20,689	18,081	38,770	17,205	15,041	32,246
1	6 Sarinah Station	1.59	22,959	25,346	48,305	21,005	23,185	44,190	19,674	21,709	41,383	18,344	20,235	38,579	16,143	17,795	33,938	13,944	15,356	29,300	11,948	13,146	25,094	9,951	10,936	20,887
1	7 JPO Indosat Monas	1.56	17,828	27,422	45,250	16,320	25,100	41,420	15,296	23,514	38,810	14,270	21,931	36,201	12,574	19,312	31,886	10,879	16,692	27,571	9,340	14,318	23,658	7,800	11,944	19,744
1	8 Harmoni Station	2.00	26,107	20,021	46,128	23,851	18,294	42,145	22,345	17,140	39,485	20,840	15,986	36,826	18,347	14,076	32,423	15,853	12,166	28,019	13,566	10,413	23,979	11,278	8,661	19,939
1	9 Olimo Station	1.30	21,668	22,807	44,475	19,749	20,787	40,536	18,528	19,519	38,047	17,307	18,252	35,559	15,279	16,146	31,425	13,253	14,040	27,293	11,340	12,037	23,377	9,427	10,033	19,460
6	10 Deptan Station	1.35	7,381	7,715	15,096	6,546	6,837	13,383	6,134	6,401	12,535	5,721	5,967	11,688	5,087	5,297	10,384	4,451	4,629	9,080	3,716	3,867	7,583	2,981	3,105	6,086
6	11 SMKN 57	1.71	13,228	13,282	26,510	11,723	11,770	23,493	10,975	11,019	21,994	10,229	10,267	20,496	9,084	9,116	18,200	7,937	7,964	15,901	6,630	6,653	13,283	5,322	5,342	10,664
6	12 Pejaten Philips Station	2.36	18,066	15,813	33,879	16,013	14,015	30,028	14,998	13,126	28,124	13,983	12,234	26,217	12,421	10,867	23,288	10,859	9,499	20,358	9,061	7,929	16,990	7,262	6,360	13,622
6	13 Duren Tiga Station	2.15	15,807	15,768	31,575	14,018	13,975	27,993	13,130	13,089	26,219	12,242	12,201	24,443	10,882	10,837	21,719	9,519	9,472	18,991	7,965	7,906	15,871	6,411	6,341	12,752
6	14 JPO Tendean	0.41	19,082	19,665	38,747	16,914	17,429	34,343	15,843	16,323	32,166	14,771	15,218	29,989	13,122	13,516	26,638	11,473	11,815	23,288	9,573	9,854	19,427	7,674	7,893	15,567
6	15 Kuningan Timur Station	1.50	28,483	19,439	47,922	25,257	17,237	42,494	23,663	16,150	39,813	22,071	15,063	37,134	19,616	13,388	33,004	17,161	11,712	28,873	14,322	9,771	24,093	11,483	7,830	19,313
6	16 Setiabudi Aini Station	2.99	41,568	38,791	80,359	36,855	34,386	71,241	34,532	32,213	66,745	32,207	30,042	62,249	28,624	26,691	55,315	25,039	23,341	48,380	20,871	19,449	40,320	16,704	15,559	32,263
6	17 Halte BBD	0.73	12,667	5,504	18,171	11,239	4,883	16,122	10,538	4,577	15,115	9,835	4,273	14,108	8,750	3,801	12,551	7,665	3,328	10,993	6,399	2,777	9,176	5,131	2,226	7,357

**Vehicle-km (ERP-charged)**

Corridor	Survey Location	Distance (km)	Vehicle-km (veh*km/16h)																							
			Exsting			Case 1			Case 2			Case 3			Case 4			Case 5			Case 6			Case 7		
			To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total
1	1 Masjid Agung Station	1.21	14,012	16,409	30,421	12,813	15,008	27,820	11,998	14,049	26,048	11,183	13,091	24,274	9,836	11,507	21,343	8,488	9,922	18,410	7,265	8,487	15,752	6,040	7,053	13,093
1	2 GBK Station	1.80	75,433	75,902	151,335	69,008	69,446	138,454	64,625	65,034	129,659	60,244	60,619	120,863	53,003	53,327	106,330	45,760	46,031	91,791	39,190	39,427	78,617	32,623	32,821	65,444
1	3 Benhil Station	0.85	39,362	39,227	78,588	36,008	35,892	71,900	33,709	33,611	67,320	31,412	31,329	62,741	27,614	27,558	55,172	23,815	23,786	47,601	20,381	20,374	40,755	16,946	16,961	33,907
1	4 Setiabudi Station	1.44	69,695	65,222	134,916	63,755	59,688	123,443	59,692	55,908	115,600	55,633	52,128	107,761	48,921	45,880	94,801	42,206	39,632	81,838	36,130	33,970	70,099	30,051	28,309	58,360
1	5 Tosari Station	0.85	33,937	29,640	63,577	31,041	27,112	58,153	29,064	25,387	54,451	27,085	23,661	50,746	23,816	20,808	44,624	20,547	17,955	38,502	17,586	15,369	32,955	14,624	12,785	27,409
1	6 Sarinah Station	1.59	36,505	40,300	76,805	33,398	36,864	70,262	31,282	34,517	65,799	29,167	32,174	61,341	25,667	28,294	53,961	22,171	24,416	46,587	18,997	20,902	39,899	15,822	17,388	33,210
1	7 JPO Indosat Monas	1.56	27,812	42,778	70,590	25,459	39,156	64,615	23,862	36,682	60,544	22,261	34,212	56,474	19,615	30,127	49,742	16,971	26,040	43,011	14,570	22,336	36,906	12,168	18,633	30,801
1	8 Harmoni Station	2.00	52,214	40,042	92,256	47,702	36,588	84,290	44,690	34,280	78,970	41,680	31,972	73,652	36,694	28,152	64,846	31,706	24,332	56,038	27,132	20,826	47,958	22,556	17,322	39,878
1	9 Olimo Station	1.30	28,168	29,649	57,818	25,674	27,023	52,697	24,086	25,375	49,461	22,499	23,728	46,227	19,863	20,990	40,853	17,229	18,252	35,481	14,742	15,648	30,390	12,255	13,043	25,298
	Subtotal Corridor 1	12.60	377,137	379,169	756,306	344,857	346,776	691,634	323,009	324,843	647,852	301,164	302,913	604,077	265,030	266,642	531,672	228,894	230,365	459,258	195,993	197,339	393,331	163,086	164,315	327,401
6	10 Deptan Station	1.35	9,964	10,415	20,380	8,837	9,230	18,067	8,281	8,641	16,922	7,723	8,055	15,779	6,867	7,151	14,018	6,009	6,249	12,258	5,017	5,220	10,237	4,024	4,192	8,216
6	11 SMKN 57	1.71	22,620	22,712	45,332	20,046	20,127	40,173	18,767	18,842	37,610	17,492	17,557	35,048	15,534	15,588	31,122	13,572	13,618	27,191	11,337	11,377	22,714	9,101	9,135	18,235
6	12 Pejaten Philips Station	2.36	42,636	37,319	79,954	37,791	33,075	70,866	35,395	30,977	66,373	33,000	28,872	61,872	29,314	25,646	54,960	25,627	22,418	48,045	21,384	18,712	40,096	17,138	15,010	32,148
6	13 Duren Tiga Station	2.15	33,985	33,901	67,886	30,139	30,046	60,185	28,230	28,141	56,371	26,320	26,232	52,552	23,396	23,300	46,696	20,466	20,365	40,831	17,125	16,998	34,123	13,784	13,633	27,417
6	14 JPO Tendean	0.41	7,824	8,063	15,886	6,935	7,146	14,081	6,496	6,692	13,188	6,056	6,239	12,295	5,380	5,542	10,922	4,704	4,844	9,548	3,925	4,040	7,965	3,146	3,236	6,382
6	15 Kuningan Timur Station	1.50	42,725	29,159	71,883	37,886	25,856	63,741	35,495	24,225	59,720	33,107	22,595	55,701	29,424	20,082	49,506	25,742	17,568	43,310	21,483	14,657	36,140	17,225	11,745	28,970
6	16 Setiabudi Aini Station	2.99	124,288	115,985	240,273	110,196	102,814	213,011	103,251	96,317	199,568	96,299	89,826	186,125	85,586	79,806	165,392	74,867	69,790	144,656	62,404	58,153	120,557	49,945	46,521	96,466
6	17 Halte BBD	0.73	9,247	4,018	13,265	8,204	3,565	11,769	7,693	3,341	11,034	7,180	3,119	10,299	6,388	2,775	9,162	5,595	2,429	8,025	4,671	2,027	6,698	3,746	1,625	5,371
	Subtotal Corridor 6	13.20	293,288	261,572	554,860	260,034	231,858	491,892	243,606	217,178	460,785	227,176	202,495	429,671	201,888	179,889	381,778	176,582	157,281	333,863	147,346	131,184	278,530	118,108	105,097	223,205
	Total	25.80	670,425	640,740	1,311,165	604,891	578,635	1,183,526	566,616	542,021	1,108,637	528,340	505,408	1,033,749	466,918	446,532	913,449	405,475	387,646	793,121	343,339	328,522	671,861	281,194	269,412	550,606

**Number of Trip (ERP-charged)**

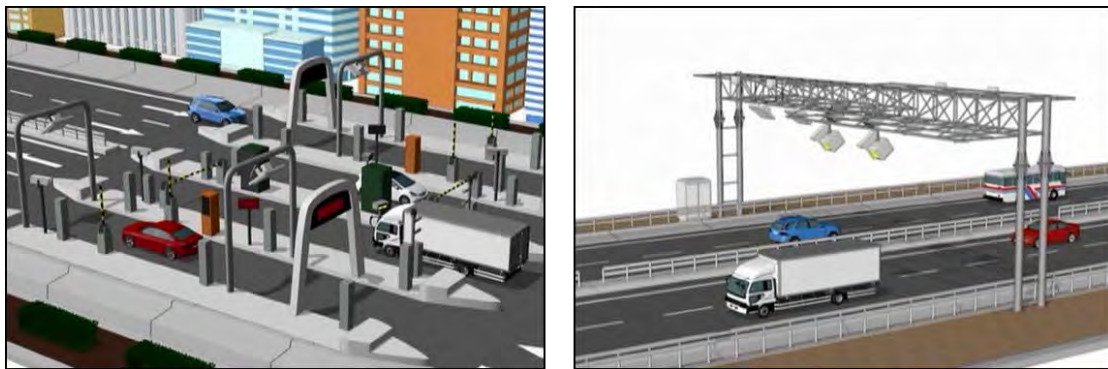
Corridor	Average Trip Length (km)	Number of Trip																							
		Exsting			Case 1			Case 2			Case 3			Case 4			Case 5			Case 6			Case 7		
		To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total	To North	To South	Total
	Subtotal Corridor 1	3.30	114,284	114,900	229,184	104,502	105,084	20																	

## 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

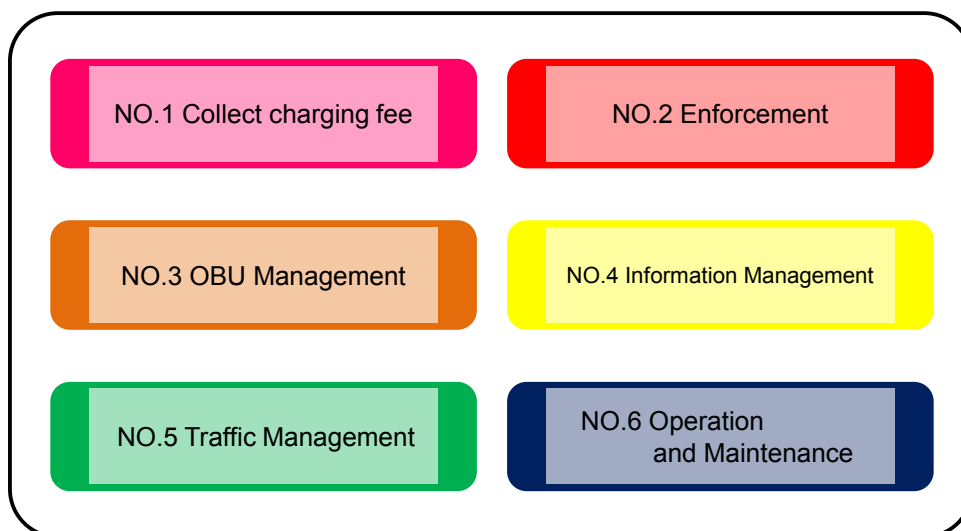
vehicle ownership for every transaction. Some of the number plates require human observation and correction more manual transaction is necessary. Jakarta Provincial Government has already decided to adopt an ERP System similar to Singapore in consideration of its heavy traffic and number plate database 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. Although the detail specification of each system differs to each other, it is possible to say that the six operational functions 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 8-1-3 and Table 8-1-1.



**Figure 8-1-3 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

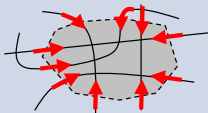
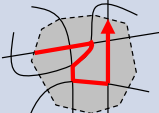
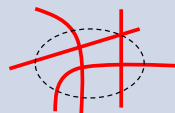
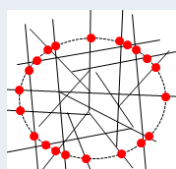
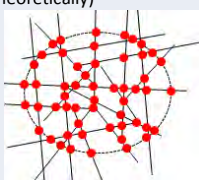

### 8.1.3 Target road of ERP system

#### 8.1.3.1 Study of ERP systems in the world

Although the objective of implementing ERP system, to mitigate traffic congestion, is common anywhere in the world, the policy of where and how to charge road pricing are different due to the difference in road infrastructure, traffic conditions and related legal basis.

Table 8-1-2 shows the comparison of cordon roadpricing, area roadpricing, and corridor roadpricing.

**Table 8.1-2 Introduced ERP System in the World**

Items	Cordon Road Pricing System	Area Road Pricing System	Corridor Road Pricing System
Charging Point	 Singapore, Stockholm	 London	 Jakarta
Objective	✓ Restrain vehicles entering the cordon	✓ Restrain vehicles using the road inside the restricted area.	✓ Restrain vehicles using the certain corridor..
Effectiveness	✓ Effective if the origin of the motorists are mostly outside the corridor.	✓ Effective if the demand of the motorists are mostly transporting inside the restricted area.	<ul style="list-style-type: none"> <li>✓ Effective if the demand of the motorists are mostly transporting the certain corridors.</li> <li>✓ Even more effective if the road network of the city depends highly to certain arterial roads.</li> </ul>
Number of Charging Point (Gantries)	<ul style="list-style-type: none"> <li>✓ Every access road to the cordon.</li> </ul> 	<ul style="list-style-type: none"> <li>✓ Every roads inside the area (Theoretically)</li> </ul> 	<ul style="list-style-type: none"> <li>✓ In major intersection only</li> </ul> 
Implementation cost	✓ High	✓ High	✓ Moderate
Operation cost	✓ Moderate	✓ High (Need to be a mixture of system and manual)	✓ Moderate
Loophole	<ul style="list-style-type: none"> <li>✓ Every access road without gantry can be a loophole</li> <li>✓ National road can be a loophole.(current law)</li> </ul>	✓ National road can be a loophole.	✓ Relatively small
Charging time (in general)	✓ One charge per crossing cordon line.	✓ One charge per day	✓ One charge per trip
Pros	<ul style="list-style-type: none"> <li>✓ Inflow restraint of car traffic to the area can be achieved</li> </ul>	<ul style="list-style-type: none"> <li>✓ Reduction of car traffic in the area can be achieved</li> </ul>	<ul style="list-style-type: none"> <li>✓ Effective if the road network of the city depends highly to certain arterial roads.</li> <li>✓ Both functions of Area and Cordon Pricing can be achieved with relatively low investment.</li> <li>✓ Can be implemented step by step (corridor by corridor).</li> <li>✓ Alternative public transportation for corridor lines only.</li> <li>✓ Can change the charge of each corridor depending on its character.</li> <li>✓ Compliant with Indonesian Regulation.</li> </ul>
Cons	<ul style="list-style-type: none"> <li>✓ Cannot restrain the traffic inside the cordon.</li> <li>✓ Need to install gantries (charging point) to every access road.</li> <li>✓ Investment can be high if the cordon is broad.</li> <li>✓ If the investment is low, only can be done in small area.</li> <li>✓ Requires development of sufficient public transportation network as a alternative modal mode.</li> <li>✓ Not compliant with Indonesian regulation.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Need to charge from every road(theoretically) inside the restricted area.</li> <li>✓ Investment can be high if the area is broad.</li> <li>✓ If the investment is low, only can be done in small area.</li> <li>✓ Requires development of sufficient public transportation network as a alternative modal mode.</li> <li>✓ Requires more manual operation and operation cost can be high.</li> <li>✓ Not compliant with Indonesian regulation.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Cannot restrain the traffic outside the corridor.</li> </ul>

When considering the typical traffic condition of Jakarta, we regard corridor road pricing is superior to the others for reasons as shown below:

- Corridor road pricing has both function of cordon road pricing and area road pricing
- Implementation cost and operating cost are relatively smaller
- The road system in Jakarta depends on a limited main road (Corridor)

Moreover, the corridor charging is compliant with the traffic policy in Jakarta as follows:

- BRT can be the alternative transportation on exactly same corridor
- ERP can be implemented corridor by corridor and the expansion is easy.



### 8.1.3.2 Target road of corridor road pricing system

As a targeted route/area for the aforesaid corridor road pricing, corridor 1 (Kota to Blok M) and corridor 6 (\*\* to Ragunan) are selected. Figure 8-1-3 shows the road map of corridor 1 and corridor 6 that is targeted for charging.

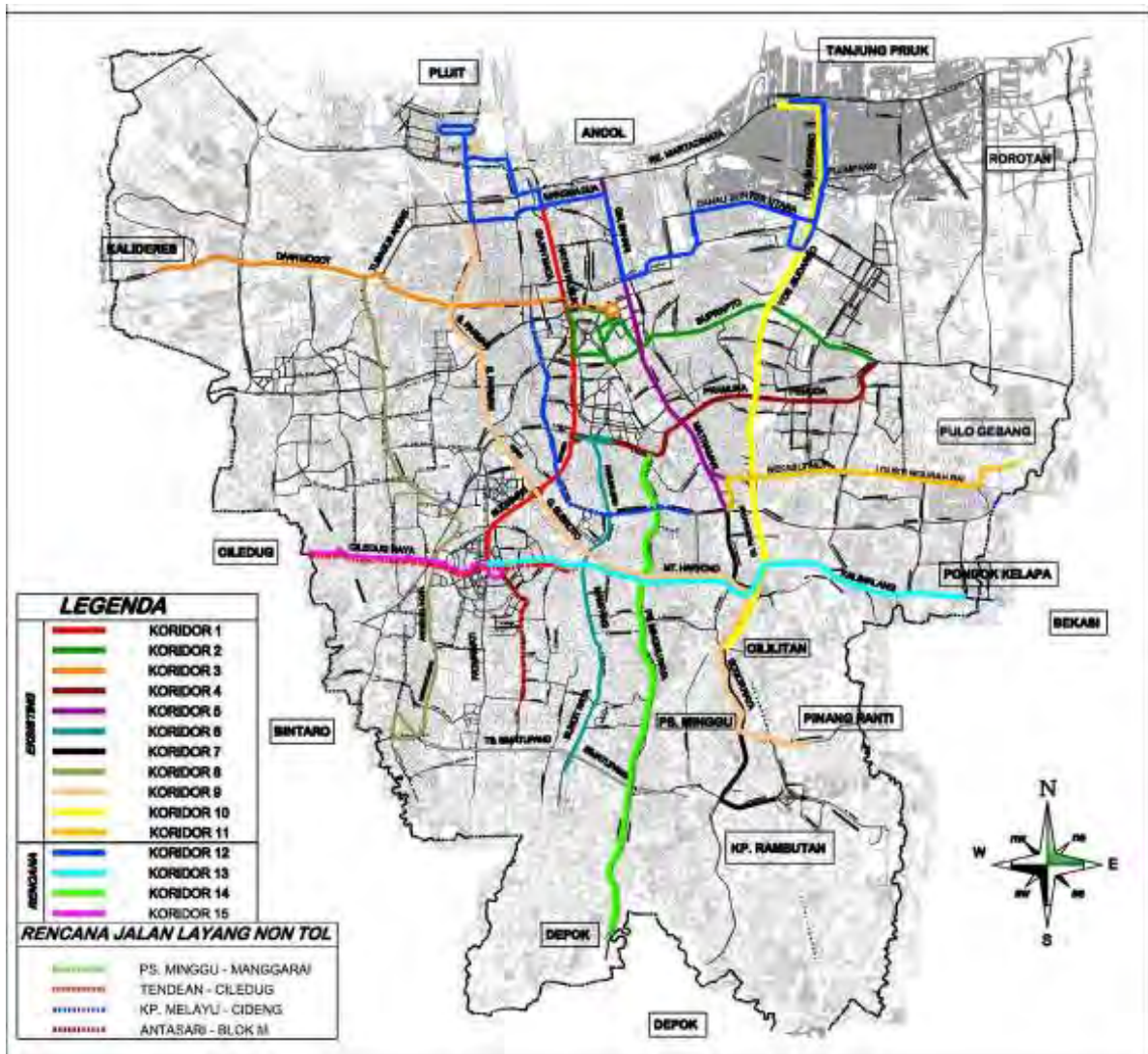


Figure 8-1-3 Road Map of Targeted for Charging (Corridor 1 and Corridor6)

## 8.2. Operational policy of ERP system

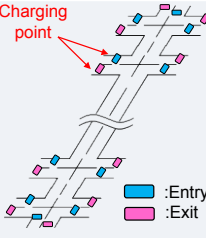
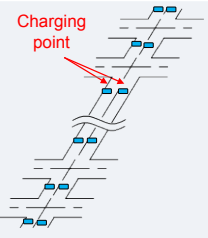
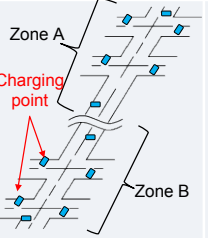
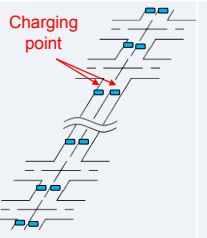
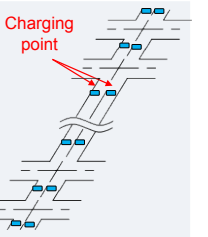
### 8.2.1 Charging

#### 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)	 <p>Locations of charging point(gantry) are all possible entries and exits of corridor</p>	 <p>Locations of charging point (gantry) are near the main inflow intersections</p>	 <p>Locations of charging points (gantry) are all possible entries of each zone</p>	 <p>Locations of charging points (gantry) are near the main inflow intersections</p>	 <p>Locations of charging points (gantry) are near the main inflow Intersections</p>
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 methodology 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.

#### (1) Commercial Facilities

There are many commercial facilities that drivers may tend to stay longer time at one place. Accordingly some measures to restrict long staying need to be taken.

#### (2) U-turn in the opposite lane for a right turn

Right-turn is restricted in many intersection in Jakarta and drivers need to make u-turn instead. Accordingly some measures to prevent drivers from being double charged just because they wanted to make right-turn.

### (3) Using two ERP corridors

There are possibilities of drivers using two ERP corridors in one trip, In this case, charging individual ERP charge for each corridors may not be fair enough, especially for the residents who live along either ERP corridors. Accordingly, measures to allow drivers using different corridors for one trip need to be taken.

The study results of the optimal charging method in consideration of such factors are shown in Table 8-2-2.

**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)	×	○	×	○	○
Income of charging fee	⊙	⊙	○	○	×
Risk of loophole	⊙	○	⊙	○	○
Tolerance of driving behavior (U turn)	×	×	○	○	○

As shown in Table 8-2-2, Trip based Charging (Fixed Charging per certain hour) could restrain inflow traffic to the ERP corridor and traffic inside the ERP corridor. Moreover it could differentiate the vehicles staying longer time in ERP corridor.

In addition, Trip based Charging (Fixed Charging per certain hour)

- Easier expansion of ERP target routes
- Fair charging for vehicle that are staying longer and that are not.
- Cost is cheaper due to smaller number of charging points

Due to the travel time survey conducted from Block M to Kota, the appropriate time length of Trip based Charging (Fixed Charging per certain hour) is 1 hour as the average time to travel this length is less than 1 hour at non-congested traffic situation on holidays.

Figure 8-2-1 indicates how the charging is done for Trip based Charging (Fixed Charging per certain hour).

- (1) Path A #1: Traveling time is more than less an hour.
- (2) Path A #2: Traveling time is one hour or more.

- (3) Path B: Crossing the several charging road.
- (4) Path B: Avoids the charging point.

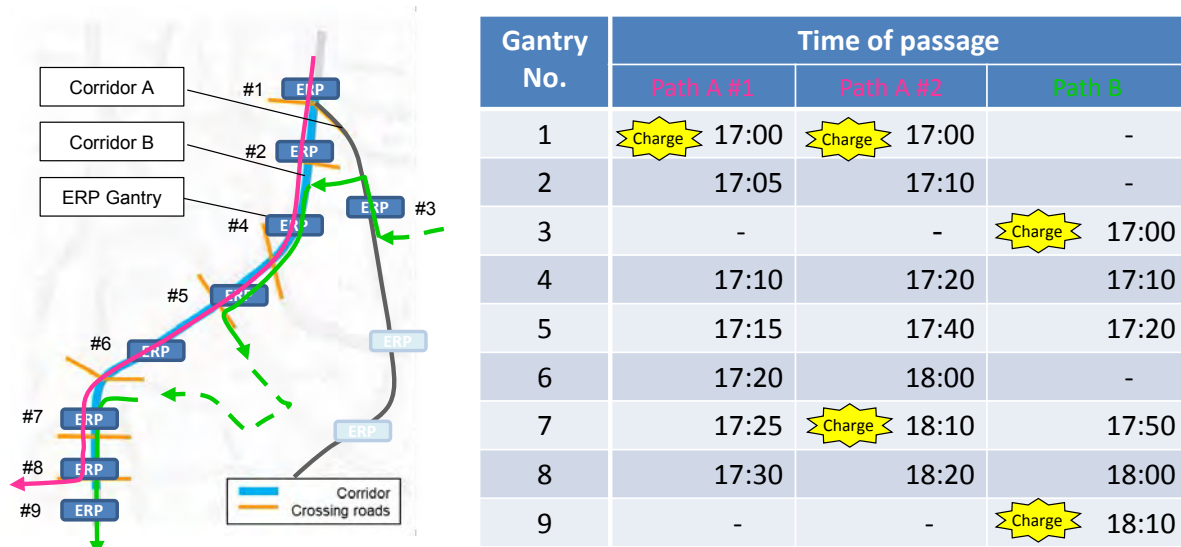


Figure 8-2-1 Example of Methodology of Charging based on usage time

### 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 Figure 8-2-2 and Figure 8-2-3.

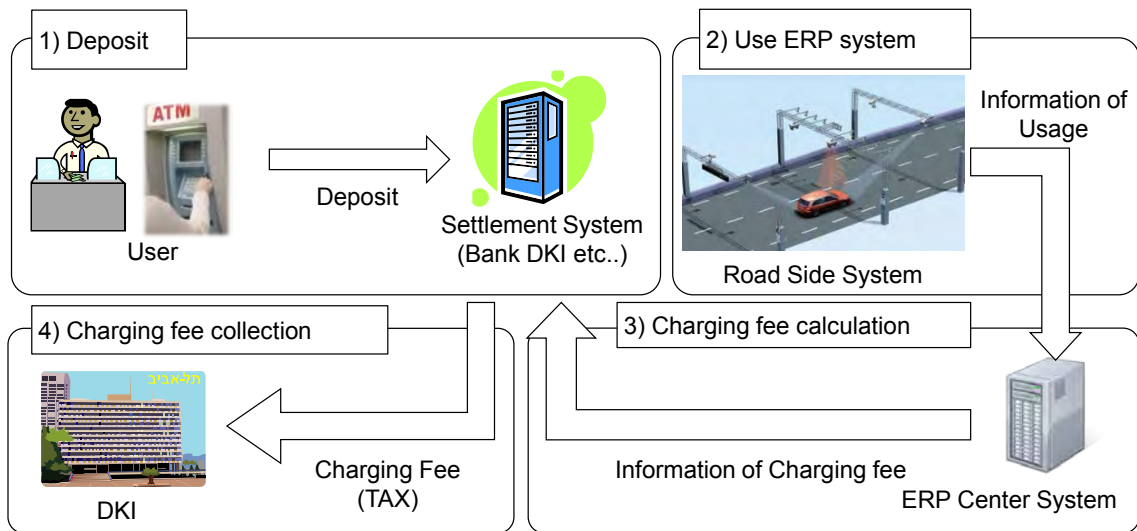


Figure 8-2-2 prepaid method

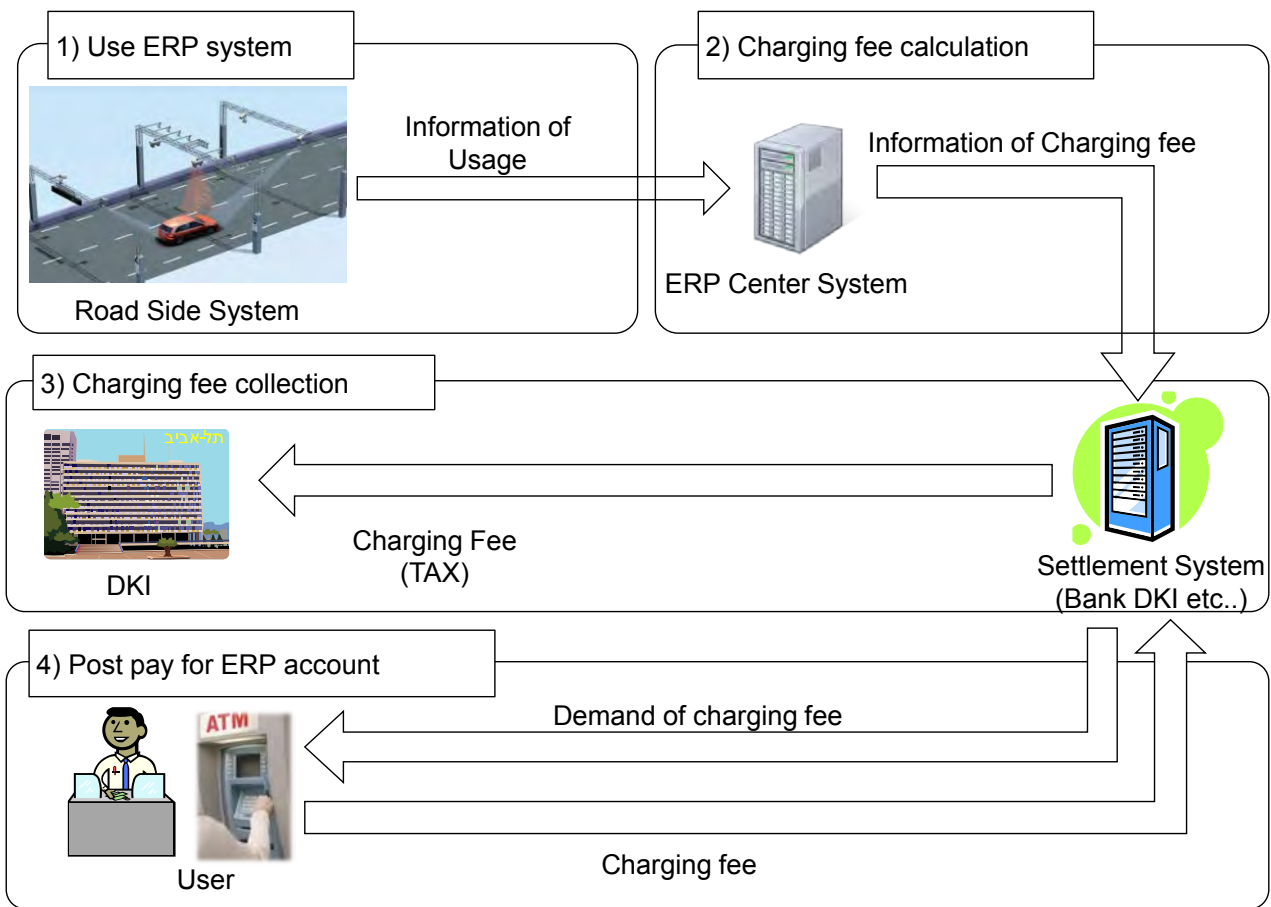


Figure 8-2-3 post-pay method

**(1) Prepaid payment method**

Procedure of prepaid method is shown below.

- 1) ERP user opens ERP account and top up necessary amount to ERP account (prepaid)
- 2) ERP system informs the usage information from the roadside system (charging point) to the ERP users upon usage.
- 3) ERP system calculates the Charge and notify the Charge amount to ERP account
- 4) ERP Charge is deducted from ERP account and transferred to DKI

**(2) Charge amount payment method of the post-pay method**

Payment procedure of post-pay method is shown below.

- 1) The roadside system (charging point) notifies the usage information to back office.
- 2) ERP system calculates the Charge and notify the ERP Account
- 3) ERP system pays the ERP charge to DKI. (within 24 hours)
- 4) Payment system notifies the Charge amount to the user and user settles the bill.

The comparison of the prepaid, post-pay system is shown in Table 8-2-5.

**Table 8.2-5 Comparison of Prepaid and Post-Pay**

No.	Item	Pre paid	Post pay (Incl. credit card)
1	Mechanism of payment	✓ The deposit to the prepaid account in advance. At the time of payment, deduct from the account.	✓ The combined payments, and automatically debit all at once from a bank account, etc.. However, in case of using a credit card, user pay via the credit card company.
2	Pros	✓ Available to anyone	✓ No need to top up. ✓ Worry of insufficient balance is small compared to the pre-paid.
3	Cons	✓ The user needs to be deposited in the prepaid account in advance. There is a possibility of insufficient balance.	✓ Need for examination of account and credit card issuance. It is not necessarily anyone is available.

Prepaid system described in Table 8-2 3 is superior to post-paid by following reasons.

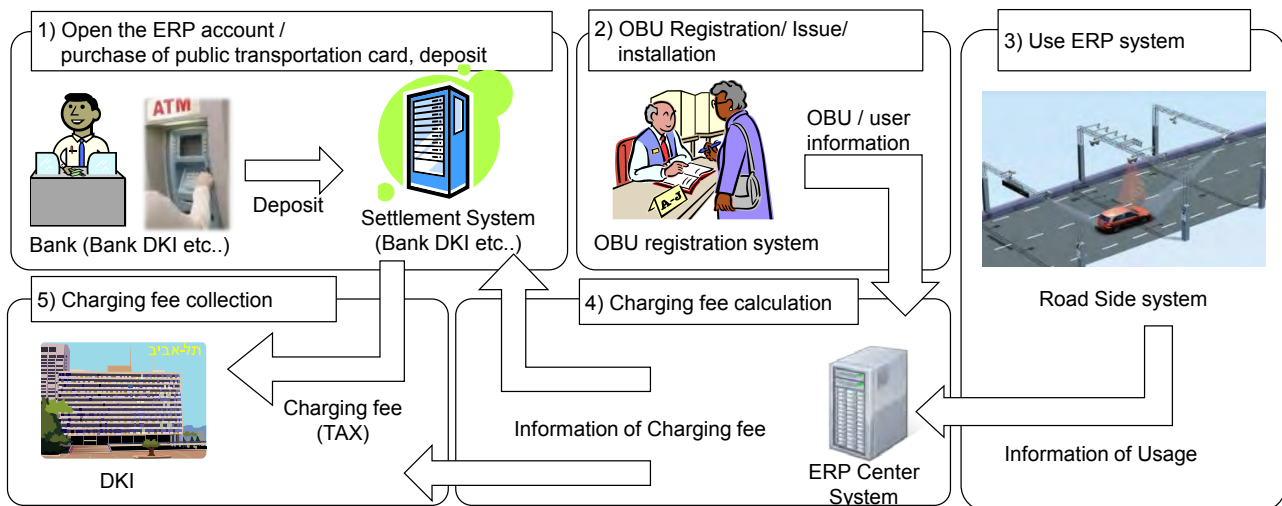
- Credit cards holders in Indonesia is about 30-40% (\* 1)
- Same as electronic payment method that has been used in the BRT and commuter.

\* 1 based on financial Study by Japan External Trade Organization (JETRO) Overseas Research Department



### 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 8-2-4.



**Figure 8-2-4 Charging flow**

Charging flow (procedure) is described as below.

- 1) ERP user opens ERP account and top up necessary amount to ERP account (prepaid)
- 2) ERP system informs the usage information from the roadside system (charging point) to the ERP users upon usage.
- 3) ERP system calculates the Charge and notify the Charge amount to ERP account
- 4) ERP Charge is deducted from ERP account and transferred to DKI

### 8.2.1.4 Top-up method and the balance confirmation method

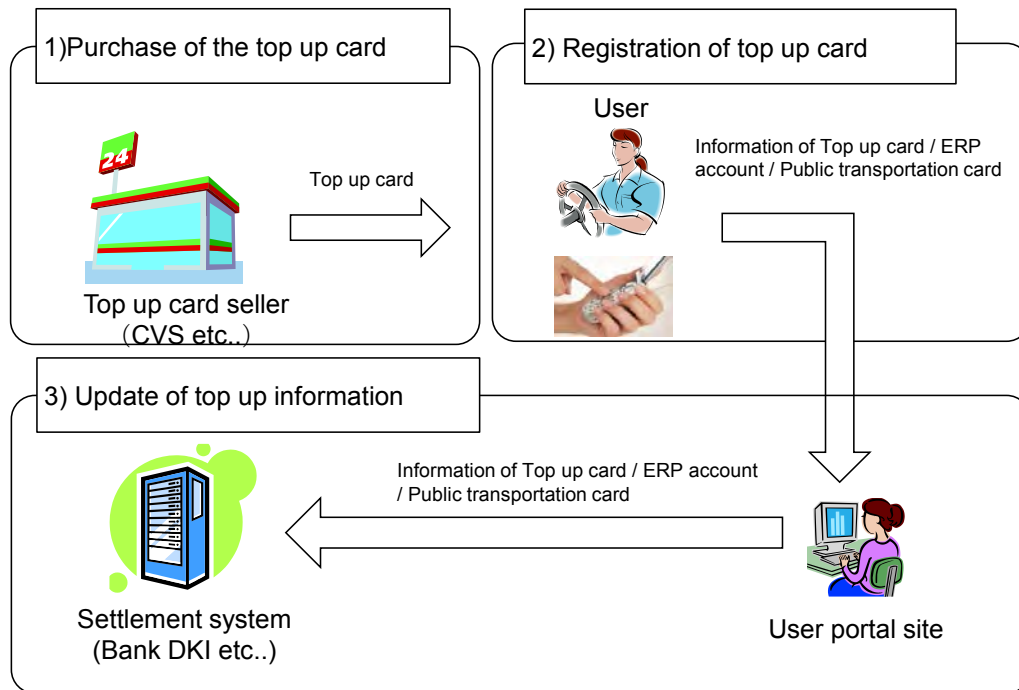
When applying the ERP system, it is necessary to top-up to the ERP account in advance. In order to suppress insufficient balance, it is desirable for the users to verify their balance easily and to mandate a certain amount of balance as a deposit.

Top-up methods and, balance confirmation of ERP account should be equivalent method that has been already used in other systems in Indonesia.

#### (1) Use top-up card

Top-up using a top-up card (i.e. voucher), is the same charging method with mobile phone in Indonesia. The top-up schematically is shown in Figure 8-2-5.



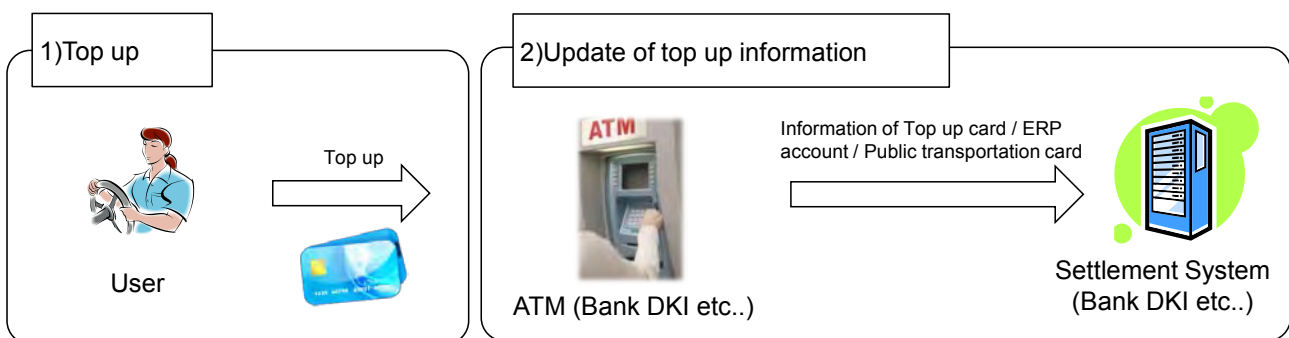


**Figure 8-2-5 Top up schematic**

The top-up procedure using a top-up card is described below.

- 1) Buy top-up card in the convenience stores, etc.
- 2) Using a mobile phones or PCs, and accesses the user portal site, type top-up card information, ERP dedicated account information, user information, etc., to top-up
- 3) User portal site verifies the input data and updates the ERP account balance.
- 4)

Top-up with the ATM terminal is the similar to the existing BRT card (i.e. Bank issued prepaid cards) in Indonesia. The top-up schematic is shown in Figure 62-6



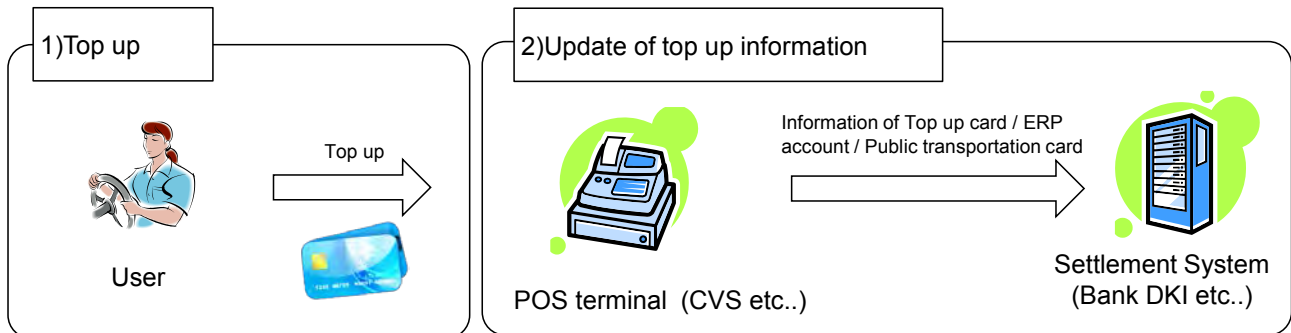
**Figure 8-2-6 Top-up schematic diagram using the ATM terminal**

The top-up procedure using the ATM terminal is described below.

- 1) Top-up to the ERP account from ATM terminal
- 2) ATM terminal verifies the cash/input data and updates the ERP account balance.

## (2) Top-up from POS terminal

Top-up using the POS terminal is similar to the top up of existing BRT card (i.e. Bank issued prepaid cards) in Indonesia. The top-up schematic is shown in Figure 8-2-7



**Figure 8-2-7 Top-up schematic diagram using the POS terminal**

The top-up procedure using a POS terminal is described below.

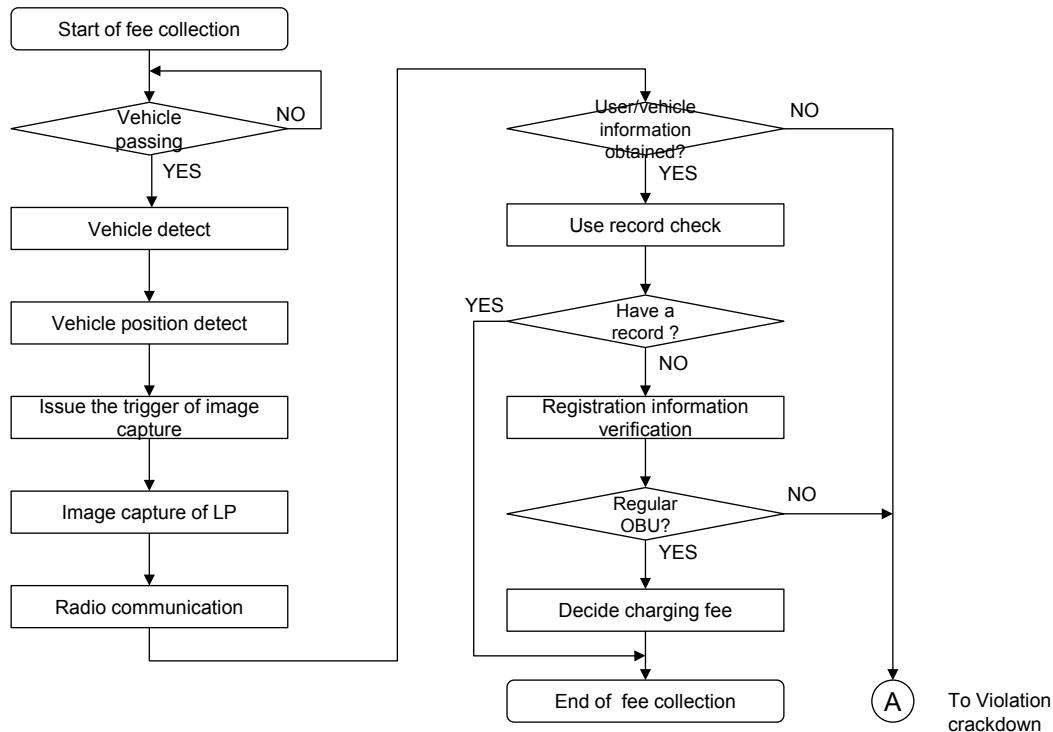
- 1) Conducted a top-up from POS terminal in a convenience store to the ERP account
- 2) POS terminal verifies the cash/input data and updates the ERP account balance.

## (3) Balance confirmation using the user portal site

Balance confirmation with user portal site is the same as the balance confirmation method for mobile phones in Indonesia. For an overview of the specifications of the user portal site, see Section 8.7.1

### 8.2.1.5 Charging method (Charge amount determining method)

The Charge amount determination procedure is shown in Figure 8-2-8.



**Figure 8-2-8 Flow of charge amount determining method**

The procedure of charge amount determining method is described below.

- 1) Roadside system (charging point) detects all the vehicle by the vehicle detector
- 2) Roadside system specify the vehicle location when the vehicle passes Roadside system
- 3) When the vehicle is detected by the vehicle detector, image capturing instruction is made.
- 4) Camera that received the image capturing instruction captures a vehicle number plate which is passing the location that has been identified by the vehicle detector
- 5) Roadside system obtains the identification number from the OBU that has communicated with roadside antenna.
- 6) Roadside system checks the usage history of the last hour
- 7) If there is no record of use in the last hour, the matching of the identification number of OBU and the and registration information is conducted
- 8) If the identification is done correctly, amount of ERP Charge is determined

### **8.2.1.6 ERP Charge collection method**

There are two types of ERP Charge Collection method which is a regular collection done by OBU and sufficient balance and the other is irregular collection such as OBU being not installed and a lack of ERP balances. Regular collection procedure is shown below. Violation collection is described in Section 8-2.2.

- 1) ERP system request the Charge amount to settlement system From ERP accounts which is linked to a normal OBU.
- 2) If the balance of the ERP account is sufficient to collect the ERP Charge amount, Settlement system performs the remittance to the account of DKI within 24hours.
- 3) ERP system to notify DKI the same amount that was remitted to the DKI as a payment notification,

### 8.2.1.7 Required functions for charging

Necessary functions to realize the Charge collection for ERP system are shown in Table 8-1-6.

**Table 8-1-6 Functions for charging**

No.	Function	Specification	Configuration
1	Detect vehicle	<ul style="list-style-type: none"> <li>✓ Detect the vehicle that passes through charging point (ERP system user).</li> <li>✓ Recognize the position of vehicle that passes through charging point.</li> <li>✓ Issue the trigger of image capture.</li> </ul>	Road Side System
2	Capture the image of License Plate	<ul style="list-style-type: none"> <li>✓ Capture the image of License Plate for vehicle that passes thorough charging point.</li> </ul>	Road Side System
3	Recognize License Plate number	<ul style="list-style-type: none"> <li>✓ Recognize the License Plate number based on the captured image</li> </ul>	Road Side System
4	Air Communication	<ul style="list-style-type: none"> <li>✓ Receive the OBU information from OBU that is equipped on the vehicle that passes through charging point.</li> </ul>	Road Side System
5	Link information	<ul style="list-style-type: none"> <li>✓ link the License Plate number and OBU information based on vehicle position.</li> </ul>	Road Side System
6	Decide charging fee	<ul style="list-style-type: none"> <li>✓ Decide the charging fee based on usage time, table of charging fee, and so on, after recognizing actual usage by "Detect violation" function.</li> </ul>	ERP Center System
7	Collect charging fee	<ul style="list-style-type: none"> <li>✓ Collect the charging fee from each ERP system users (ERP account).</li> </ul>	ERP Center System Settlement System
8	ERP account management	<ul style="list-style-type: none"> <li>✓ ERP account management as open/close account.</li> </ul>	Settlement System
9	Top up to the ERP account	<ul style="list-style-type: none"> <li>✓ Top up to the ERP account (by bank ATM or top up card)</li> </ul>	Settlement System User's portal site
10	Management of balance of ERP account	<ul style="list-style-type: none"> <li>✓ Inquiry of ERP account balance from the user.</li> <li>✓ If necessary, issues a usage details</li> </ul>	User's portal site
11	Remittance to the designated account by DKI	<ul style="list-style-type: none"> <li>✓ Remit the charge amount that was collected from ERP account to the designated account by DKI.</li> <li>✓ Inform the transferred amount to the DKI.</li> </ul>	ERP Center System Settlement System

## 8.2.2 Violation detection

### 8.2.2.1 Definition of violation

The definition of violations in the ERP system is shown in Table 8-1-7.

**Table 8-1-7 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

### 8.2.2.2 Violation enforcement method

Among the violations of ERP system, violations of using ERP corridor without OBU and OBU irregular OBU such as forged OBU needs to be regarded as violation of the Road Traffic Law and enforced by the Jakarta State Police (POLDA METRO JAYA). A visual violation such as No-OBU should be apprehended on site by the police. Regarding the violation of using irregular OBU, such a case needs to be detected by the ERP system, and that the ERP system provides violation vehicle information to the police, to help police apprehend on site.

### 8.2.2.3 Violation vehicle detection method

In order to enforce the violation, it is necessary to detect the violation and identify the offender as describe from (1) to (7)

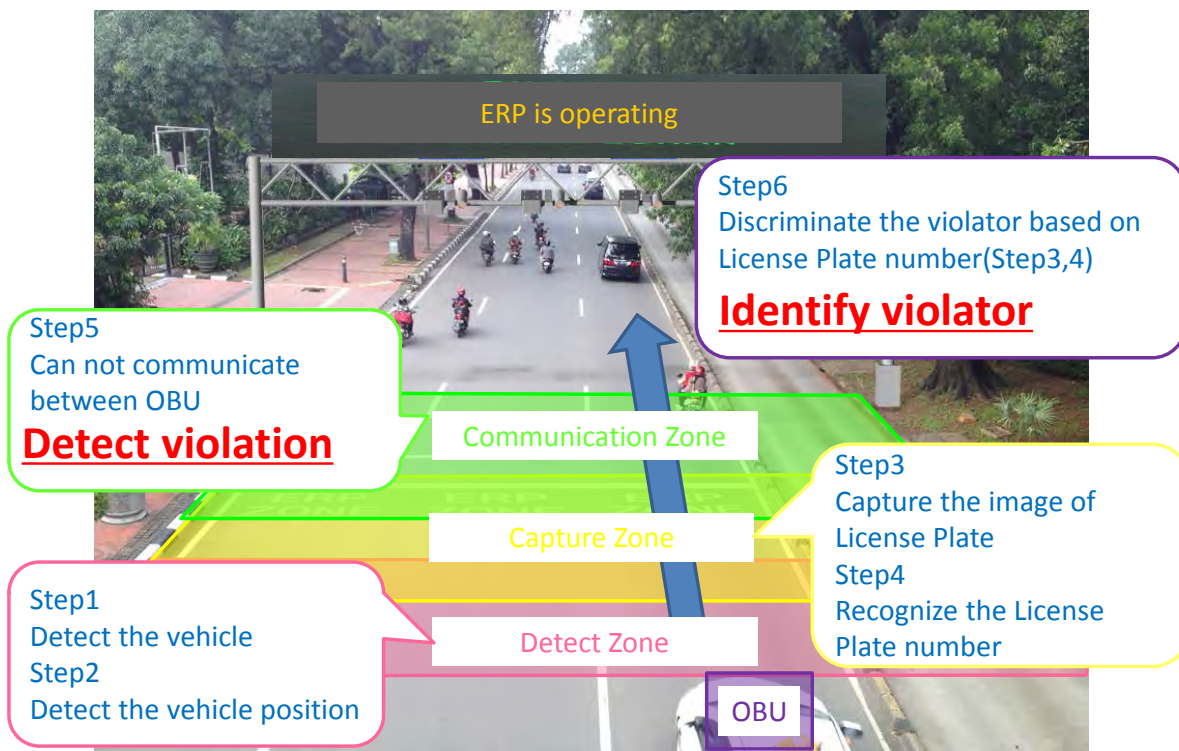
#### (1) No OBU

Roadside system (charging point) detects all the vehicles passing vehicle by the vehicle detection function. Vehicle detection functions specify the position of the vehicle at the time vehicle is passing the roadside system. When a vehicle is detected by the vehicle detection function it sends an imaging instruction to the Imaging function. Imaging function that received the imaging instruction captures an image of the vehicle license plate traveling the vehicle travel position detection function has specified. Road-vehicle communication function has the function to specify the traveling position of the vehicle

device that made the road-vehicle communication, and if the road-to-vehicle communication is not performed also vehicle detection function has specified the vehicle position, it is recognized as a violation. Based on the license plate information obtained by the image pickup function, system starts to identify the user (offenders).

Once after the violation location and violator is specified, it is possible to notify the license plate information and the image of the violation vehicle to the police, to help police enforce the offenders.

Figure 8-2-9 shows the diagram of detecting the Violation of OBU being not installed.



**Figure 8-2-9 Outline of Detecting Violation and Identifying Violator for usage without OBU**

The ownership information of a vehicle linked to the number plate is required to enforce this violation.

## (2) Altered OBU

Roadside system (charging point) detects all the vehicles passing vehicle by the vehicle detection function. Vehicle detection functions specify the position of the vehicle at the time vehicle is passing the roadside system. When a vehicle is detected by the vehicle detection function it sends an imaging instruction to the Imaging function. Imaging function that received the imaging instruction captures an image of the vehicle license plate traveling the vehicle travel position detection function has specified.

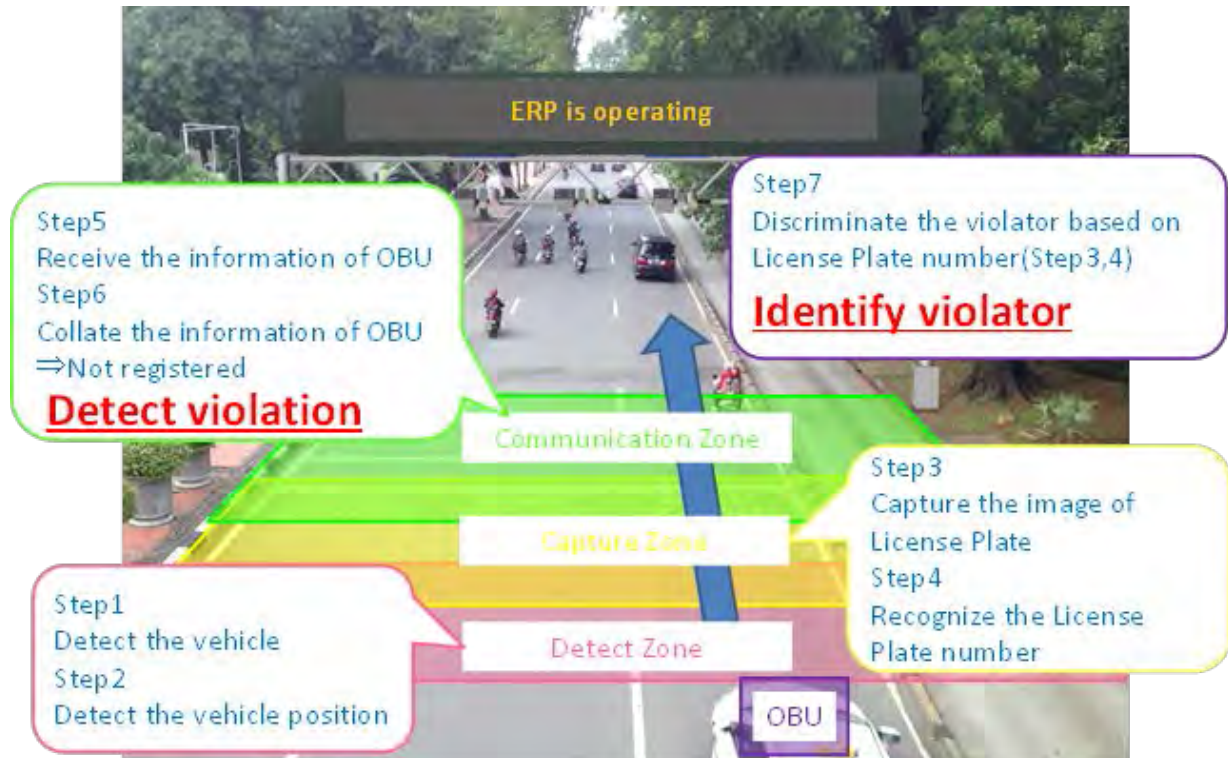
Road-vehicle communication function obtains the unique information of the identification number from the OBU that made the road-to-vehicle communication. The identification number is compared to the registration information OBU and If the acquired the information does not exist in the registration



information, it can be regarded as a violation.

Once after the violation location and violator is specified, it is possible to notify the license plate information and the image of the violation vehicle to the police, to help police enforce the offenders.

Figure 8-2-10 shows the outline of Detecting Violation and identifying Violator for usage of altered OBU.



**Figure 8-2-10 Outline of Detecting Violation and identifying Violator for usage of altered OBU**

The ownership information of a vehicle linked to the OBU and ownership information of a vehicle linked to the number plate is required to enforce this violation.

### (3) Usage of illegal OBU

Same as (2)

### (4) Usage of stolen OBU

Roadside system (charging point) detects all the vehicles passing vehicle by the vehicle detection function. Vehicle detection functions specify the position of the vehicle at the time vehicle is passing the roadside system. When a vehicle is detected by the vehicle detection function it sends an imaging instruction to the Imaging function. Imaging function that received the imaging instruction captures an image of the vehicle license plate traveling the vehicle travel position detection function has specified.

Road-vehicle communication function obtains the unique information of the identification number from the OBU that made the road-to-vehicle communication. The identification number is compared to the registration information OBU and if the acquired the information does not match with the number plate

information that is acquired from the image, it can be regarded as a violation.

Once after the violation location and violator is specified, it is possible to notify the license plate information and the image of the violation vehicle to the police, to help police enforce the offenders.

Figure 8-2-11 shows the outline of Outline of Detecting Violation and Identifying Violator for usage of stolen OBU.

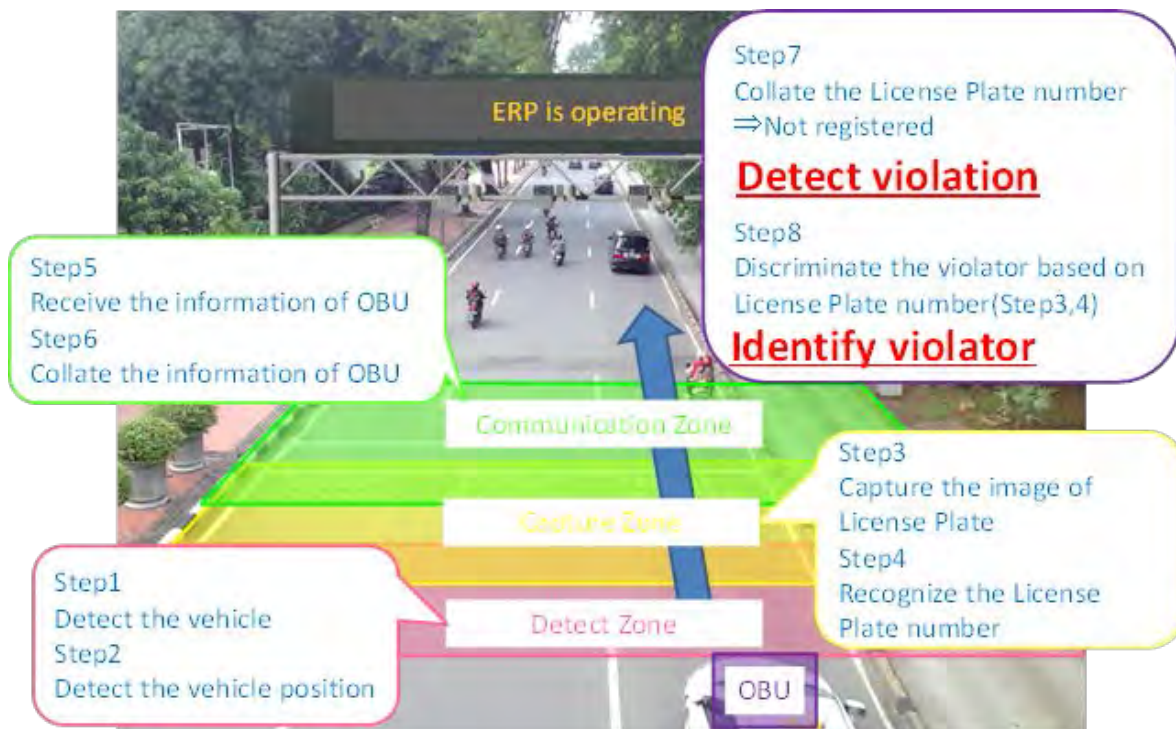


Figure 8-2-11 Outline of Detecting Violation and Identifying Violator for usage of stolen OBU

The ownership information of a vehicle linked to the OBU and ownership information of a vehicle linked to the number plate is required to enforce this violation.

#### (5) Usage of Swapped OBU

Similar to the above number (4)

#### (6) Usage of OBU with low or zero balance

Roadside system (charging point) detects all the vehicles passing vehicle by the vehicle detection function. Vehicle detection functions specify the position of the vehicle at the time vehicle is passing the roadside system. When a vehicle is detected by the vehicle detection function it sends an imaging instruction to the Imaging function. Imaging function that received the imaging instruction captures an image of the vehicle license plate traveling the vehicle travel position detection function has specified.

Road-vehicle communication function obtains the unique information of the identification number from the OBU that made the road-to-vehicle communication. The identification number is compared to the

registration information OBU and if the acquired the information matches with the number plate information that is acquired from the image, it is regarded as a regular charging and the ERP system will perform the settlement by checking the balance of ERP account. However, when the balance is insufficient, it is regarded as violation.

Once after the violation location and violator is specified, it is possible to notify the license plate information and the image of the violation vehicle to the police, to help police enforce the offenders.

Figure 8-2-12, Outline of Detecting Violation and Identifying Violator for usage of OBU without balance

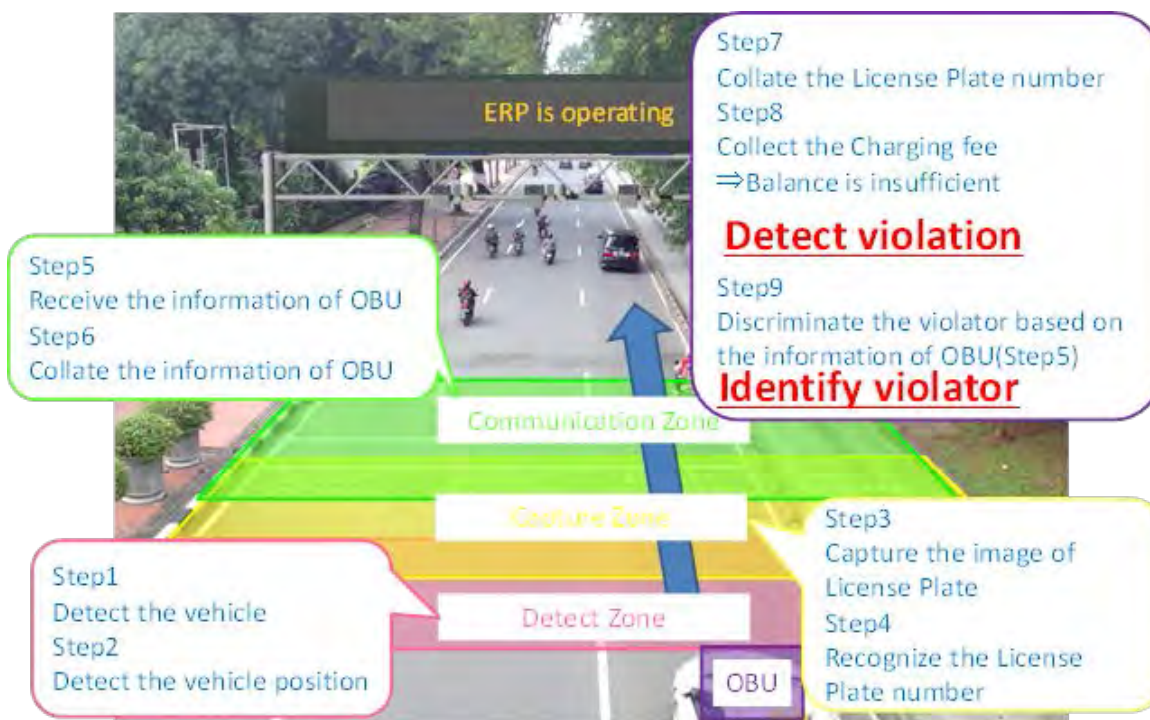


Figure 8-2-12 Outline of Detecting Violation and Identifying Violator for usage of OBU without balance

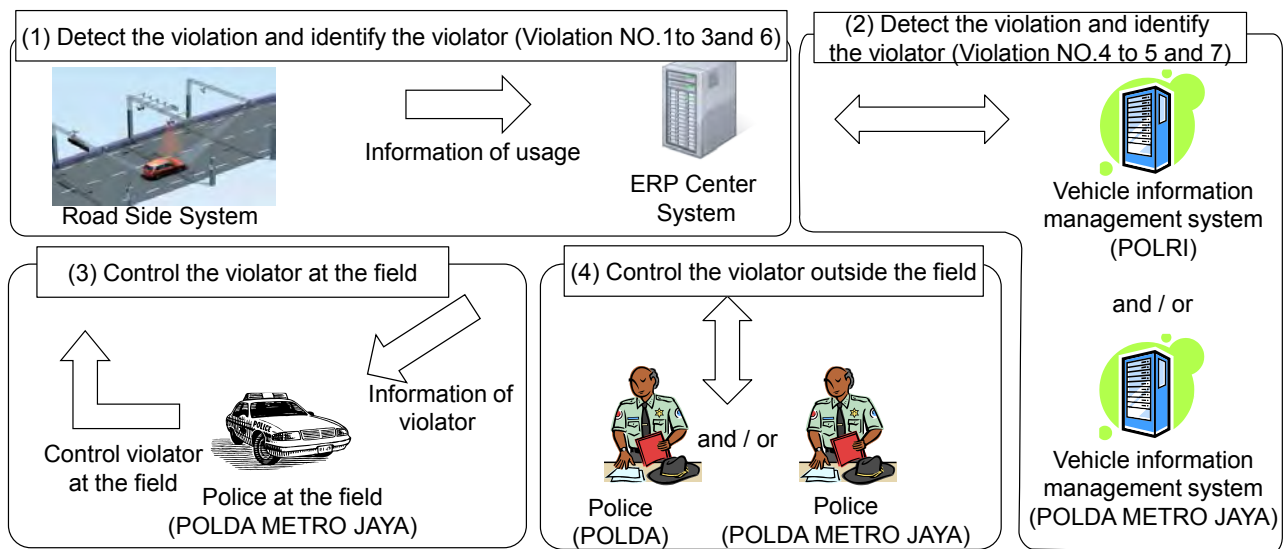
The ownership information of a vehicle linked to the OBU and ownership information of a vehicle linked to the number plate is required to enforce this violation.

### (7) Usage of illegal vehicle

Similar to above (1), (2), (4)

### 8.2.2.4 Violation Enforcement flow

The flow Violation Enforcement is shown in Figure 8-2-13.



**Figure 8-2-13 the flow of violation detection and enforcement**

- 1) The ERP system detects a violation vehicle from number plate information and peculiar information such as the OBU ID number that is obtained from a roadside system (charging point) passage vehicle and identifies violation contents and the violator.
- 2) In the case of the identification of the violator, system identify the violator by referring to vehicle information management system of the police using the vehicle number plate information and the characteristics of the vehicle such as the color, car model information that are taken by image.
- 3) The ERP system supports flagrante delicto control duties by notifying the police of the information of the violation vehicle which violated violation such as the OBU non-deployment which police can check as a flagrante delicto, violation contents, the violation place
- 4) In addition, about other violation vehicles, system support normal control duties by notifying the police of a violation vehicle and violation content

### 8.2.2.5 Required functions for violation Enforcement

For carrying out the Enforcement described in 8-2.2.4 paragraph, the functions necessary are shown in Table 8-1-7.



**Table 8-1-7 Functions for violation enforcement**

No.	Function	Specification	Configuration
1	Detect vehicle	<ul style="list-style-type: none"> <li>✓ Detect the vehicle that passes through charging point (ERP system user).</li> <li>✓ Recognize the position of vehicle that passes through charging point.</li> <li>✓ Issue the trigger of image capture.</li> </ul>	Road Side System
2	Capture the image of License Plate	<ul style="list-style-type: none"> <li>✓ Capture the image of License Plate for vehicle that passes thorough charging point.</li> </ul>	Road Side System
3	Recognize License Plate number	<ul style="list-style-type: none"> <li>✓ Recognize the License Plate number based on the captured image</li> </ul>	Road Side System
4	Air Communication	<ul style="list-style-type: none"> <li>✓ Receive the OBU information from OBU that is equipped on the vehicle that passes through charging point.</li> </ul>	Road Side System
5	Link information	<ul style="list-style-type: none"> <li>✓ link the License Plate number and OBU information based on vehicle position.</li> </ul>	Road Side System
6	Detect violation	<ul style="list-style-type: none"> <li>✓ Detect the violation for using ERP system based on linking License Plate number, OBU information, registered OBU information and registered vehicle information</li> <li>✓ Recognize the violator based on above information</li> </ul>	ERP Center System
7	Registration information inquiry	<ul style="list-style-type: none"> <li>✓ When the violation detection, the unregistered vehicle information on the ERP system, query the vehicle information management system.</li> </ul>	ERP Center System
8	Violation vehicle information notification	<ul style="list-style-type: none"> <li>✓ Management violator information and notify the violator information to police.</li> </ul>	ERP Center System
9	Vehicle information management	<ul style="list-style-type: none"> <li>✓ Manage the information of all vehicle and those owner in Indonesia.</li> </ul>	Vehicle Information Management System
10	Violator enforcement	<ul style="list-style-type: none"> <li>✓ Clamp down the violator.</li> </ul>	Police

## 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 that I listed in item 8.2.2. Therefore, when OBU is distributed, regular user information and vehicle information are registered.

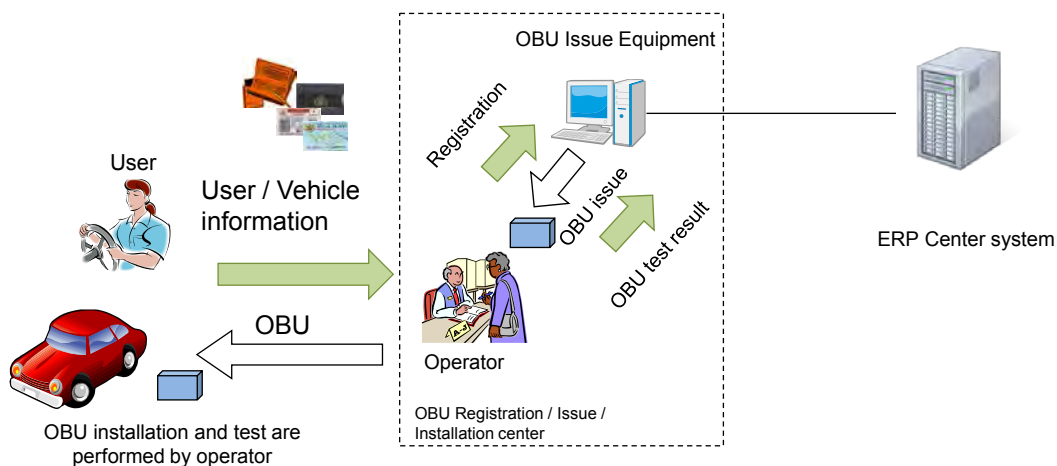
### 8.2.3.2 OBU management method

Timing to manage the OBU are when new registration of user and vehicle to the ERP system, and at the time of registration contents change by the vehicle replacement or change of address of the user, and at the time of registration contents deleted by scrapping are considered.

**(1) New registration of user and vehicle**

in the OBU registration, publication, installation center, the center install a vehicle installation device registration device connected to the device with the OBU information management functions such as ERP center systems, and, by a located operator, the new registration of a user by a user reception and the terminal operation and the vehicle, the registration of the vehicle installation device publish it. An example of the new registration of a user and the vehicle are shown in figure 8-2-14.

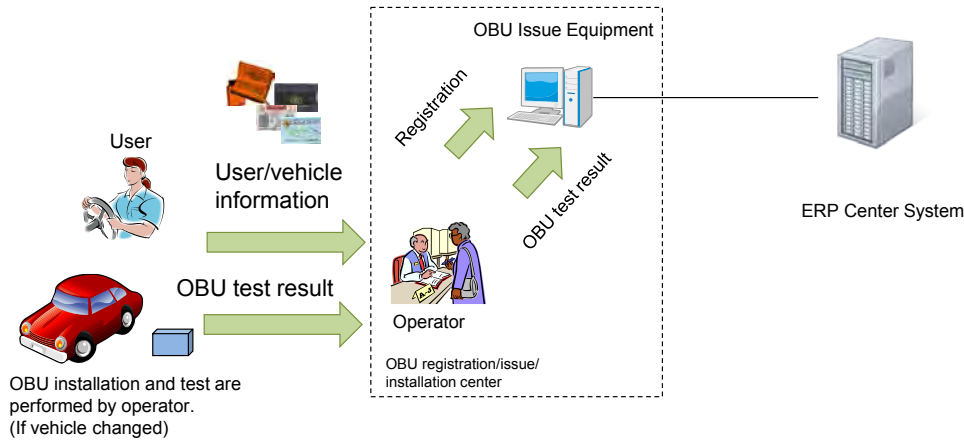
The user submits the documents which listed vehicle information of documents which listed user info of documents which listed the number of the account for exclusive for ERP to use an ERP system for an operator, identification card (KTP) or driver's license (SIM), car number vote paper (STNK) and tax payment certificate (SKPD), and the operator inputs user info and vehicle information into a vehicle installation device registration device, and registration publishes a vehicle installation device. In addition, the OBU can reduce inconvenience by the installation defectiveness and the risk by the illegal acts such as the changes of the vehicle installation device by the user without permission because an operator performs the installation to a vehicle and operation check.



**Figure 8-2-14 Example of new registration of user and vehicle**

**(2) Change of registered contents**

The user, address changes, the vehicle replacement, etc., ERP account information, if the resulting change user information, in one of the vehicle information, can be made to change the procedure of registration contents in the OBU registration issue and mounting Center. An example of the registration contents change I are shown in Figure 8-2-15.

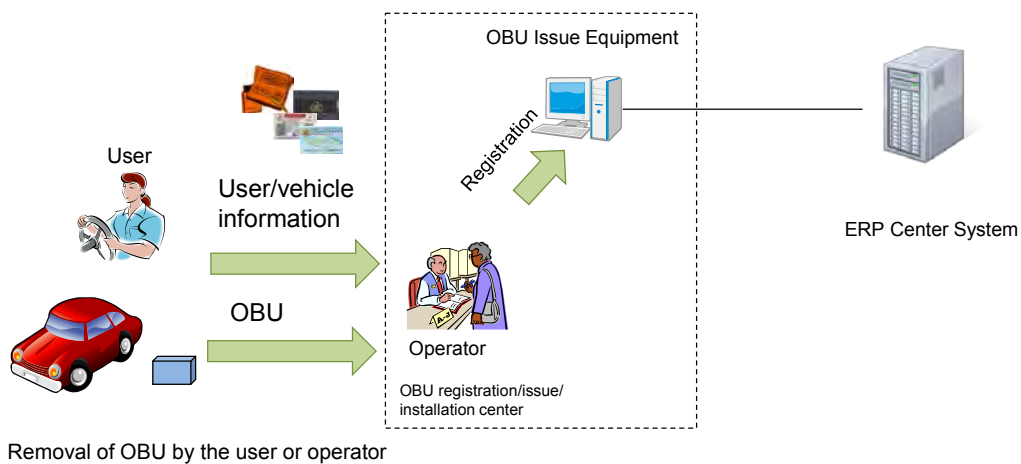


**Figure 8-2-15 Example of change of registered contents**

All the documents that were used during the registration of the user and a new vehicle of the above (1), submitted to the operator, the operator, to re-register the user information and vehicle information to the OBU issuing device. Also, when the vehicle replacement user, as well as when the vehicle registration, the operator and by checking the operation of the OBU, it is possible to reduce the risk of fraud in the unauthorized replacement of OBU by the user.

**(3) Delete of registered contents**

The user, if it becomes necessary to delete the contents registered by scrapping, etc., can be performed to remove procedure of registration content at OBU registration, issuance and installation center. An example of the registration contents Delete is shown in Figure 8-2-16



**Figure 8-2-16 Example of Delete of registered contents**

In principle, the user all the documents that are used during test registration of the user and a new vehicle of the above (1), is submitted to the operator. Operator, enter the user information and vehicle information to the OBU issuing device, it is possible to register the deleted information, removing the OBU from the



user of the vehicle. For removal of the OBU, at the time of removal, since the vehicle can be considered also impossible self, removable by the user (bring) is also possible.

### 8.2.3.3 OBU registration contents

As described in Section 8-2.2.3, detection and various violations, such as OBU not installed, for enforcement of the violators, as the registration information of the OBU, and requires registration of such vehicle information that regular OBU is attached become. The information required for registration of regular OBU is listed in Table 8-1-8.

**Table 8-1-8 OBU registration contents**

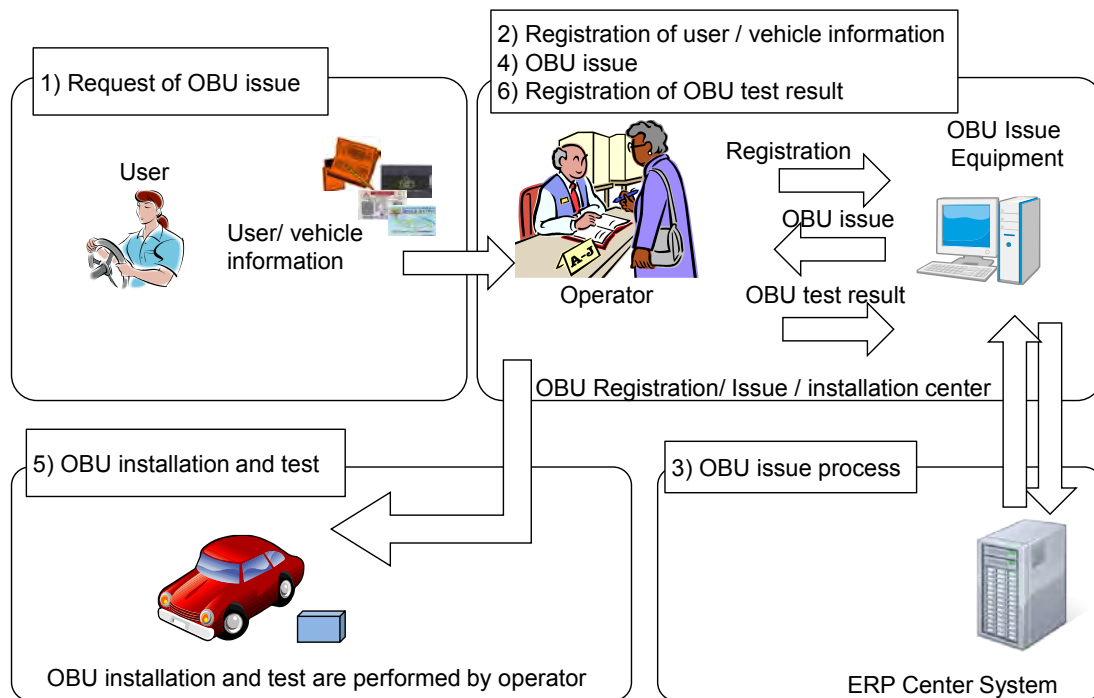
No.	Item	Contents of registration
1	Inherent OBU Information	Unique and inherent number of each actual OBU ⇒Use for identifying “Usage of altered OBU” violation and “Usage of illegal OBU” violation.
2	Vehicle information	The following information of vehicle that is equipped with actual OBU. • Name of vehicle owner • Address of vehicle owner • Manufacturer • Name of vehicle • Year of manufacture • Color • License plate number ⇒Use for identifying “Usage of stolen OBU” violation and “Usage of swapped OBU” violation.
3	User information	The following information of user that uses actual OBU for ERP system • Name of user • Address of user • Occupation • Phone number • account number/name of ERP account ⇒Use for identifying “Usage of OBU with low or zero balance” violation and for collecting charging fee from regular OBU.

### 8.2.3.4 OBU management flow

About OBU management method shown in Section 8-2.3.2, when a new registration of the user and OBU information, time change, to describe the flow when deleting in Figure 8-2-17 through Figure 8-20-19.

#### (1) New registration of user and vehicle

User and vehicle information at the time of new registration flow shown in Figure 8-2-17 is advanced in the following steps.

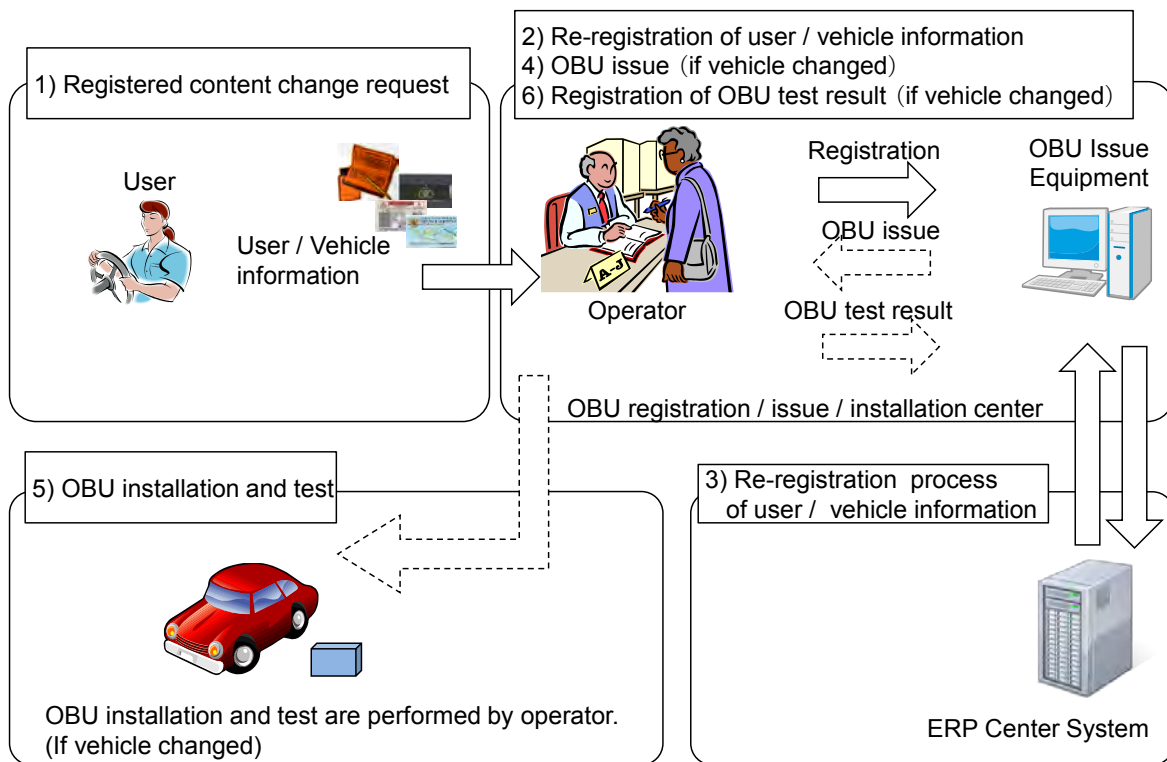


**Figure 8-2-17 The flow of registration of new user and vehicle**

- 1) The user visited by vehicle to OBU registration and issuance and mounting center, to the operator, a document that describes the ERP account number in order to use the ERP system, identification card (KTP) or driver's license (SIM documents describing the user information of), and, car number vote certificate (STNK) and, I submit the documents described the vehicle information of the tax certificate (SKPD).
- 2) The operator, enter the user information and vehicle information to the OBU registration device.
- 3) ERP center system, based on the information input by the operator, performing the OBU issuance process.
- 4) OBU issuing device, based on the OBU issue processing result of ERP center system issues an OBU.
- 5) The operator then mounted the OBU to the user of the vehicle, check the operation.
- 6) The operator registers the OBU issuing device OBU operation check results conducted by the above (5).

**(2) Change of registered contents**

User and vehicle information when changing flow (shown in Figure 8-2-18) proceed with the following steps.

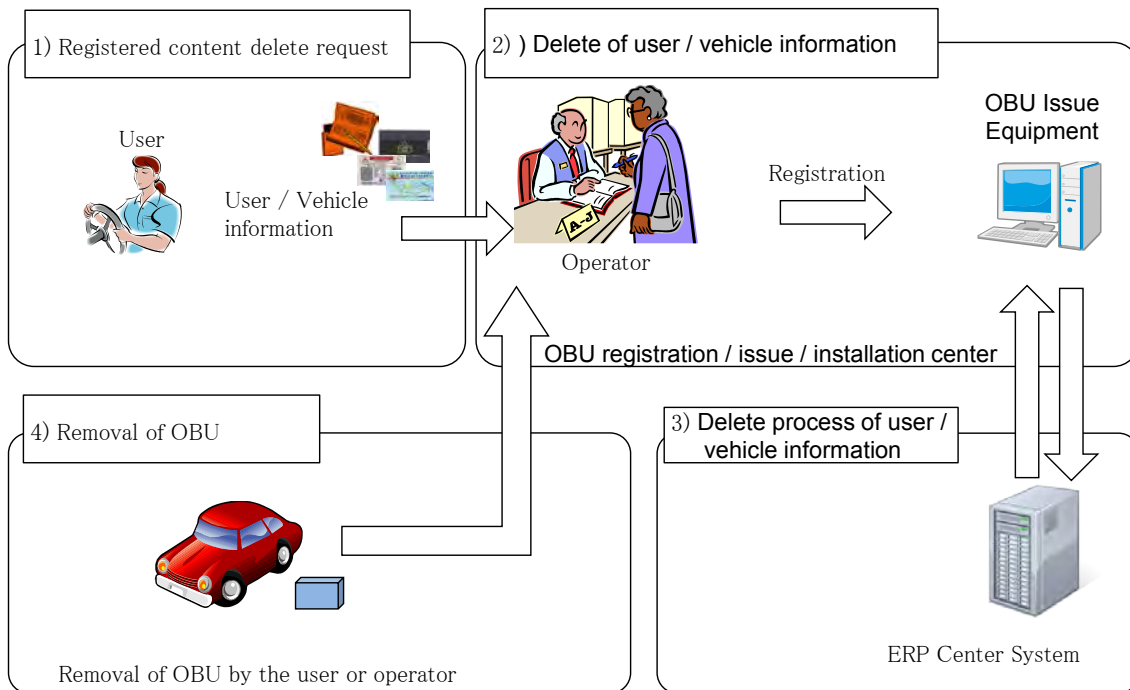


**Figure 8-2-18 The flow of change of registered contents**

- 1) User visited by vehicle or alternative transportation means to OBU registration and issuance and mounting center, to the operator, the document that describes the ERP account number in order to use the ERP system, identification card (KTP) or driver's license (documents describing the user information of SIM), and, car number vote certificate (STNK) and, I submit the documents described the vehicle information of the tax certificate (SKPD).
- 2) Operator, enter the user information and vehicle information to the OBU issuing device.
- 3) ERP center system performs the process of changing the user information and the vehicle information based on the information inputted by the operator.
- 4) When the vehicle replacement; OBU issuing device to issue the OBU based on the user information and vehicle information change processing result of ERP Center system.
- 5) When the vehicle replacement; operator is mounting the OBU in the vehicle of the user, check the operation.
- 6) When the vehicle replacement;, operator be registered in the OBU issuing device the OBU operation check results that were carried out in the above (5).

**(3) Delete of registered contents**

User and vehicle information when deleting the flow shown in Figure 8-2-19 is advanced in the following steps.



**Figure 8-2-19 The flow of delete of registered contents**

- 1) User visited by vehicle or alternative transportation means to OBU registration and issuance and mounting center, to the operator, the document that describes the ERP account number in order to use the ERP system, identification card (KTP) or driver's license (documents describing the user information of SIM), and, car number vote certificate (STNK) and, I submit the documents described the vehicle information of the tax certificate (SKPD). However, if you have already been scrapped, and the vehicle, any document that lists the vehicle information and unnecessary.
- 2) Operator, enter the user information to the OBU registration apparatus. If the vehicle information exists, I enter together also vehicle information.
- 3) ERP center system to perform the deletion of the user information and the vehicle information based on the information inputted by the operator.
- 4) The operator performs the removal of the OBU mounted on the user's vehicle.  
 (User is removed from the vehicle in advance, mosquitoes also be handed to the operator)

### 8.2.3.5 Required functions of OBU management

To achieve the OBU flow management described in paragraph 8-2.3.4, necessary functions are shown in Table 8-1-9.

**Table 8-1-9 Functions of OBU management**

No.	Function	Specification	Configuration
1	OBU management	✓ Resister, change, and control the information of OBU, user, and vehicle that is equipped with regular OBU.	ERP Center System
2	OBU Issue	✓ Issue the OBU.	ERP Center System

## 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 method

To distributed management information with the ERP system in a plurality of places, since it leads to an increase of the information management load, the ERP system at ERP center system, collectively manages all the information that the ERP system is responsible for.

ERP Center system is duplicating the information storage device in order to prevent the loss of information. In addition, and ERP center system, the connected devices such as roadside system comprises a mechanism that can continue operating in abnormality of the isochronous communication line disconnection, at the time of communication line recovery, by exchanging the stored information in the abnormality, information I want to prevent the loss.

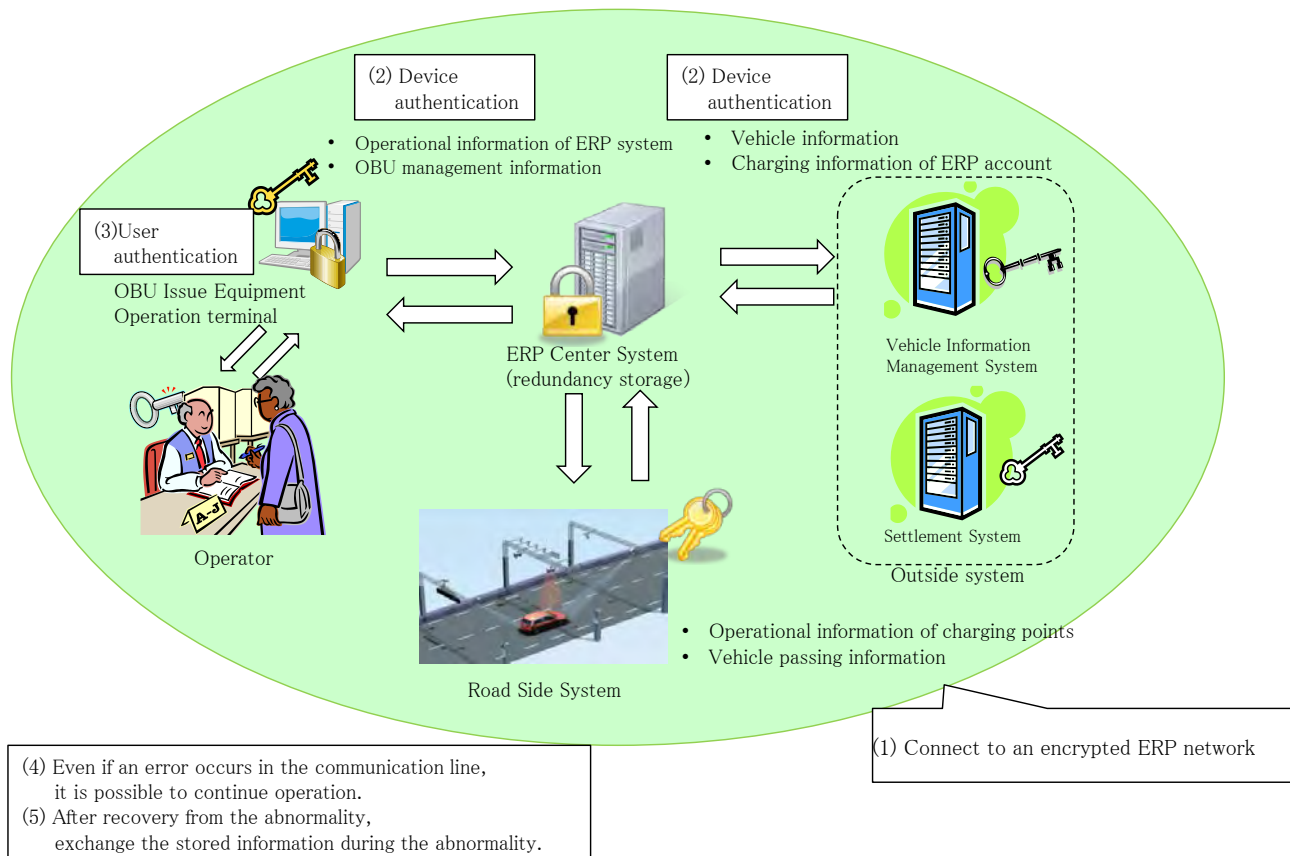
In addition, Section 8-2.1, Section 8-2.2, as described in Section 8-2.3, ERP system, with charging to the user, detection of various violations, crackdown of the offender, the function of the in-vehicle apparatus information registration.

Therefore, when the ERP system operation, access to the information is required in addition / update of the matching and the registration information of the information.

To prevent such unauthorized access and alteration to the information, firewall as well as implement the encryption processing for the transmission communication path, such as any person or device capable of accessing the information for transmitting the information and the information and can be limited by the authentication function, such as only the authorized person or device to be accessed.

### 8.2.4.3 Information management flow

Information management of the flow shown in Figure8-2-20 is advanced by the following procedure.



**Figure 8-2-20 Information management flow**

- 1) All systems, including roadside system that connects to the ERP system center, OBU issuing device of the terminal, the external system such as a bank is connected to encrypt network ERP System Center
- 2) All devices connected to the ERP center system, when connecting to the ERP center system, ERP center system and it is possible to perform device authentication, it is possible to eliminate the unauthorized illegal access of devices to be connected to the ERP center system, each device I will

grant the appropriate information access rights to

- 3) The operator that operates the terminal of the OBU issuing apparatus or the like, prior to operating the terminal, it is possible to perform user authentication, to impart proper device operation information and access to each operator
- 4) Even at the time of abnormality of the communication line such as cutting, ERP center system and connected equipment to continue the operation
- 5) During the recovery from the abnormality, performs the exchange of information that is accumulated in abnormal among equipment (synchronization), to prevent loss of information

#### 8.2.4.4 Required function of information management

In order to realize the information management flow according to 8-2.4.3 paragraph, the functions necessary to the ERP system are shown in Table 8-2-9.

**Table 8-2-9 Functions of information management**

No.	Function	Specification	Configuration
1	Information management	<ul style="list-style-type: none"> <li>✓ Manage all data and information such as OBU information, user information, table of charging fee, and so on.</li> <li>✓ Prevent the loss of information at the time of occurrence of an abnormality by redundancy storage.</li> </ul>	ERP Center System
2	Information security	<ul style="list-style-type: none"> <li>✓ In order to prevent unauthorized access or data tampering, ERP network perform data encryption and human/device authentication.</li> </ul>	ERP Center System



## **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.

### **8.2.5.2 Traffic management method**

The analysis of traffic effects of the ERP system implementation, based on the vehicle passing information to be collected at the roadside system (charging point), cross-section traffic volume of roadside system installation location, QV curve of ERP target routes, trip time and, to use distance, etc. the use of the analysis result, future charging time period, charging amount and changes, can be utilized in consideration of expansion of charging point. Later analysis methods I describe.

#### **(1) Cross-section traffic volume of roadside system location**

A cross-section traffic volume of roadside system installation location, period, day of the week, it is possible to graph display with the specified conditions of time band, or the like, hourly traffic volume of ERP target road and, to visualize the traffic distribution on the route

#### **(2) QV curve of ERP target road**

By displaying the QV curves for each roadside subsystem location, to visualize the relationship between traffic capacity and the vehicle speed of the target road ERP

#### **(3) ERP target trip time**

The trip time ERP target road, time, day, and statistically analyzed with the specified conditions of time zone, etc., by displaying a graph of the histogram or the like to obtain the trip time of the user in the ERP target road.

#### **(4) Using distance of ERP target road**

The average utilization distance of a particular route, and constant conditions (time, day of the week, time of day, etc.) to display the graph of the histogram such statistically analyzed to obtain usage

distance of the user in the ERP target route.

**(5) Average billing amount**

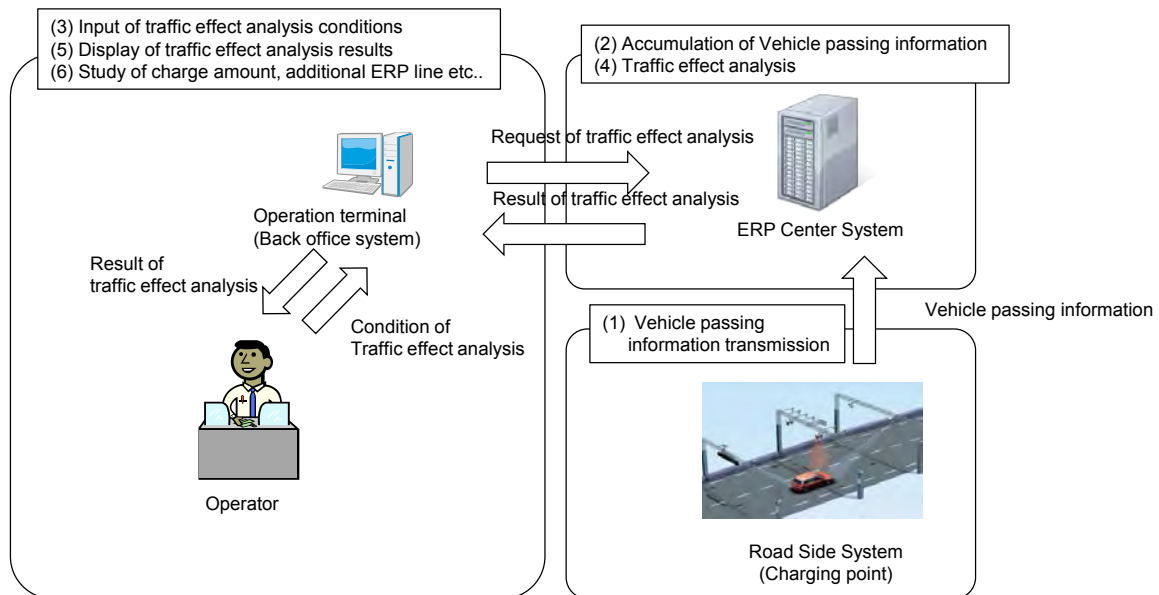
The average billing amount to the user, time, day, and statistically analyzed with the conditions specified time period, etc., by displaying a graph of the histogram or the like to obtain the Charge amount of the user in the ERP target road.

(1) (2), the traffic volume of the roadside system (charging point), the traffic volume, it is possible to visualize the vehicle speed, on the ERP target routes, it is possible to traffic conditions grasp locations such as traffic is concentrated, ERP operator, based on these analysis results, it is possible to carry out the expansion of the investigated target ERP routes such as charging point expansion.

(3) (4) (5), the trip time of the vehicle traveling the ERP target line, use distance, it is possible to statistically analyze and visualize the Charge amount, it is possible to use trending users of the ERP system , ERP operator, based on these analysis results, it is possible to examine the change of ERP fee.

**8.2.5.3 Traffic management flow**

Flow of traffic effects analysis shown in Figure 8-2-21 is advanced in the following steps.



**Figure 8-2-21 Traffic effect analysis flow**

- 1) Roadside system is to collect the vehicle passing information and transmits it to the ERP Center system.
- 2) ERP Center system accumulates the vehicle passing information.
- 3) ERP operator, enter the conditions of the traffic effect analysis on ERP center system (operation terminal).

- 4) ERP center system performs traffic effect analysis based on the conditions of the traffic effects analysis entered in the above (3).
- 5) ERP Center system displays the results of an analysis of traffic effect.
- 6) ERP operator to run the measures carried out additional measures study of Charge amount of change and ERP target line.
- 7) If necessary, it is possible to implement the above-mentioned (1) to (6 ), to confirm the effect of the measures.

#### 8.2.5.4 Required functions of traffic management

To achieve the effect traffic flow analysis described in Section 8-2.5.3, the functions deemed necessary to the ERP system, are shown in Table 8-2-10.

**Table 8-2-10 Functions of traffic management**

No.	Function	Specification	Configuration
1	Traffic management	<ul style="list-style-type: none"> <li>✓ Accumulate the traffic condition based on the number of vehicle that pass through charging point.</li> <li>✓ Analyze the effect of traffic condition by difference of charging fee.</li> </ul>	ERP Center System

## **8.2.6 Operation and maintenance**

### **8.2.6.1 Operation and maintenance method**

After introducing the ERP system, in order to continuously perform the normal charging and enforcement, it is necessary to carry out maintenance of the ERP system. In order to maintain the operation of the ERP system, not only performs a normal operation of the ERP system, regular inspections and, also maintenance of replacement of consumables necessary. Furthermore, even if an abnormality occurs in the ERP system, backup measures and for maintaining the operation of the ERP system, it is necessary to early detection of abnormalities. The ERP system has a maintenance and operation functions in order to maintain the operation of the ERP system.

Also, across the ERP system in the long run, in order to continue operation, the customer service to query response of the ERP user, extension of ERP target line for the purpose of traffic jams for other congestion line, charging time the operation of the optimal ERP system it is necessary due to review of and Charge amount. Later, I described the details.

### **8.2.6.2 Maintenance of the ERP system running**

The ERP system has an operation monitoring function of monitoring a system malfunction. If the system abnormality is detected, immediately notifies the content and the generation point of the system error to the operator. In addition, if the ERP center system is a control nerve center of this ERP system has fallen into abnormal, for the ERP system is likely to be stopped, for ERP center system, I have a backup system. In addition, since the ERP system at the time of power failure is likely to stop, the roadside system and the ERP system center, a power supply function, and has a backup power supply.

The ERP system, configuration equipment and configuration functions, including the configuration equipment of other systems, the ability to monitor such as the connection status between each configuration equipment, at all times, it is possible to monitor the health of the ERP system, In the event of failure or abnormal occurrence, it is possible to take a quick response. In addition, natural disasters such as flooding, malfunction or failure of other infrastructure facilities such as a power outage or network failure, malfunction or failure of other systems, such as payment systems, aging of the ERP system configuration equipment, due to interference by the user, damage or problems even if it occurs, has a measure function to maintain the operation of the system. Accordingly, the failure or abnormal generation through to recovery, without stopping the operation of the ERP system, it is possible to maintain operation. In operation maintenance of the ERP system, aging or ERP system configuration equipment, such as destruction of the equipment by the user, for the physical equipment failure or abnormal, and regular maintenance and inspection of component equipment, and corresponding in exchange such as flooding and power outages, physically affect the operation of the device, for those that lead to failure or abnormality of the ERP system, and the failure or abnormality occurs the device or function, and backup equipment and having an equivalent performance and functions at the function, I

maintain the running of the ERP system.

Abnormalities of other systems such as payment systems, the failure or defects, such as network failure or failure of the secondary ERP system due to failure or abnormal, correspond by having a backup function. Such as unauthorized user access to the ERP system, against the interference of hacking, etc. to the ERP system via the network from the outside, and security measures, including encryption processing, I correspond at its regular reinforcement. Definition of the envisaged failure or abnormal and, I will be described later its measures.

### 8.2.6.3 Definition of slight failure and an abnormality

Slight failure and abnormalities are shown in Table 8-2-11.

**Table 8.2-11 Slight failure and an abnormality**

No.	Failure or abnormal cases	Factor
1	Loss of function of the charging point	<ul style="list-style-type: none"> <li>✓ Equipment failure of Road Side System.</li> <li>✓ Loss of network line connecting the ERP Center System from the Road Side System.</li> </ul>
2	Temporary loss of settlement function	<ul style="list-style-type: none"> <li>✓ Loss of network line connecting the ERP Center System and Settlement System.</li> </ul>

Failure and abnormality case shown in Table 8-2-11 when performs the following actions.

#### **(1)In case of loss of function of the charging point**

The Road Side System with failure or abnormalities is separated from a charging system. The Road Side System and other subsystems which are carrying out normal operation are used for a charging system. Moreover, the equipment of failure or abnormalities performs repair or replacement.

#### **(2)If charging point function was lost by lost network connection**

Therefore, the Road Side System maintains functions except communication with the ERP Center System. The function which is not maintained is violation detection information of vehicles, etc. At this time, the Road Side System holds the data to be transmitted to the ERP Center System Between network line until the spread. When a network line is restored, the Road Side System transmits to the ERP Center System data stored in it.

#### **(3)When temporary loss of settlement function**

An ERP Center System stops an inquiry of the information on a Settlement System until a network link is restored. Then, ERP Center System maintains system operation, de-generating a charging function.

After a network link is recovered, an ERP Center System resumes an inquiry demand and maintains a system action.

### 8.2.6.4 Correspondence for Heavy Trouble and Problem of ERP System

Failure and abnormal case are shown in Table 8-2-12.

**Table 8.2-12 Serve failure and an abnormality**

No.	Failure or abnormal cases	Factor
1	Loss of function of the ERP Center System	✓ Equipment failure of ERP Center Subsystem.
2	Temporary loss of management functions.	✓ Loss of network line connection the management function subsystem and ERP Center System.

When abnormality and failure shown in Table 8-2-12 has occurred, center system performs the following action.

#### (1) In case of the loss of function of a ERP Center System

System operation is maintained by changing to a backup system until apparatus replace or repair is completed.

#### (2) Case of loss of management function

An ERP Center System stops an inquiry of the information on a management subsystem until a network link is restored. After a network link is recovered, an ERP Center System resumes an inquiry demand and maintains a system action.

### 8.2.6.5 Customer service

In order to continue the smooth operation of the ERP system, it is desirable to be able to easily use the ERP system for ERP users. Specifically, easy confirmation and billing balance in each ERP users, rapid response, etc. for inquiries of carrying ERP system usage, and the like. That enhance these customers (for ERP users) service is important to the continuation of the smooth operation of the ERP system.

In this ERP system, as a point of contact for customer service, user portal site and has a call center. User portal site, service content in the call center, I described in Section 7.7.

### 8.2.6.6 Optimal operation of the ERP system

Introduction main purpose of the ERP system in Jakarta Special Province is easing traffic congestion. To achieve congestion mitigation, charging hours or, optimally adjust and set the charging amount, it is necessary to operate the ERP system. charging time zone that is proposed in this document, charging amount, and the traffic situation in the current Jakarta Special Province is a before introduction of the ERP system, but is one that was set such as to base economic conditions, economic development of the

future of Jakarta Special Province since the influence due etc. are not considered, in the future, it is necessary to operate the ERP system adapted to prevailing circumstances. The ERP system has a traffic effect analysis function to perform the analysis of the traffic volume, etc. described, of another Charge amount in Section 8.2.5. The analysis results and, by using the economic analysis results of the DKI Jakarta, it is possible to continue the operation of the optimal ERP system.

#### **8.2.6.7 Expansion of ERP target road**

ERP target road is an adaptive range of this document, as described in Section 8.1.2, Corridor 1 and is a corridor 6 Jakarta Special Province government, not only Corridor 1 and Corridor 6, sequentially, is a plan to introduce the ERP system for the other corridor. In the extension of ERP target road, the installation of roadside system that was based on the traffic situation of each ERP target road is required. The ERP system has a traffic effect analysis function to perform the analysis of the traffic volume, etc. described, of by each roadside system in Section 8.2.5. This analysis results and, using a traffic survey results, etc. in ERP target road of expansion plans, it is possible extension of the optimal 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.

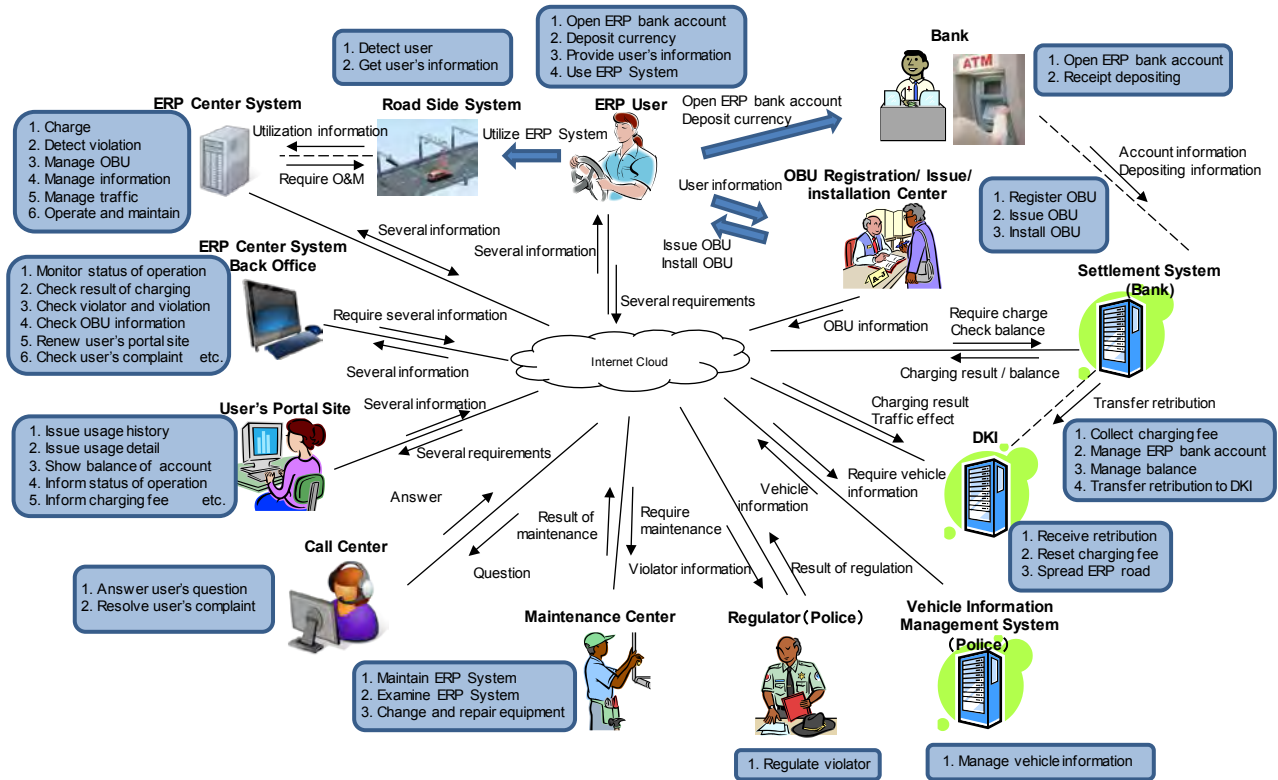


Figure 8-3-1 System configuration

#### 8.3.2 Functional configuration of the ERP system

In order to realize the system described in Section 8-3.1, it is necessary to various system functions. In the charge collection, ability function and to identify a vehicle traveling on the target line of the ERP system, and the specified vehicle is determined whether or not committed the violation, the ability to determine the Charge amount for the specified vehicle, collect Charge amount function is such that. Furthermore, the ability to identify the vehicle, functions to detect whether the vehicle is actually traveling on a charge point, the ability to acquire vehicle information traveling charging points, the personal information necessary for charging, vehicle information is required from the embedded OBU, etc. such as the ability to read the information. Such as the ability to detect the vehicle, it is a necessary function in the operation of each charge point, determines the Charge amount, since there may be a case of traveling several charging points, and integrated management of multiple charge point ERP is a function of the center system. System function Overview and configure the ERP system in Table 8-3-1, shows the configuration system for implementing each system function.

**Table 8-3-1 Functional configuration of ERP system**

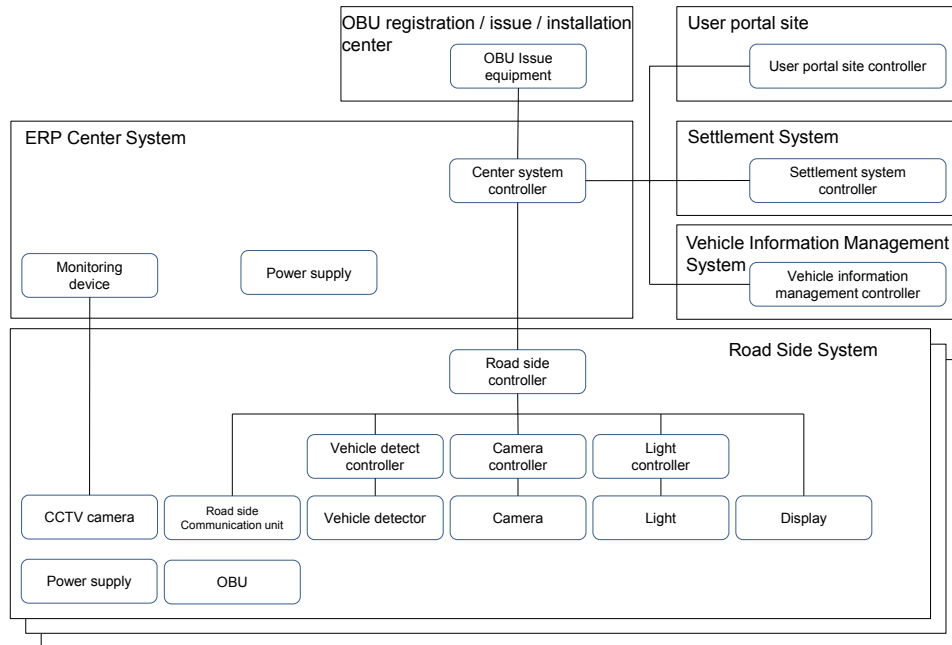
No.	Category	Function	Specification	Configuration
1	Collect charging fee and Enforcement	Detect vehicle	<ul style="list-style-type: none"> <li>✓ Detect the vehicle that passes through charging point (ERP system user).</li> <li>✓ Recognize the position of vehicle that passes through charging point.</li> <li>✓ Issue the trigger of image capture.</li> </ul>	Road Side System
2		Capture the image of License Plate	<ul style="list-style-type: none"> <li>✓ Capture the image of License Plate for vehicle that passes thorough charging point.</li> </ul>	Road Side System
3		Recognize License Plate number	<ul style="list-style-type: none"> <li>✓ Recognize the License Plate number based on the captured image</li> </ul>	Road Side System
4		Air Communication	<ul style="list-style-type: none"> <li>✓ Receive the OBU information from OBU that is equipped on the vehicle that passes through charging point.</li> </ul>	Road Side System
5		Link information	<ul style="list-style-type: none"> <li>✓ link the License Plate number and OBU information based on vehicle position.</li> </ul>	Road Side System
6	Collect charging fee	Decide charging fee	<ul style="list-style-type: none"> <li>✓ Decide the charging fee based on usage time, table of charging fee, and so on, after recognizing actual usage by "Detect violation" function.</li> </ul>	ERP Center System
7		Collect charging fee	<ul style="list-style-type: none"> <li>✓ Collect the charging fee from each ERP system users (ERP account).</li> </ul>	ERP Center System Settlement System
8		ERP account management	<ul style="list-style-type: none"> <li>✓ ERP account management as open/close account.</li> </ul>	Settlement System
9		Top up to the ERP account	<ul style="list-style-type: none"> <li>✓ Top up to the ERP account (by bank ATM or top up card)</li> </ul>	Settlement System User's portal site
10		Management of balance of ERP account	<ul style="list-style-type: none"> <li>✓ Inquiry of ERP account balance from the user.</li> <li>✓ If necessary, issues a usage details</li> </ul>	User's portal site
11		Remittance to the designated account by DKI	<ul style="list-style-type: none"> <li>✓ Remit the charge amount that was collected from ERP account to the designated account by DKI.</li> <li>✓ Inform the transferred amount to the DKI.</li> </ul>	ERP Center System Settlement System
12	Enforcement	Detect violation	<ul style="list-style-type: none"> <li>✓ Detect the violation for using ERP system based on linking License Plate number, OBU information, registered OBU information and registered vehicle information</li> <li>✓ Recognize the violator based on above information</li> </ul>	ERP Center System
13		Registration information inquiry	<ul style="list-style-type: none"> <li>✓ When the violation detection, the unregistered vehicle information on the ERP system, query the vehicle information management system.</li> </ul>	ERP Center System
14		Violation vehicle information notification	<ul style="list-style-type: none"> <li>✓ Management violator information and notify the violator information to police.</li> </ul>	ERP Center System
15		Vehicle information management	<ul style="list-style-type: none"> <li>✓ Manage the information of all vehicle and those owner in Indonesia.</li> </ul>	Vehicle Information Management System
16		Violator enforcement	<ul style="list-style-type: none"> <li>✓ Clamp down the violator.</li> </ul>	Police
17	OBU Management	OBU management	<ul style="list-style-type: none"> <li>✓ Resister, change, and control the information of OBU, user, and vehicle that is equipped with regular OBU.</li> </ul>	ERP Center System
18		OBU Issue	<ul style="list-style-type: none"> <li>✓ Issue the OBU.</li> </ul>	ERP Center System
19	Information management	Information management	<ul style="list-style-type: none"> <li>✓ Manage all data and information such as OBU information, user information, table of charging fee, and so on.</li> <li>✓ Prevent the loss of information at the time of occurrence of an abnormality by redundancy storage.</li> </ul>	ERP Center System
20		Information security	<ul style="list-style-type: none"> <li>✓ In order to prevent unauthorized access or data tampering, ERP network perform data encryption and human/device authentication.</li> </ul>	ERP Center System
21	Traffic Management	Traffic management	<ul style="list-style-type: none"> <li>✓ Accumulate the traffic condition based on the number of vehicle that pass through charging point.</li> <li>✓ Analyze the effect of traffic condition by difference of charging fee.</li> </ul>	ERP Center System
22	Operation and Maintenance	Operation	<ul style="list-style-type: none"> <li>✓ Operate ERP system.</li> </ul>	ERP Center System
23		Provide information	<ul style="list-style-type: none"> <li>✓ Inform and provide the information of operating ERP system.</li> </ul>	Road Side System
24		Maintenance	<ul style="list-style-type: none"> <li>✓ Maintain ERP system.</li> </ul>	ERP Center System
25		Monitor operating condition	<ul style="list-style-type: none"> <li>✓ Monitor the operating condition of ERP system.</li> </ul>	ERP Center System
26		Control ERP system	<ul style="list-style-type: none"> <li>✓ Control ERP system totally.</li> </ul>	ERP Center System
27		Road Side System control	<ul style="list-style-type: none"> <li>✓ Control Road Side system at each charging point.</li> </ul>	Road Side System
28		Supply power	<ul style="list-style-type: none"> <li>✓ Supply power to ERP system.</li> <li>✓ Back up for power supply.</li> </ul>	ERP Center System Road Side System

### 8.3.3 ERP system Equipment

Necessary equipment for ERP system is shown in Figure 8-3-2.

**Table 8-3-2 Equipment of ERP system**

No.	Function	Equipment	Configuration
1	Detect vehicle	Vehicle detector	Road Side System
2		Vehicle detect controller	Road Side System
3	Capture the image of License Plate	Camera	Road Side System
4		Camera controller	Road Side System
5		Light	Road Side System
6		Light controller	Road Side System
7	Recognize License Plate number/ Link information / Road Side System control	Road side controller	Road Side System
8	Air Communication	Road side communication unit	Road Side System
9		OBU	Road Side System
10	Decide charging fee/ Detect violation/ Registration information inquiry/ Violation vehicle information notification/ OBU management/ Information management/ Information security/ Traffic Management / Operation/ Maintenance/ Control ERP system/ Road Side System control	Center system controller	ERP Center System
11	Collect charging fee/ Remittance to the designated account by DKI	Center system controller Settlement system controller	ERP Center System Settlement System
12	ERP account management	Settlement system controller	Settlement System
13	Management of balance of ERP account	User portal site controller	User portal site
14	Top up to the ERP account	Settlement system controller User portal site controller	Settlement System User Portal Site
15	OBU Issue	OBU Issue equipment	OBU Registration/Issue/Installation center
16	Vehicle information management	Vehicle information management controller	Vehicle Information Management System
17	Violator enforcement	-	Regulator
18	Provide information	Display	Road Side System
19	Monitor operating condition	Monitoring device	ERP Center System
20		CCTV camera	Road Side System
21	Supply power	Power supply	Road Side System ERP Center System



**Figure 8-3-2 Equipment configuration of ERP system**

### 8.3.4 Requirements of the ERP system

The requirements of the ERP system is shown in Table 8-3-3.

**Table 8-3-3 Requirements of the ERP system**

No.	Item	System requirement
1	Number of lanes	4 lanes or more.
2	Condition of vehicle passing	Multi-lane free flow
3	Structure of road side equipment	1set of gantry which is 6m or more height.
4	Sunshine condition	All-weather
5	Operating time	Irrespective of day and night.
6	Gantry installation environment	Withstand the flooding of less than 50cm.
7	OBU	RFID or 2 piece type
8	Charging methodology	Trip based charging method
9	Charging scheme	Identifies the user from the OBUID, and charging fee collection from user.
10	Fee collection success rate	90% or more
11	Target vehicle type	4 or more wheel vehicle (include the Heavy goods vehicle and bus)
12	Maximum vehicle passing speed	120km/h (for fee collection)
13	Maximum traffic volume	2,200 vehicle/hour/lane
14	Violation detection	Shoot evidence images by identifying the violation vehicle and notifies the police.
15	Violation detection ratio	90% or more
16	Health check of equipment	Monitor the health of each equipment.
17	Maintainability	High maintainability
18	Information management	Information of handling needs redundancy. Communication between each equipment needs security measures.

## 8.4. Outline specifications of OBU

### 8.4.1 Selection of OBU

Currently, in Singapore and Europe and elsewhere around the world, various ERP systems have been introduced. Specification of ERP systems that are operating in various countries has become a different specification from such country-specific traffic conditions and related legislation. In addition, OBU also specification is different. The comparison result of the OBU, which is used in each country shown in Table 8-4-1.

**Table 8-4-1 Comparison of OBU**

Item	Type of OBU		
	RFID	1 piece	2 piece
Standard	ISO18000-6C	CEN EN 12253 (L1) EN 12795 (L2) EN 12834 (L7)	ARIB-STD-T75 ARIB-STD-T88
Adopted country	USA	EU countries	Japan
Manufacturer	Transcore etc..	Kapsch etc..	MHI etc..
Cost (approx. USD)	\$2	\$20	\$100
The applicable payment method	Prepaid/ Post-pay	Prepaid/ Post-pay	Prepaid/ Post-pay
Theft protection	○	-	-
Utilization promotion of public transportation	-	-	○ (with public transportation card)

As described in Section 8.2.2, in order to detect and identify the violator. The unique ID number of OBU, a number plate information of the vehicle which is linked to the OBU, and registration information of the owner of the vehicle are necessary. By using RFID Tag it is possible to register such the information. In order to prevent swapping of OBU to other vehicles, it would be difficult with the tamperproof function of RFID Tag as shown in figure 8.3-2. In addition, at the point of view of the penetration of OBU, RFID Tag is dominant in a point having low unit price. Penetration of OBU is indispensable to reduce control load of the OBU non-deployment violation, and RFID Tag is more dominant than other OBUs about this point. Besides, the appearance design (print contents) of RFID Tag is changeable to any design and available for the design which is arbitrary as a registered certificate of the number plate.



**Figure 8-3-3 Tamper Proof function of RFID-Tag (Image)**

Source: JICA Study Team

### 8.4.2 General specifications of the OBU

The general specification of RFID Tag is shown in Table 8-4-2.

**Table 8-4-2 Basic specification of RFID tag**

No.	Item	Specification
1	Standard	ISO18000-6-C EPC global Class-1 Generation-2
2	Memory	TID:96-bits EPC:240bits User512bits
3	Endurance	100,000cycles or more
4	Data retention time	10 years or more
5	Frequency	UHF band (86-0~96-0MHz)
6-	Face printing	Apply (By DKI specified design)
7	Back printing	Apply (By DKI specified design)

### 8.4.3 Environmental specification of OBU

The environmental specification of RFID Tag is shown in Table 8-4-3.

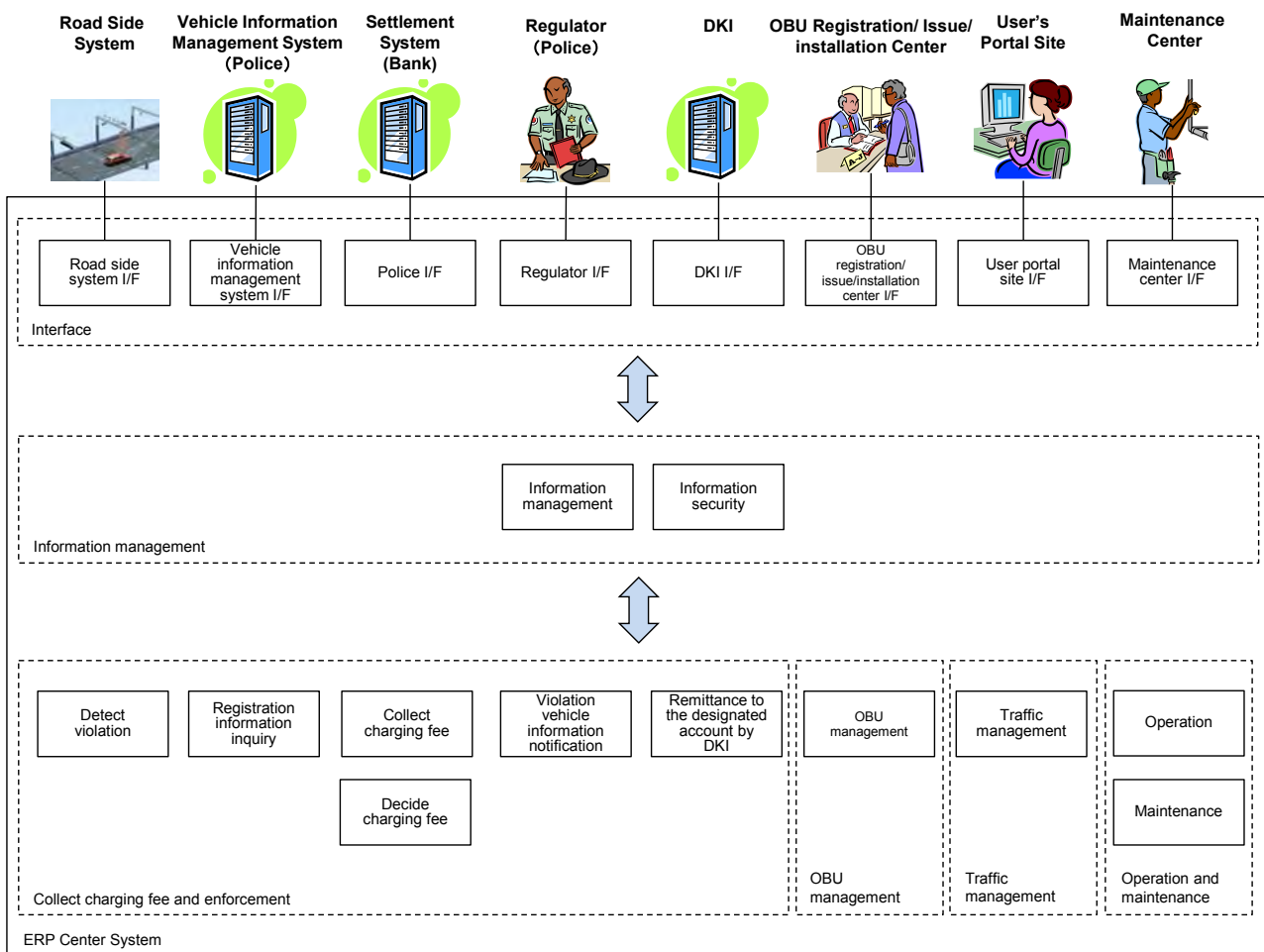
**Table 8-4-3 Environmental specifications of RFID Tag**

No.	Item	Specification
1	Operating temperature	-40degC~85degC
2	Storage temperature	-40degC~85degC
3	Humidity	More than less 95%

## 8.5. Outline specifications of ERP center system

### 8.5.1 System configuration of ERP center system

ERP center system has the functions shown in Table 8-3-1, operates as an application on the server computer (central control unit). The functional configuration of the ERP center system is shown in Figure 8-5-1.



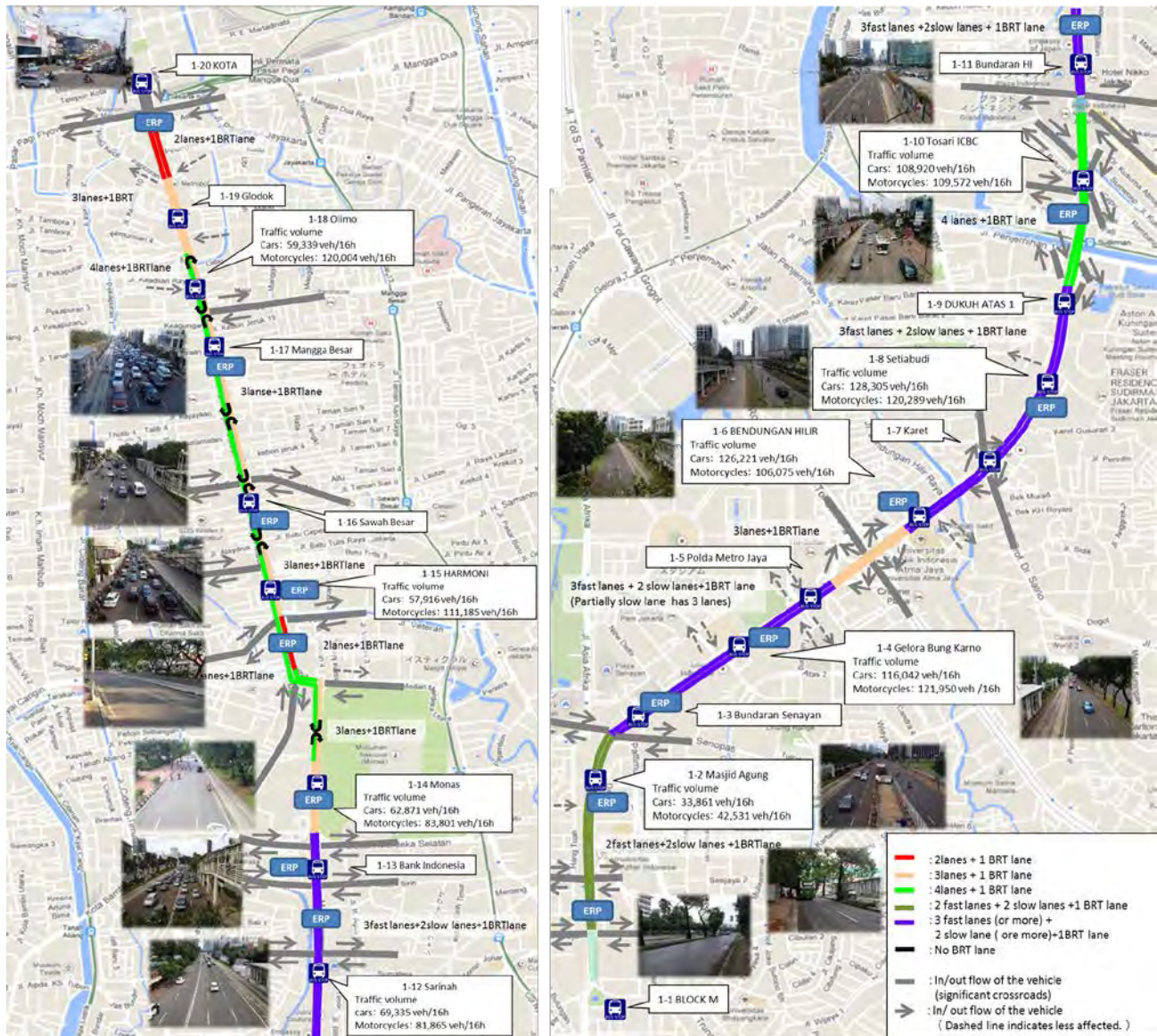
**Figure 8-5-1 Functional block diagram of the ERP center system**



## 8.6. Outline specifications of the roadside system

### 8.6.1 Location of roadside system

Figure 8-6-1 and Figure 8-6-2 are the possible location of roadside system on Corridor 1 and Corridor 6.

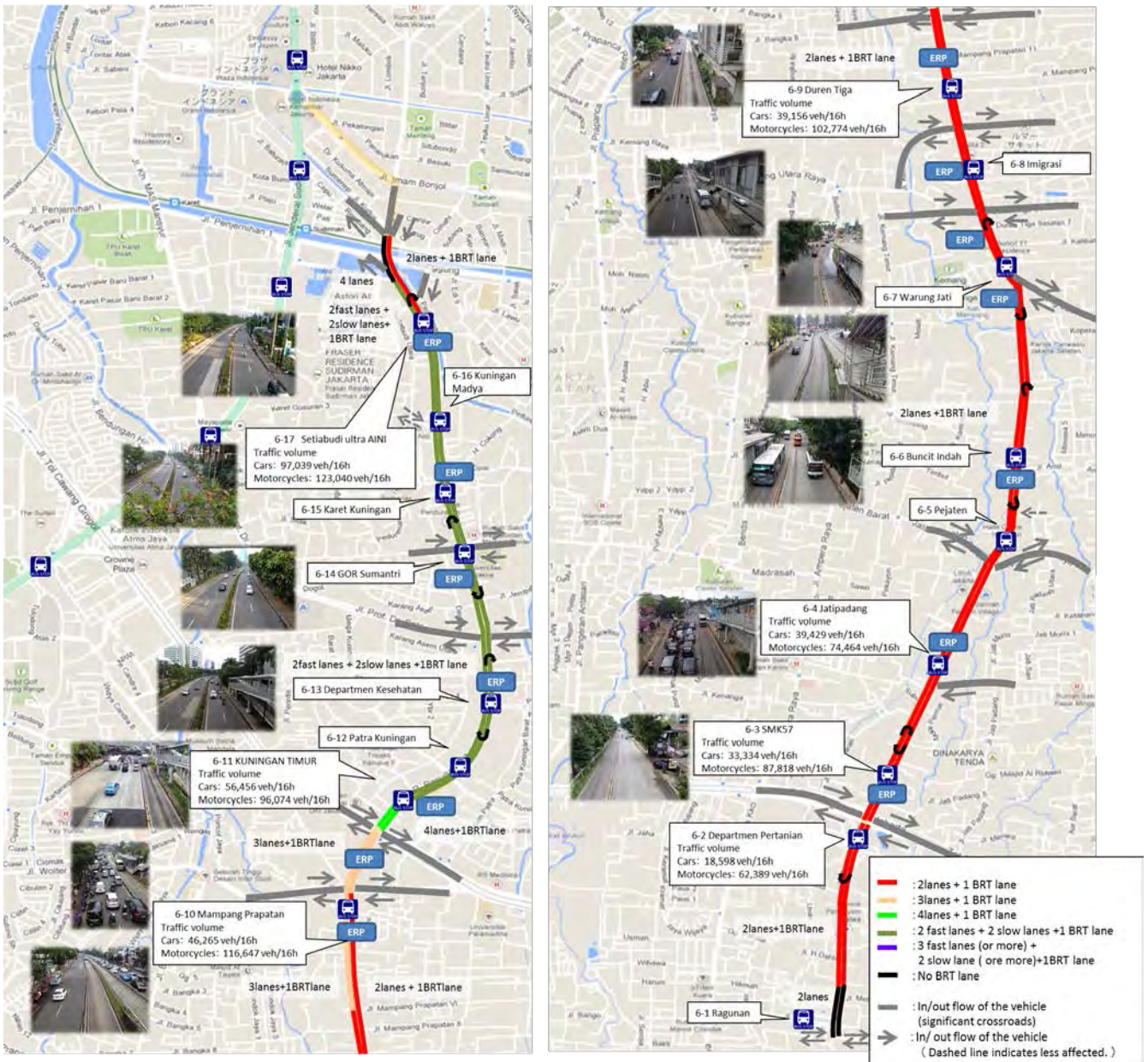


(a) North Jakarta; Upper side of (b)

(b) Central Jakarta; Lower side of (a)

**Figure 8-6-1 Location of roadside system on corridor 1**





(a) Central Jakarta; Upper side of (b)

(b) South Jakarta; Lower side of (a)

**Table 8-6-2 Location of roadside system on corridor 1**

## **8.7. Outline specifications of other ERP system components**

### **8.7.1 User portal site**

The ERP system includes user portal site as a customer service improvement tool.

User portal site is a dedicated website for registered ERP user only.

User portal site provides the following services to each ERP users.

- 1) Confirmation and issuance of ERP usage history
- 2) Issuance of ERP usage receipt
- 3) Checking the prepaid account balance
- 4) Provides information related to the operation status of the ERP system
- 5) Provides information about the current Charge amount

### **8.7.2 Call center**

The ERP system has a call center as a customer service improvement tools. Call center is a query institution available for registered ERP users. The call center provides the following services to each ERP users.

## **8.8. Comparison of ERP Technologies**

### **8.8.1 ERP system using similar technologies**

For ERP system or Multi-Lane-Free-Flow System (MLFF) using OBU which is planned to be implemented in Jakarta, the key is the controlling technology of RF communication and Enforcement system. Although ERP is not implemented in Japan, Japan has over decades of experience in ETC system which deals with one of the world's heaviest traffics and most complex tolling rate without failure.

Moreover the Japanese has experience with ERP system in Singapore, which is still one of the only three large scaled ERP in the world. As described in Section 8.1.1, there are two types of ERP system which are the one using OBU for charging and using cameras to detect number plate license for enforcement and the other using only camera to detect number plate license and distinguish whether the vehicle are registered vehicle or non-registered vehicle (i.e. violators).

Jakarta has already decided to adopt ERP which is similar to ERP in Singapore which uses OBU. Regarding the heavy traffic volume in Jakarta, the controlling technology should maintain the highest technology level.

Table 8.8-1 indicates the comparison of ERP system in three cities.

**Table 8.8-1 Comparison of ERP system in three cities**

Items	Singapore	London	Stockholm
System	Microwave OBU and Antenna Number Plate recognition	Number Plate recognition	Number Plate recognition*1
Operation	1998	2003	2007
Supplier	Mitsubishi Heavy Industries	IBM	IBM, Q-Free
Merit	Charging is done automatically through OBU transaction	OBU is not necessary Camera is the only roadside system	OBU is not necessary Camera is the only roadside system
Demerit	Diffusion of OBU is necessary Requires high standard roadside system	Requires knowledge and effort in the back office which may result as a high operation cost.	Requires knowledge and effort in the back office which may result as a high operation cost.

\*1 OBU and Antenna was used only during the trial period

Source: JICA Study Team

As shown in Table 8-8-1, Mitsubishi Heavy Industries, IBM and Q-FREE are the only three System Integrators who had supplied ERP system.

### 8.8.2 Recognition of Number Plate at night

Next is the comparison of Number Plate Recognition technologies at night. During night time flash light is necessary for the number plate recognition. Normally in most of the world the flash right uses Infrared instead of visible lights for safety reason. Number Plate in Europe and Australia are reflective type which could obtain clear image with the infrared flash light. However many countries in Asia, including Indonesia, uses non-reflective number plate which is not suitable for infrared Flash right. As a result in order to cover the insufficient brightness, visible right was used for flash right during night time as shown in Figure 8.8-2 and Figure 8.8-3 which could be sometimes not safe for drivers.



**Figure 8-8-2 Demonstration in Jl. Sudirman**



**Figure 8-8-3 Demonstration in Jl. Rasuna Said**

Likewise other Asian countries, Japan and Singapore uses non-reflective number plate (Singapore also partially uses reflective number plate) and both countries use infrared for the flash right. Accordingly, both countries have abundant experience to deal with non-reflective number plate using infrared flash right.



## 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 and Table 9-1-2.

**Table9-1-1 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	



**Table9.1-2 Preconditions of the Project Cost**

Items	Preconditions
(1) Targeted Corridor	Corridor1, Corridor 6
(2) Backend system	Use the existing Building owned by Jakarta Provincial Gov.
(3) Roadside Systems (Charging Points)	32 Locations *Based on the study of Chapter 7 Locate at the property owned by Jakarta Provincial Gov. Land acquisition is excluded
(4) On-Boar-Units	4 million *Based on the number of registered vehicle Using RFID sticker tag (ISO18000-6C)
(5) Optical Fibers	Use the existing lines in Jakarta
(6) Construction Period	390 days
(7) Duty and Custom	5% based on current regulation
(8) VAT	10% based on current regulation
(9) Provision Sum	10% of the project value

The Operation & Maintenance cost is a rough ball park figure which is 10% of the project cost/year. However based on the details of Table9.-1-3, we could say that the level is appropriate.

**Table9.1-3 Preconditions of Operation & Maintenance**

Items	Preconditions
(1) ERP Backend Office	1 Locations 20 administrators, 200 workers
(2) OBU Diffusion Center	20 Locations 5 administrators, 20 workers
(3) Maintenance Cost/year	Less than 5% of the
(4) Communication Cost	4 billion Rupiahs (32 charging points)

## 9.2 Revenue of ERP Project

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

**Table9-2-1 Items for Revenue Estimation**

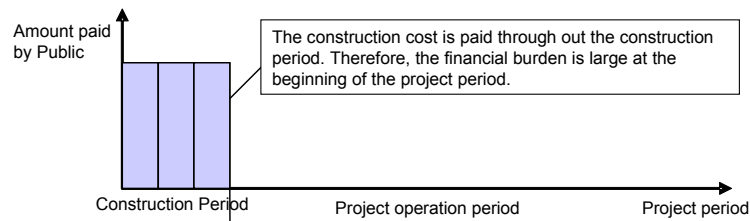
Items	General Conditions
(1) Corridor	Corridor1, Corridor 6
(2) Hour	6:00-22:00 Weekdays
(3) Charge	20,000 Rupiah
(4) Vehicle	All excluding Motorbikes and Emergency Vehicles
(5) Charging Point	Under work in progress
(6) Traffic Volume	Under work in progress
(7) Volume	Under work in progress
(8) Project Length	Ten years

## 9.3 Financing Plan for Public and Private Sector

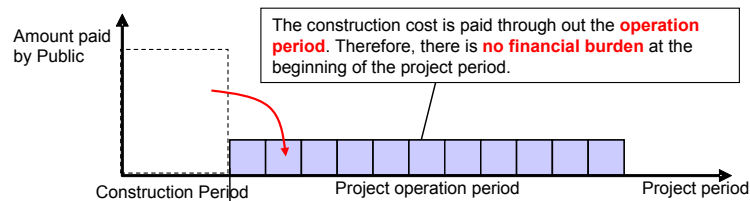
ERP Charge is considered as revenue of the Jakarta Provincial Government when applying Unitary Payment Scheme (BTO). The Jakarta Provincial Government will pay SPC the necessary amount of money from its budget for the construction, and operation and maintenance. The payment for the construction will 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.

**Table9-3-1 Image of the alleviation of Public Expenditure**

Public Expenditure in Conventional method



Public Expenditure in PFI method



## 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)<sup>1</sup> based on the cash flows in real terms. We further calculate equity IRR, project IRR<sup>2</sup>, 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.

#### 9.4.1.2 Exchange Rate

The exchange rates are set as below, in accordance with the tentative JICA Yen-loan evaluation criteria for Indonesia in FY2013.

- USD/JPY                      1 USD = 99.24 JPY
- USD/IDR                      1 USD = 9,697.3 IDR
- IDR/JPY                      1 IDR = 0.001023 JPY

<sup>1</sup> 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.

<sup>2</sup> 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.

### **9.4.1.3 Inflation Rate**

The inflation rates are set as below, in accordance with the tentative JICA Yen-loan evaluation criteria for Indonesia in FY2013.

- Foreign currency      1.3%/year
- Local currency        4.9%/year

### **9.4.1.4 Value-added tax rate**

In accordance with the laws of Indonesia, value-added tax rate of 10% is applied for the products that are procured within Indonesia.

### **9.4.1.5 Tariff Rate**

In accordance with the laws of Indonesia, tariff rate of 5% is applied for all the products that are procured outside Indonesia.

### **9.4.1.6 Corporation tax rate**

In accordance with the laws of Indonesia, corporation tax rate of 25% is applied.

### **9.4.1.7 Financing method**

From the standpoint of making the most of fund raised through International Development Finance, which includes JICA's Private Sector Investment Finance(PSIF), initial investment cost (including interest during construction) shall be procured at a rate of 70% from the fund raised through the above-mentioned fund and 30% from the equity.

### **9.4.1.8 Short-term loan**

In case where accumulated cash flow become negative during the operating period, the deficit shall be covered by short-term loan which parent companies of the SPC provide with interest rate of 0% and repayment period(maturity) of 5 years.

### **9.4.1.9 Financial Conditions**

As for loan condition of International Development Finance, annual interest rate was assumed as 2.0% and loan is assumed to be disbursed as Yen-basis, on the basis of the results of the interview with JICA. As the base case (scenario), the repayment period is set as the same period of project period. The annual interest rate during construction for this loan is set as 2.0% for both construction and consulting parts.

### **9.4.1.10 Depreciation**

We assume all initial costs shall be depreciated by the straight-line method during the project period, which means that in the case where the project period is 10 years, all initial costs shall be depreciated by

the straight-line method for 10 years from the start of the project.

### 9.4.2 Case Analysis

As in the project plan to be described below, the project period is basically set to be 10 years. Furthermore, for the objective of ascertaining feasibility in the contingency case of project period change, the cases of 5 years project period and 15 years project period are also analyzed.

Moreover, since the income may change as a result of altered fare settings as noted above, we also conduct sensitivity analysis for fare settings.

In addition, as the unitary payment fee to be paid for SPC by DKI is at present unclear, we conduct sensitivity analysis for the impact of different payment to SPC from DKI with the base case of 50% of fare income.

With all perspectives above the financial analysis was conducted for following cases.

**Table9-4-1 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)

### 9.4.3 Financial Analysis

#### 9.4.3.1 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.

**Table9-4-2 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

#### 9.4.3.2 Sensitivity Analysis for Project Period

Even when the project period is changed the FIRR remains positive. It is found that a change in the length of project period does not pose serious threat to the financial feasibility of the project.

**Table9-4-3 Sensitivity Analysis for Project Period**

Case	Project Period	Repayment Period for International Development Finance	Revenue of SPC (Case 5 corresponds to the case number)	FIRR
Base Case	10 years	10 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)	20.32%
Sensitivity Analysis for Project Period	Case 1-1	5 years	5 years (Construction Period)	6.57%
	Case 1-2	15 years	15 years (Construction Period)	23.03%

#### 9.4.3.3 Sensitivity Analysis for Fare

In the cases of different fare settings the FIRR still exceeds 15%. The impact of different fare settings on the financial feasibility is found to be not significant.

**Table9-4-4 Sensitivity Analysis for Fare**

Case	Project Period	Repayment Period for International Development Finance (Grace Period)	Fare (Case 3,5,and 7 correspond to the case number)	FIRR
Base Case	10 years	10 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)	20.32%
Sensitivity Analysis for Fare	Case 2-1	10 years	50% of revenue of Case3 (10,000IDR/trip)	15.64%
	Case 2-2	10 years	50% of revenue of Case7 (20,000IDR/trip)	17.98%

### 9.4.3.4 Sensitivity Analysis for DKI's Payment to SPC

It was found that, when the unitary payment from DKI to SPC is set to be 25% of fare revenue, the FIRR would be negative, which means significant difficulty for the realization of the project. That the unitary payment needs to drop to as low as 25% to have small (-2.06%) negative FIRR, however, suggests still sound financial feasibility even in the face of minor reduction in the payment rate from DKI to SPC.

**Table9-4-5 Sensitivity Analysis for DKI's Payment to SPC**

Case	Project Period	Repayment Period for International Development Finance	DKI's payment to SPC (Case 5 corresponds to the case number)	FIRR	
Base Case	10 years	10 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)	20.32%	
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)	8.12%
	Case 3-2	10 years	10 years (Construction Period)	40% of revenue of Case5 (15,000IDR/trip)	12.45%
	Case 3-3	10 years	10 years (Construction Period)	45% of revenue of Case5 (15,000IDR/trip)	16.49%
	Case 3-4	10 years	10 years (Construction Period)	75% of revenue of Case5 (15,000IDR/trip)	37.71%
	Case 3-5	10 years	10 years (Construction Period)	100% of revenue of Case5 (15,000IDR/trip)	53.79%

### 9.4.4 Cash Flow Analysis

For the base case we computed and analyzed the cash flow (nominal). We obtained the result that in the base case the equity IRR exceeds 20%, which is higher than standard IRR level in Indonesia (General expected return level demanded by the private sector for infrastructure projects in developing countries about 15-20%). The evaluation suggests that the project is financially feasible.

**Table9-4-6 Cash Flow for Cash Flow Analysis (Base Case, Unit: billion IDR)**

(Unit: billion IDR)	total	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
P&L Statement												
Fare Revenue	4,900	0	391	411	431	452	474	497	522	547	574	602
Non-fare Revenue	0	0	0	0	0	0	0	0	0	0	0	0
Operation Cost	1,016	0	81	85	89	94	98	103	108	113	119	125
Net Income	3,885	0	310	325	341	358	376	394	413	434	455	477
Depreciation	1,287	0	129	129	129	129	129	129	129	129	129	129
Interest Payment(Yen-Loan)	104	0	18	17	15	13	11	10	8	6	4	2
Interest Payment(Commercial Loan)	0	0	0	0	0	0	0	0	0	0	0	0
Net Profit before TAX	2,494	0	163	180	198	216	236	256	277	299	322	347
Corporate TAX	623	0	41	45	49	54	59	64	69	75	81	87
Net Profit after TAX	1,870	0	122	135	148	162	177	192	208	224	242	260
Cash Flow												
Equity	386	386	0	0	0	0	0	0	0	0	0	0
Yen-Loan	919	919	0	0	0	0	0	0	0	0	0	0
Commercial Loan	0	0	0	0	0	0	0	0	0	0	0	0
Net Profit after TAX	1,870	0	122	135	148	162	177	192	208	224	242	260
Depreciation	1,287	0	129	129	129	129	129	129	129	129	129	129
Initial Investment	1,305	1,305	0	0	0	0	0	0	0	0	0	0
Principal Payment(Yen-Loan)	919	0	84	86	87	89	91	93	95	96	98	100
Principal Payment(Commercial Loan)	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flow	2,238	0	167	178	190	202	215	228	242	257	272	288
Accumulative Cash Flow	11,203	0	167	345	535	737	951	1,179	1,421	1,678	1,950	2,238
Service Payment	1,023	0	102	102	102	102	102	102	102	102	102	102
Equity IRR	48.1%	-386	167	178	190	202	215	228	242	257	272	288
Project IRR	10.1%	-1,305	167	178	190	202	215	228	242	257	272	288
DSCR	3.03		3.03	3.18	3.34	3.50	3.67	3.85	4.04	4.24	4.45	4.67



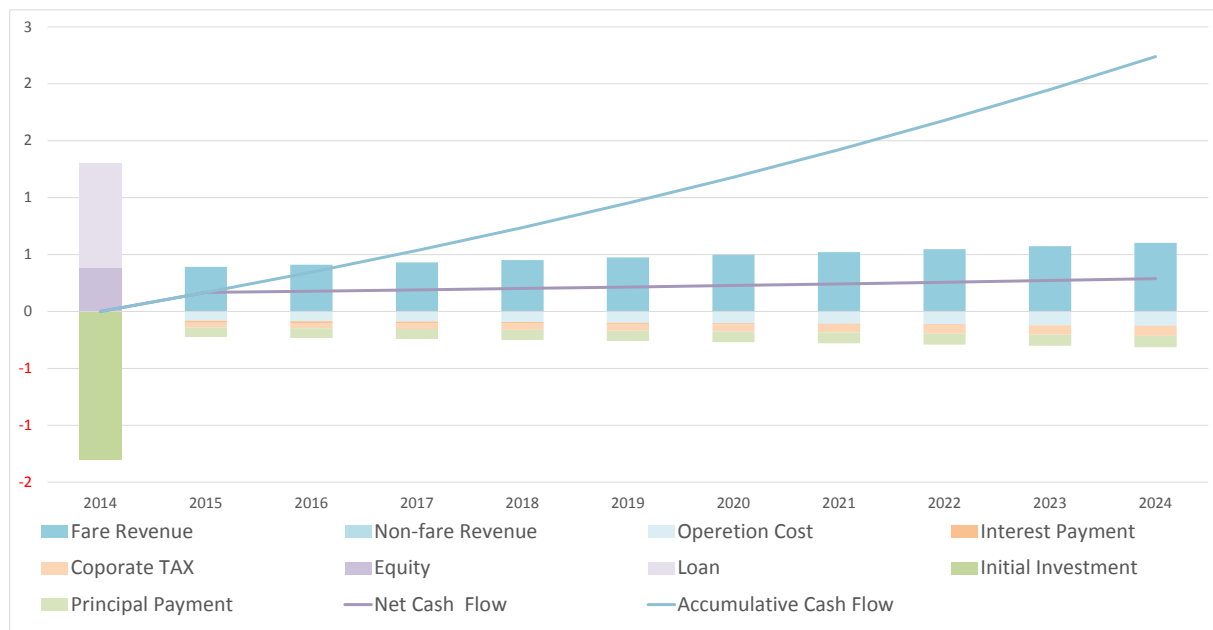


Figure9-7-1 Cash Flow for Cash Flow Analysis (Base Case, Unit: trillion IDR)

#### 9.4.4.2 Sensitivity Analysis for Project Period

In the case of different project period the equity IRR is basically more than 15%, with the minimum DSCR exceeding 1.50. However, when the project period is 5 years the project IRR is negative. In the 5 years case the profitability of the project as a whole cannot be secured sufficiently. When the project period is set to be not smaller than 10 years the profitability can be secured.

Table9-4-7 Sensitivity Analysis for Project Period

Case	Project Period	Repayment Period for International Development Finance (grace period)	Revenue of SPC (Case 5 corresponds to the case number)	Equity IRR	Project IRR	Minimum DSCR
Base Case	10 years	10 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)	48.1%	10.1%	3.03
Sensitivity Analysis for Project Period	Case 1-1	5 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)	18.6%	-18.9%	1.59
	Case 1-2	15 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)	54.2%	16.9%	4.34

#### 9.4.4.3 Sensitivity Analysis for Fare

In the case of change in fare setting the equity IRR basically exceeds 30% with the minimum DSCR higher than 2.00. As long as the fare settings is in the range of 10,000-20,000 IDR the project feasibility is sound.

**Table9-4-8 Sensitivity Analysis for Fare**

Case		Project Period	Repayment Period for International Development Finance (Grace Period)	Revenue of SPC (Case 3,5,and 7 correspond to the case number)	Equity IRR	Project IRR	Minimum DSCR
Base Case		10 years	10 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)	48.1%	10.1%	3.03
Sensitivity Analysis for Fare	Case 2-1	10 years	10 years (Construction Period)	50% of revenue of Case3 (10,000IDR/trip)	38.3%	5.6%	2.57
	Case 2-2	10 years	10 years (Construction Period)	50% of revenue of Case7 (20,000IDR/trip)	43.2%	7.9%	2.80

#### 9.4.4.4 Sensitivity Analysis for DKI's Payment to SPC

If the payment rate from DKI to SPC is around 25% of fare revenue, the equity IRR would be 14.1% with negative project IRR, added by 1.14 minimum DSCR. These figures would be insufficient to receive investment/loan. We found that this project can obtain investment/loan if the payment rate is contracted in such a way that around 50% of fare revenue (around 548 billion Indonesia Rupiah / year) is to be paid to SPC.

**Table9-4-9 Sensitivity Analysis for DKI's Payment to SPC**

Case		Project Period	Repayment Period for International Development Finance (grace period)	Revenue of SPC (Case 5 corresponds to the case number)	Equity IRR	Project IRR	Minimum DSCR
Base Case		10 years	10 years (Construction Period)	50% of revenue of Case5 (15,000IDR/trip)	48.1%	10.1%	3.03
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)	12.8%	-7.8%	1.50
	Case 3-2	10 years	10 years (Construction Period)	40% of revenue of Case5 (15,000IDR/trip)	22.8%	-2.2%	1.89
	Case 3-3	10 years	10 years (Construction Period)	45% of revenue of Case5 (15,000IDR/trip)	31.7%	2.4%	2.27
	Case 3-4	10 years	10 years (Construction Period)	75% of revenue of Case5 (15,000IDR/trip)	86.8%	25.4%	4.95
	Case 3-5	10 years	10 years (Construction Period)	100% of revenue of Case5 (15,000IDR/trip)	124.8%	38.4%	6.86

## 9.5 Economic Analysis

### 9.5.1 Preconditions

In this section we evaluate the feasibility of the project plan from economical point of view. Specifically, based on cost-benefit analysis we are going to evaluate economic validity of the project using economic internal rate of return (EIRR), benefit-cost ratio (B/C), and net present value (NPV).

#### (1) Project Period

We set the project period as 10 years, which is the same as in the financial analysis.

#### (2) Exchange Rate (written again)

The exchange rates are set as below, in accordance with the tentative JICA Yen-loan evaluation criteria for Indonesia in FY2013.

- USD/JPY                    1 USD = 99.24 JPY
- USD/IDR                   1 USD = 9,697.3 IDR
- IDR/JPY                   1 IDR = 0.001023 JPY

#### (3) Without Case

In performing the economic analysis, as the benchmark “Without Case” to be compared with the project, we set a case where this project is not implemented (no fare is collected).

#### (4) Social Discount Rate

Based on similar cases and economic analysis by ADB, we set 12% for the social discount rate.

#### (5) Cost

In this economic analysis we used pre-tax price, that is, the price without value-added tax or tariff, as the economic price in calculating the cost of project and others.

#### (6) Benefit

For the benefit factor, we considered the benefit for users, the value of travel time savings (VTTS). As the travel time unit cost of users which acts as the basic unit in the calculation of VTTS, we set 18,506IDR/hour (value for 2015) using income approach. This value is calculated with following settings. The per capita income of Indonesia is 3,240USD (2011). Since the average working hour in Indonesia is 43 hours per week, the working hour per day is  $43 \div 5 = 8.6$  hour/day. As noted above in Indonesia the number of weekdays in a year is 245 days, which is assumed to be equivalent to working days. Consequently, using following equations we obtained per capita value of time of Indonesians.

$$[\text{Annual per capita income(IDR)}] \div [\text{working hours per year}]$$

$$\begin{aligned}
 &= [\text{Annual per capita income(USD)}] \times [\text{exchange rate (IDR/USD)}] \div [\text{working hours per year}] \\
 &= [\text{Annual per capita income(USD)}] \times [\text{exchange rate (IDR/USD)}] \div ([\text{working hours per day}] \times \\
 &\quad [\text{working days per year}]) \\
 &= 3,240 \text{ (USD)} \times 9,697.3 \text{ (IDR/USD)} \div (8.6 \text{ (hours)} \times 245 \text{ (days)}) \\
 &= 14,912 \text{ IDR (value for 2011)}
 \end{aligned}$$

After taking inflation into account we obtain 18,056IDR/hour as 2015 value. Further, the travel time savings attributable to this project is as expressed in section 8.3. In this analysis, we define the “benefit” as the VTTS from travel time reduction in the case of fare amount being 15,000IDR.

### 9.5.2 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.

**Table9-5-1 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
9	1,258	0	-81	1,177	454	0	424
10	1,258	0	-81	1,177	405	0	379
Tota l	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				■	■	■

### Project Preparation

#### (1) Bidding preparation

360days including the budgeting for the ERP Project, Documentation, finalizing the project budget, and Pre-Qualification

#### (2) Bidding and Evaluation

180days for Technical Trial and Evaluation

#### (3) Designing and Manufacturing

180days for the program developing and manufacturing necessary equipment

#### (4) Installation and Testing

390days. There will be Overlapping period with Designing and Manufacturing

(5)Pre-Operation

540days for diffusion of On-Board-Units and monitoring the penetration rate of On-Board-Units. There will be Overlapping period with Installation and Testing

(6) Operation and Maintenance

10years of O&M after the pre-operation

(7)Unitary Payment

For 10years during the O&M period

Examination and preparation of the establishment of SPC

The establishment of SPC will be examined in accordance with the project scheme decided by DKI Jakarta.

Pursuant to UU40/2007 (Company Law), the SPC for the ERP project will be established as a Limited Liability Company. The procedure for establishment of SPC will be the same as a foreign investment company (PT PMA). The outline of the procedure is shown as below.

The outline of procedure for establishment of SPC for the EPR project

- ① Obtaining Principal License from the BKPM;
- ② Articles of Association (AOA) made before a notary;
- ③ Obtaining Domicile Statement from the municipal;
- ④ Obtaining tax registration number (NPWP) and value added tax (VAT) number from the Tax Office;
- ⑤ Opening of a PMA Company bank account for injection of capital (Transfer proof for capital injection);
- ⑥ Obtaining approval for AOA from the Ministry of Law and Human Rights (MLHR);
- ⑦ Obtaining approval for Expatriate Utilization Plan (RPTKA) from the Ministry of Manpower;
- ⑧ Obtaining Company Registration Code ( "TDP" ) from the Department of Trade; and
- ⑨ Obtaining Business License (IU) from BKPM.

The roadmap toward realization of ERP can be shown in the next page, which takes into account of the above-mentioned conditions.

Roadmap for implementation of ERP (Draft)

NO	Action Item			Relative Law	Issue	Required Support	Competent Authorities	Expected Schedule (Draft)							
								2015	2016	2017	2018	2019	2020		
1	Legal Basis for ERP Introduction	Meeting criteria for ERP introduction	Applying for judging ERP introduction Judging ERP introduction based on criteria	PP32/2011(Traffic Management) PP97/2012 (Traffic Control Retribution)	<ul style="list-style-type: none"> <li>ERP introduction criteria: the level of traffic density and travel speed are not clear. Those indexes are difficult to measure.</li> <li>Having two (2) road lines, each lane having at least two (2) lanes</li> <li>Mass transportation network and service is available and meets the minimum service standard specified by MOT</li> <li>Ratio of motorized vehicle traffic volume to road capacity in one of the lanes of equal to or higher than zero point nine (0.9);</li> <li>Average speed in peak hour of equal to or less than ten (10) km/hour</li> <li>The above congestion occurs regularly every working day(Art. 79 of PP32/2011, Art.4 of PP97/2012 )</li> </ul>	<ul style="list-style-type: none"> <li>Support for developing measurement method and interpretive criteria for the result</li> </ul>	DKI Jakarta MOT								
2	Preparation of project scheme and tender	Decision support of project scheme		—	<ul style="list-style-type: none"> <li>No adequate consensus formation on ERP project scheme within DKI Jakarta</li> <li>It is possible that Presidential Regulation on PPP will cover ERP in the future and there's room for examination on project scheme under Presidential Regulation</li> </ul>	<ul style="list-style-type: none"> <li>Decision support of project scheme                             <ul style="list-style-type: none"> <li>Plan1:Cooperation scheme of regional governments or Plan 2: Presidential Regulation on PPP)</li> </ul> </li> </ul>	BAPPENAS , DKI Jakarta (DISHUB)	Project Scheme							
				PP32/2011 (Traffic control)	<ul style="list-style-type: none"> <li>Under the prevailing laws, regional government is responsible for traffic control. So DKI Jakarta needs to own and operate ERP facility. (Article 2, 3, 28 of PP32/2011,)</li> </ul>	<ul style="list-style-type: none"> <li>Need to amend PP32/2011 because private sector cannot own ERP facility under the existing laws (As a special measure, ERP introduction through lease from private sector etc.)</li> </ul>	MOT, DKI Jakarta (DISHUB)	Amendment of legal framework							
		Plan1:Implementation of project with public procurement	Presreg 54/2010 (government procurement) MOHA 13/2006 (regional finance management)	<ul style="list-style-type: none"> <li>Under multi-year contract of EPC+M(+Finance), a scheme based on BTO can be introduced while the contract period is up to 5 years (term of governor).(Article 54 A(6) of MOHA13/2006 )</li> </ul>	<ul style="list-style-type: none"> <li>Support for revising the regulation in order to extend the period of multi-year contract.</li> </ul>	MOHA, DKI Jakarta (DISHUB)	Amendment of legal framework								
			Reviewing the contract draft	Presreg 54/2010 (public procurement), MOHA 22/2009 (guideline on cooperation among regional government)	<ul style="list-style-type: none"> <li>Contract draft, tender system and tender document for multi-year contract of EPC+M(+Finance) are not reviewed yet.</li> </ul>	<ul style="list-style-type: none"> <li>Support for review on contract draft, tender system and tender document</li> </ul>	DKI Jakarta (DISHUB)	Support for review on contract							
			Reviewing the tender system, preparing tender document	NPPA Regulation 14/2012(guideline on public procurement)											
			Implementing tender (to select an operator)	Presreg67/2005 <sup>3</sup> (PPP regulation)	<ul style="list-style-type: none"> <li>ERP is not included in the scope of PPP project at this time.</li> <li>Inadequate review on PPP scheme with Presidential Regulation</li> </ul>	<ul style="list-style-type: none"> <li>Approach for amendment of Article 4 of Presreg 67/2007 (adding ERP to the PPP project)</li> <li>Support for review on contract draft, tender system and tender document                             <ul style="list-style-type: none"> <li>Especially need the review on guarantee for SPC utilizing IIGF(for example, covering risk of unpaid unitary payment by DKI Jakarta)</li> </ul> </li> </ul>	BAPPENAS BAPPENAS, DKI Jakarta (DISHUB)	Amendment of Presreg 67/2007 Support for review on contract							
3	Specification development	Sub-system	—	<ul style="list-style-type: none"> <li>DKI Jakarta is responsible for the development of specification. DKI Jakarta also has to improve their capacity to elaborate the specification of ERP.</li> </ul>	<ul style="list-style-type: none"> <li>Support for capacity development of DISHUB to elaborate the specification of ERP</li> </ul>	DKI Jakarta (DISHUB)									
		Selection of OBU	—												
		Selection of location of roadside system	—												

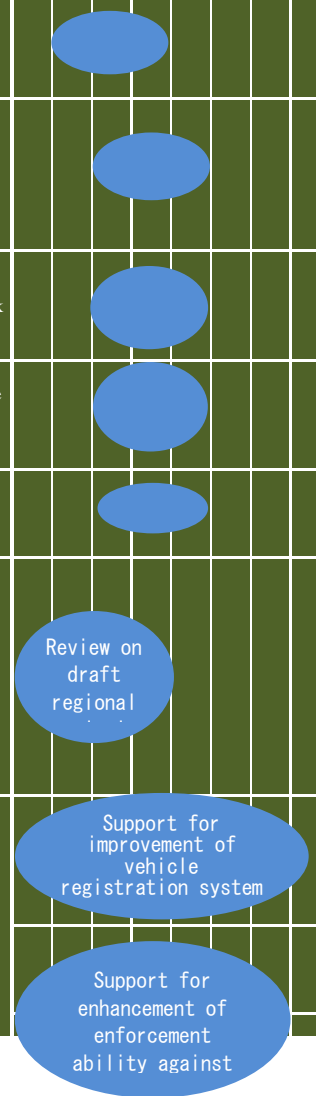
<sup>3</sup> Presreg 67/2005 has been amended by Presreg 13/2010, Presreg 56/2011 and Presreg 66/2013.



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

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NO	Action Item		Relative Law	Issue	Required Support	Competent Authorities	Expected Schedule (Draft)											
							2015	2016		2017	2018	2019	2020					
	Coordination on allocation of usage of radio frequency spectrum		UU36/1999(Telecommunications), Reg Menkominfo 29/2009 (allocation of usage of radio frequency spectrum)	• The radio frequency spectrum for ERP is not yet allocated. ⇒Application for permission of usage of 5.8GHz radio wave in DKI Jakarta area (Coordination between DKI Jakarta and MCIT)	—	MCIT												
4	Operation	Decision on methodology of charging (Charging timing, other conditions, etc.)	(Stipulation of general conditions on usage of target roads of ERP is required.)	• DKI Jakarta themselves has not examined the details for methodology of charging sufficiently yet.	• Support for decision on methodology of charging and stipulation of general conditions	DKI Jakarta (DISHUB)												
		Development of prepaid system, review on location of top-up terminal etc.	—	• The development of pre-paid system and operational procedures for it are required in cooperation with private entities.	—	DKI Jakarta (DISHUB), Commercial bank, other business entities (convenience stores etc.)												
		Development of payment system for Retribution (From pre-paid OBU to DKI Jakarta)	—	• The development of payment system for Retribution is required in cooperation with commercial banks and so on.	—	DKI Jakarta (DISHUB), Commercial bank												
	Dissemination and installation of OBU	Supply of OBU (Production and dissemination of OBU in initial stage of ERP implementation)	—	• The detailed plan for dissemination of OBU in the initial stage is required.	• Support for establishment of supply scheme of OBU (Production and dissemination of OBU in initial stage of ERP implementation etc.)	DKI Jakarta (DISHUB), Private (car dealer, gas station, etc.)												
		Registration of OBU	(Stipulation of general conditions on usage of target roads of ERP is required.)	• DKI Jakarta themselves has not examined the detailed scheme of registration and management of OBU that prevents fake OBU spreading sufficiently yet.	• Support for establishment of scheme on registration and management of OBU, and stipulation of general conditions	DKI Jakarta (DISHUB)												
	Constructing the scheme of regulating ERP violators	Clarifying the definition of ERP violation	(UU22/2009 Law on Road Traffic)	• ERP violators can be regulated according to road traffic sign board same as regulation of 3 in 1, on the basis of Law on Road Traffic (Article 287 of UU22/2009). • However, no existing law regulates ERP users who unpaid ERP charge payable as Retribution. ⇒ Once road traffic sign boards showing the rules of ERP road are installed, the violator can be regulated on the basis of Law on Road Traffic ⇒ On the other hand, retribution payment is based on the assumption that public service is provided at the same time, so there is no penalty for users who unpaid retribution.	• Support for developing new provincial ordinance to regulate users who unpaid retribution.	DKI Jakarta (DISHUB) , POLDA Metro JAYA												
		Constructing the scheme of identifying violators (including violators who come from outside of DKI Jakarta)	—	• Inadequate system to share vehicle DB information among regional governments	• Support for improvement of vehicle registration system and DB operation	DKI Jakarta (DISHUB) , POLDA Metro JAYA, POLRI												
		Improving the regulation capacity for vehicles with fake license plate	—	• System and method to regulate vehicles with fake license plate are not reviewed yet	• Support for improvement of regulation capacity for fake license plate													
		Constructing the	—	• Inadequate system in DKI Jakarta police to seize vehicles or process	• Support for developing a system of													



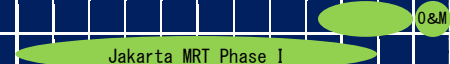
Preparatory Survey on Intelligent Transport System Project  
to mitigate Traffic Congestion in Jakarta  
(PPP Infrastructure Project)

Draft Final Report Chapter 9

NO	Action Item	Relative Law	Issue	Required Support	Competent Authorities	Expected Schedule (Draft)							
						2015	2016	2017	2018	2019	2020		
	<ul style="list-style-type: none"> <li>implementation body to process compulsory execution (measure for violators who ignore the demands)</li> <li>ERP operator capacity development</li> </ul>		<ul style="list-style-type: none"> <li>compulsory execution for outside-DKI Jakarta violators who ignore the demands</li> <li>DISHUB must establish a new internal organization for the operation of ERP and develop their human resources.</li> </ul>	<ul style="list-style-type: none"> <li>compulsory execution for outside-DKI Jakarta violators</li> <li>Support for establishment of internal organization for the operation of ERP, and training programs for improvement of ERP operation ability</li> </ul>									
5	<ul style="list-style-type: none"> <li>Stipulation of regional regulations and governor regulations</li> </ul>			<ul style="list-style-type: none"> <li>Support for development of legal framework based on action items No. 1 to 4</li> </ul>	DKI Jakarta, MOHA, MOF								
	<ul style="list-style-type: none"> <li>Target road of ERP, Charging Hours</li> <li>Amount of ERP charging</li> <li>Definition of subject of ERP charging</li> <li>Procedure of collection of ERP charging</li> <li>Mandatory installation of OBU</li> <li>Definition of ERP violation, enforcement body and procedure for enforcement</li> <li>Other detailed regulations</li> </ul>												
6	<ul style="list-style-type: none"> <li>Other (Environmental impact)</li> </ul>	DKI Jakarta Regional Regulation No. 8 of 2007 concerning Public Order	<ul style="list-style-type: none"> <li>The activity of "jockey" of 3 in 1 is prohibited under current legal framework (according to Article 4(2) of DKI Jakarta Regional Regulation No. 8 of 2007 concerning Public Order). However, "Jockey" is seen as low-income group and Social Rehabilitation Program can be applied.</li> </ul>		DKI Jakarta (DISHUB, DINAS SOCIAL)								

	2015	2016	2017	2018	2019	2020
Detailed design and construction for ERP						
Development of alternative public transport system						

Design, Construction and Preparation



## 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.

**Table9-7-1 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 Environmental and Social Conditions

#### (1) Natural Environment

There are no national parks and protected areas in the project areas and surrounding areas. In addition, there are no endangered fauna and flora in the project areas. The gantries will be installed on the provincial Roads, there are some street trees in the area where the gantries will be installed. (See photo 7-7-1 and photo 7-7-2).



Photo 7-7-1 Harmoni/Corridor 1

Source: JICA Study Team



Photo 7-7-2 Buncit/Corridor 6

Source: JICA Study Team

The Vegetation on Corridor 1 and 6 is shown in Table9-7-2.

**Table9-7-2 Vegetation on Corridor 1 and 6**

Category	Name of Latin	Name of Indonesian
Tree	<i>Cassia multijuga</i>	Kasia
	<i>Delonix regia</i>	Flamboyan
	<i>Swietenia mahagonii</i>	Mahoni
	<i>Plumeria spp.</i>	Kamboja
	<i>Pterocarpus indicus</i>	Angsana

Category	Name of Latin	Name of Indonesian
	<i>Pithecolobium ducle</i>	Lamtoro
	<i>Cerbera odollam</i>	Bintaro
	<i>Cordia sebestana</i>	Jati mas
	<i>Polyalthia longifolia</i>	Goldogan tiang
	<i>Ficus benyamina</i>	Beringin
	<i>Manilkara kauki</i>	Sawo kerik
	<i>Lagerstroemia indica</i>	Bungur
	<i>Bignoniaceae</i>	Tabe buya
	<i>Terminalia catappa</i>	Ketapang
	<i>Mimusops elengi</i>	Tanjung
	<i>Samanea saman</i>	Kihujan
	<i>Albizia-falcataria</i>	Sengon
Palm	<i>Roystonea regia</i>	Palem raja
	<i>Chrysalidocarpus litescens</i>	Palem kuning
	<i>Rhapis excels</i>	Palem wregu
	<i>Elaeis guinensis</i>	Kelapa Sawit
Shrubs	<i>Adenium cutanium</i>	Kamboja jepang
	<i>Cordyline terminalis</i>	Hanjuang merah
	<i>Jantropa sp.</i>	Batavia
Bush	<i>Ixora javanica</i>	Soka
	<i>Rora sp.</i>	Mawar
	<i>Mussaendah sp.</i>	Nusa Indah
	<i>Neoregelia sp.</i>	Nanas hias
	<i>Iresine herbstii</i>	Bayam merah
	<i>Bougenvillea sp.</i>	Bugenvil
	<i>Arachis pintoii</i>	Kacang-kacangan
	<i>Codeaum variegatum</i>	Puring
	<i>Allium tuberosum</i>	Kuca
	<i>Adiantum cuneatum</i>	Suplir
	<i>Dracaena sp.</i>	Drasena
	<i>Pandanus pygmaeus</i>	Pandanvariegata
<i>Hibiscus rosasinensis</i>	Kembang sepatu	
Herb	<i>Hyppeastrum sp.</i>	Bakung
	<i>Canna indica</i>	Kana merah
	<i>Zephyranthes candida</i>	Bawang-bawangan

Category	Name of Latin	Name of Indonesian
	<i>Chlorophytum comosum</i>	Lili paris
Grasses	<i>Zoysia matrella</i>	Rumput Peking
	<i>Axonopus compressus</i>	Rumput gajah
Vine	<i>Opomoea batatas</i>	Telo-telo
	<i>Scindapsus aureus</i>	Sirih belanda

Source: Management of Landscape of City Green Lane on General Sudirman Road of Landscape Gardening Agency of DKI Jakarta, Bogor Agriculture Institute, 2008

## (2) Socioeconomic situation

DKI Jakarta consists of North Jakarta, West Jakarta, Central Jakarta, south Jakarta, East Jakarta and Seribu Islands. The governorate of DKI Jakarta is 65,575 ha, population is 9.74 million and density of population is 149 persons/ha. The corridor 1 and corridor 6 installed ERP systems are located in Central Jakarta and South Jakarta.

**Table9-7-3 Population of DKI Jakarta**

No.	Municipality (Kota)	District (Kecamatan)	Town (Kerurahan)	Population (persons)	Area (ha)	Density (persons/ha)
1	North Jakarta	6	31	1,554,003	13,903	112
2	West Jakarta	8	56	2,345,524	12,525	187
3	Central Jakarta	8	44	952,635	4,714	202
4	South Jakarta	10	65	2,280,406	14,573	156
5	East Jakarta	10	65	2,585,628	18,990	136
6	Seribu Islands	2	6	20,684	870	24
DKI Total		44	267	9,738,880	65,575	149

The GDP of fourth quarter in 2011 was up 6.6 % from the previous year in DKI Jakarta. (See Table9-7-4). DKI Jakarta's per capita GDP was 89.73 million IDR in 2010 and 100.98 million IDR in 2011, up 12.5% from the previous year in 2011.

**Table9-7-4 Sectoral growth rate**

No.	Sector	Growth rate (year on year)
1	Transportation and Communication	13.8
2	Trade, Hotel and Restaurant	7.7
3	Service	7.7
4	Construction	7.2
5	Money and banking, real estate	5.2

No.	Sector	Growth rate (year on year)
6	Electricity, gas and clean water	3.7
7	Manufacturing	1.2
8	Agriculture	0.4
9	Mining	3.0

Source: DKI Jakarta

### 9.7.3 Regal system for Environmental and Social considerations

#### (1) Summary

The Environmental Management Law (Law No. 23/1997 concerning Environmental Management) was replaced by the Environmental Protection and Management Law in October 2009 (Law No. 32/2009 on Environmental Protection and Management). This law stipulates that environmentally sustainable growth be pursued through compilation of an environmental plan and through reinforced use, development, maintenance, recovery, monitoring, and management, of the environment. The new law is characterized by a strong stress placed upon transparency, wider participation, accountability, and fairness in environmental protection and management.

Further, the new law provides that AMDAL be implemented for any business project or activity potentially having material impact on the environment and requires the implementation of an environmental management initiative (Upaya Pengelolaan Lingkungan/UKL) and an environmental monitoring initiative (Upaya Pemantauan Lingkungan /UPL) for any business project or activity potentially having little impact on the environment. The AMDAL procedure is detailed in Government Regulation No. 27/1999.

#### (2) Procedural flow

The flow of EIA approval procedures can be visualized largely at 3 levels. The following shows the major steps in the AMDAL approval process.

##### a. Screening

- a) Project operators shall notify the Project Authority concerned of the proposed implementation of the project. Upon receipt of the project plan, AMDAL Committee or the Project Authority concerned shall start the screening process in accordance with State Minister of Environment Decree No.11/2006.AMDAL. In the event that the proposed project falls under none of those listed on the AMDAL project implementation list, Regional Governments or the State Minister of Environment shall consider whether or not the AMDAL process is necessary.
- b) As regards the project having been judged to require AMDAL, the project operator shall publicly announce the project plan according to the schedule authorized by the Project Authority

concerned. As regards the project whose environmental impacts have been judged to be light, the project operator shall prepare UPL/UKL under the guidance of the Project Authority concerned.

- c) During a period of 30 business days starting from the date of the public announcement, residents' comments, proposals and opinions shall be received.

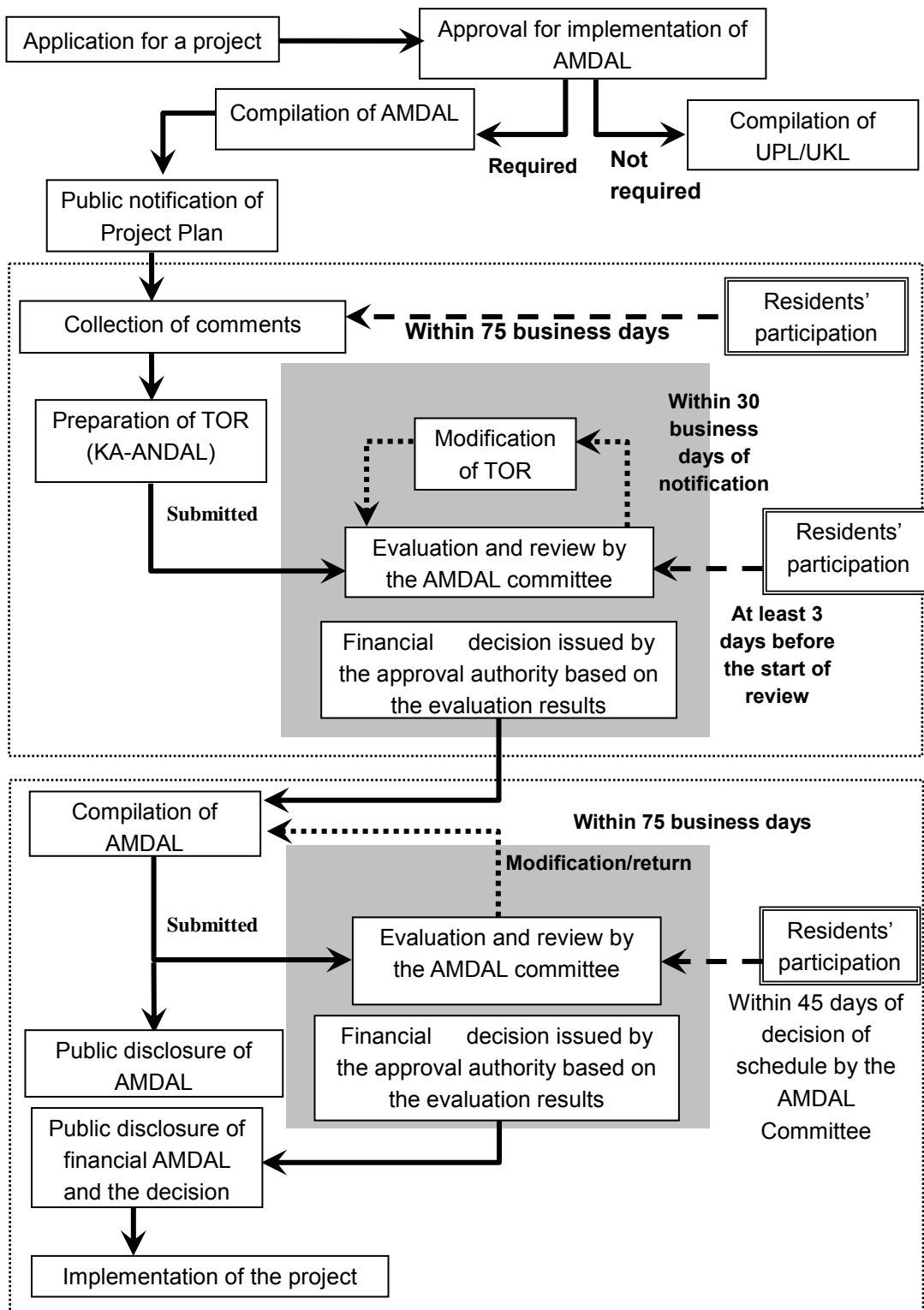
b. Scoping

- a) The project operator shall prepare the KA-ANDAL, having regard to residents' comments, proposals and opinions.
- b) The project operator shall submit the KA-ANDAL to the AMDAL Committee. The AMDAL Committee shall issue its note of receipt to the project operator.
- c) If needed, residents may submit to the AMDAL Committee their documented opinions on KA-ANDAL, with their copy being simultaneously sent to the project operator.
- d) The AMDAL Committee shall review KA-ANDAL and residents' documented opinions. The project operator shall revise the KA-ANDAL in accordance with the comments of the AMDAL Committee and the documented opinions of residents.
- e) The AMDAL Committee shall submit the outcome of assessment on KA-ANDAL to the Authority Responsible for the Environment for approval by the Approval Authority.

c. AMDAL Examination

- a) The project operator shall prepare the AMDAL documents (ANDAL, RKL, RPL) and submit them to the AMDAL Committee. The AMDAL Committee shall issue its note of receipt to the project operator.
- b) The project operator shall publicly disclose the AMDAL documents. If needed, the residents may submit to the AMDAL Committee and the project operator their documented opinions.
- c) The AMDAL Committee shall review the contents of the AMDAL documents and Residents' documented opinions and shall make AMDAL assessment. If necessary, the AMDAL Committee may make comments to the project operator.
- d) The project operator shall revise the AMDAL documents in accordance with the comments of the AMDAL Committee and residents' documented opinions and shall submit the revised AMDAL documents to the AMDAL Committee.
- e) Based on the outcome of assessment of the AMDAL Committee, the Approval Authority of the Authority Responsible for the Environment (Mayor of City, Governor of Prefecture, Governor of Province and State Minister of Environment) will issue the final decision document (approval document). Such final decision document may contain collateral conditions (conditional approval). The final version of the AMDAL documents shall be publicly disclosed together with the final decision document.





**Figure9-7-1 AMDAL procedure**

Source: compiled from Government Regulation No. 27/1999

### **(3) Necessity of AMDAL for ERP Project**

The type of business and/or activity is defined in the Attachment 1 of the Ministry of Environmental Decree No. 11/2006 Type of Business and /or Activity Plan that Requires AMDAL. In addition, the type of business and/or activity is defined in the Governor of DKI Jakarta Province Decree No. 2863/2001. According to both Decrees, the AMDAL is not required on the ERP project.

#### **9.7.4 Consideration of Options**

The considerations of options are conducted from the point of view such as technique, economy and environmental and social considerations. There are three options including zero option, Corridor 1 (Kota to Blok M), Corridor 6 (Bundaran HI to Ragunan) .

On a technology front, there are no significant differences between Corridor 1 and Corridor 6 except zero option. On an economy front, Corridor 6 is most expensive because of longest distance. On a natural environment front, shift to the public transportation and CO2 reduction will not make progress in the case of zero option. There are no significant differences between Corridor 1 and Corridor 6. On a social considerations front, economic loss of zero option will be huge because of traffic congestion continuation.

The ERP system can be installed on Corridor 1 and Corridor 6 because of Provincial Road. There are no involuntary resettlements on all options.

The result of comparison and consideration is shown in Table9-7-5. As a result, Corridor 1 and Corridor 6 are recommended.

**Table9-7-5 The result of comparison and consideration**

Category		Zero Option	ERP Route	
			Corridor 1	Corridor 6
Summary of route	Start Point	—	Kota	Bundaran HI
	End point	—	Blok M	Ragunan
	Distance	—	Provincial Road, 12.9km	Provincial Road, 13.3km
	Route	—	Kota~Merdeka Utara~Bundaran HI ~Semanggi~Blok M	Bundaran HI~Kuningan~Deptan~ Ragunan
	Equipment	—	ERP : MLFF Roadside : Wireless Communication antenna System for discriminating type of vehicle Car Clampdown system Gantry	ERP : MLFF Roadside : Wireless Communication antenna System for discriminating type of vehicle Car Clampdown system Gantry
Technique		—	Comparatively straightforward construction by using Provincial Road	Comparatively straightforward construction by using Provincial Road
Economy		—	Inexpensive than Corridor 6	Most expensive due to long distance
Environmental and Social Considerations	Natural Environment	Continuing air pollution is expected by using gasoline and diesel oil for private cars etc. There is no progress such as shifting to public transportation and reduction of carbon dioxide.	The project has little impact of natural environment due to using Provincial Road.	The project has little impact of natural environment due to using Provincial Road.
	Social Environment	<ul style="list-style-type: none"> <li>• Continuing economic losses due to traffic congestion</li> <li>• No resettlement</li> <li>• Environmental and social considerations during construction is not required</li> <li>• There are no impacts to Jockey because of same demand.</li> </ul>	<ul style="list-style-type: none"> <li>• Possibility of introducing ERP system on Provincial Road with over two lanes each way and public transport , BRT.</li> <li>• Application of 3 in 1 Policy</li> <li>• No resettlement</li> <li>• Necessary of environmental and social considerations during construction</li> <li>• Car users point out the necessity of policy to shift cars to public transportation such as increasing number of bus, punctuality, buses renewal in the case of BRT. In the</li> </ul>	<ul style="list-style-type: none"> <li>• Possibility of introducing ERP system on Provincial Road with over two lanes each way and public transport , BRT.</li> <li>• Non-application of 3 in 1 Policy</li> <li>• No resettlement</li> <li>• Necessary of environmental and social considerations during construction</li> <li>• Car users point out the necessity of policy to shift cars to public transportation such as increasing number of bus, punctuality, buses renewal in the case of BRT. In the</li> </ul>

Category		Zero Option	ERP Route	
			Corridor 1	Corridor 6
			case of Kopaja / Merto Mini, buses renewal and introduction of air conditioner are pointed out. • The income of Jockey will be zero due to abolishment of 3 in 1 policy by installing ERP system.	case of Kopaja / Merto Mini, buses renewal and introduction of air conditioner are pointed out.
Best Option and Reason		Be discouraged • There is no progress such as shifting to public transportation and reduction of carbon dioxide.	Recommended • Traffic mitigation by shifting to public transportation.	Recommended • Traffic mitigation by shifting to public transportation. • There are no impacts to Jockey because of non-application of 3 in 1 Policy

### 9.7.5 Draft Scoping

The draft of scoping is made based on the making report guideline on environmental and social considerations for category B project dated June 2011. The draft of scoping includes pollution control (air quality, wastes, soil contamination and noise and vibration etc.), natural environment (protected areas and ecosystem etc.), social environment (living and livelihood, existing social infrastructure and services, infection including HIV/AIDS etc.) and others (impacts to transboundary or global issues). The draft of scoping is shown in Table9-7-6.

**Table9-7-6 Draft of Scoping**

Category	Environmental Item		Evaluation		Reason of Evaluation
			Before and During Construction	In Service	
Pollution Control	1	Air Quality	B-	C-	DC : Worsened air quality is expected due to operation of construction equipment. DO : Worsened air quality is expected due to increase of traffic and traffic congestion if vehicles inflow into project site.
	2	Water Quality	D	D	There is no water contamination due to drainage from construction sites, construction equipment and vehicles.
	3	Waste	B-	D	DC : Construction waste soil and scrap wood generation are expected.
	4	Soil Contamination	B-	D	DC : Soil contamination is expected due to spill of fuel oil and lubrication oil etc. for construction vehicles.
	5	Noise and Vibration	B-	C-	DC : Noise is expected due to operation of construction equipment and vehicles. DO : There is a possibility of noise impact if there are vulnerable area including residences, schools and hospitals and others in the project site and the surrounding area.
	6	Subsidence	D	D	Any work causing subsidence is not expected.
	7	Odor	D	D	Any work causing odor is not expected.
Natural Environment	8	Protected Areas	D	D	There are no national parks and protected areas in the project site and the surrounding area.
	9	Ecosystem	D	D	There is no ecosystem impact due to no precious animals and plants in the project site and the surrounding area.
	10	Hydrology	D	D	Any work causing the change of water flow of rivers and river bed is not projected.
	11	Topography and Geology	D	D	Any impact on topography and geology is not projected because large-scale cut and earth fill is not planned.
Social Environment	12	Resettlement	D	D	There is no resettlement in the project site because the ERP system is installed along the provincial road.

Category	Environmental Item		Evaluation		Reason of Evaluation
			Before and During Construction	In Service	
	13	Living and Livelihood	D	C-	DC: There is no impact due to construction during the night with one side traffic regulation. DO : There are some impacts for poverty group due to no demand of jockey by introduction of ERP system and repeal of the 3 in 1 policy. The impact of living and livelihood for low income households owing car due to economic burden increase is expected depending on the ERP fee. In addition, there are some impacts such as migration time and economic burden increase due to shifting to public transportation etc. Occurrence of car owners having to pay ERP fee and economic burden increase are expected.
	14	Land Use and Utilization of Local Resources	B-	D	DC: Cutting trees will be needed to install ERP systems. The ERP system will be located with minimum impacts of land use. DO: No impacts will be expected.
	15	Heritage	D	D	There are some cultural heritage such as Museum National, Monument National(Monas) 、 Monas park, Hotel Indonesia、 Stadium (Senayan) in the project site and the surrounding area. No impact will be expected due to far distance from construction sites.
	16	Landscape	D	D	There is no landscape impact because the ERP system is installed along the provincial road.
	17	Ethnic Minorities and Indigenous People	D	D	There are no ethnic minorities and indigenous people in the project site and the surrounding area.
	18	Existing Social Infrastructure and Services	B-	B-	DC : The traffic congestion and traffic accidents are expected. DO : There is a possibility of traffic accidents increase if there are vulnerable area including residences, schools and hospitals and others in the project site and the surrounding area.
	19	Uneven Distribution of Benefits and Damages	D	D	There is no uneven distribution of benefits and damages in the project site and the surrounding area.
	20	Gender	D	C-	DO : There are some impacts for gender such as migration time increase due to traffic congestion by inflowing cars in the project site and the surrounding area. Migration time increase of gender due to shifting to public transportation etc. is expected.
	21	Children's Rights	D	D	The project has no particular negative effect on Children's Rights.

Category	Environmental Item		Evaluation		Reason of Evaluation
			Before and During Construction	In Service	
	22	Infection including HIV/AIDS and Others	B-	D	DC : There is a possibility of spread of infection due to the inflow of construction workers.
	23	Working Conditions	B-	D	Attention to labor environment of construction worker is needed.
Others	24	Impacts to trans boundary or Global Issues	D	D	The project has no impact on crossing the border or global issues.

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

### 9.7.6 TOR for Survey

The TOR for survey is made based on Table9.7-6 and considering the impacts. The TOR for survey is shown in Table9-7-7. The Mitigation measures and monitoring plan will be made based on the result of survey.

**Table9-7-7 TOR for Survey**

Category	Survey Item	Survey Method
Consideration of Options	Consideration of construction method	Consideration of construction method for reducing environmental and social impacts and traffic congestion during construction.
Air Quality	<ul style="list-style-type: none"> <li>① Confirmation of environmental standards</li> <li>② Assess of air quality</li> <li>③ Confirmation of traffic volume increase in service phase</li> <li>④ Confirmation of residences, schools and hospitals in the project site and the surrounding area</li> <li>⑤ Impacts during construction</li> </ul>	<ul style="list-style-type: none"> <li>① Document investigation</li> <li>② Document investigation</li> <li>③ Impact forecast based on the traffic volume prediction</li> <li>④ Document investigation and field survey</li> <li>⑤ Confirmation of description of work, construction method, construction duration, construction site, type and number of construction vehicles, driving route of construction vehicles, operation site and operation duration of construction vehicles, and operation time slot of construction vehicles etc.</li> </ul>
Waste	Disposal method for construction waste soil and scrap wood	Interview to related organization and case study analysis
Soil Contamination	Measures to prevent soil contamination due to spill of fuel oil and lubrication oil from construction vehicles during construction	Confirmation of description of work, construction method, construction duration, type and number of construction vehicles, operation and storage site of construction vehicles etc.
Noise and Vibration	① Confirmation of	① Document investigation



Category	Survey Item	Survey Method
	environmental standards ② Distance from source origin to residences, schools and hospitals ③ Impacts during construction	② Document investigation and field survey ③ Confirmation of description of work, construction method, construction duration, construction site, type and number of construction vehicles, driving route of construction vehicles, operation site and operation duration of construction vehicles, and operation time slot of construction vehicles etc.
Living and livelihood	① Income survey of Jockey based on the 3 in 1 policy ② Economic burden increase of low income households owning car by introducing ERP system ③ Economic burden and migration time increase by shifting to public transportation etc.	① Interview ② Interview ③ Interview
Land Use and Utilization of Local Resources	① Approximation of cutting trees ② Relevant regulations	① Document investigation and field survey ② Document investigation
Existing Social Infrastructure and Services	① Confirmation of residences, schools and hospitals in the project site and the surrounding area ② Impacts during construction	① Document investigation and field survey ② Confirmation of description of work, construction method, construction duration, construction site, type and number of construction vehicles, driving route of construction vehicles, operation site and operation duration of construction vehicles, and operation time slot of construction vehicles etc.
Gender	① Confirmation of traffic volume increase in service phase ② Impacts of modal shift	① Impact forecast based on the traffic volume prediction ② Interview
Infection including HIV/AIDS and Others	① Disease rate of HIV/AIDS in the project site and the surrounding area. ② Organization conducting Related activities	① Document investigation and Interview to related organizations ② Interview to related organizations
Working Conditions	Safety measures for labor	Case study analysis including contract with subcontractors

Source: JICA study team

### 9.7.7 Result of Survey

According to the TOR, environmental and social consideration survey was implemented. The survey result is shown Table9-7-8.

**Table9-7-8 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

Category	Survey Item	Survey Method
		<p>will be implemented 20 days per month excluding Saturdays and Sundays.</p> <p>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.</p>
Air Quality	Confirmation of environmental standards	The environmental standards for SO <sub>2</sub> , CO, O <sub>3</sub> , HC, PM <sub>10</sub> , PM <sub>2.5</sub> , 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, NO <sub>2</sub> , SO <sub>2</sub> , Pb, PM <sub>10</sub> , 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 O <sub>3</sub> exceeds the allowable limit.
	Confirmation of traffic volume increase in service phase	<p>The rate of current users shifting from cars to public transportation due to introduction of ERP is 19% on Corridor 1 and 21% on Corridor 6 in the case of 15,000 RP./trip of charging fee.</p> <p>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.</p> <p>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.</p> <p>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.</p>
	Confirmation of residences, schools and hospitals in the project site and the surrounding area	<p>The medical facilities, schools and residence area are identified along Corridor 1 and 6, 1km each side.</p> <p>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.</p>
	Impacts during construction	<p>The construction of gantry installation consists of field survey, foundation work, pole construction, power and communication distribution work and testing.</p> <ul style="list-style-type: none"> <li>●Field survey: 2 days each site</li> </ul> <p>Boring investigation will be implemented each site.</p> <ul style="list-style-type: none"> <li>●Foundation work: 10 days each site</li> </ul> <p>1 backhoe, 1 truck and 1 rough terrain crane for tree cutting, if necessary.</p> <p>1 backhoe and 1 truck for excavation</p> <p>1 vibrohammer, 1 rough terrain crane (9.9t), 1 truck (10t) and 1 auger for piling</p> <p>1 truck and 1 concrete mixer truck for formwork, reinforcing steel and blinding concrete</p> <p>1 concrete mixer truck for depositing concrete</p> <ul style="list-style-type: none"> <li>●Pole construction: 6 days each site</li> </ul> <p>1 rough terrain crane (9.9t) and 1 truck (10t) for pole</p>

Category	Survey Item	Survey Method
		<p>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.</p> <p>Air quality deterioration such as NO<sub>2</sub>, CO, CO<sub>2</sub>, HC and PM will be expected because of exhaust gases from construction vehicles.</p>
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	<p>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</p> <p>The vibration level is stipulated according to 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</p>
	Distance from source origin to residences, schools and hospitals	<p>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</p>
	Impacts during construction	<p>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.</p> <p>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</p>

Category	Survey Item	Survey Method																			
		<p>Boring investigation will be implemented each site.</p> <ul style="list-style-type: none"> <li>●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</li> <li>●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</li> <li>●Power and communication distribution work: 5 days each site 1 lift type and 1 unique vehicle (4t)</li> <li>●Testing: 5 days each site</li> </ul> <p>There is no necessity to prepare construction vehicles.</p> <p>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 from 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.</p> <p>The low noise and vibration vehicles will be selected and low noise and vibration construction method will be applied to reduce noise and vibration level.</p>																			
Living and livelihood	Income survey of Jockey based on the 3 in 1 policy	<p>The monthly income of Jockey based on the interview survey, 144 respondents, is as follows;</p> <table border="0"> <tr> <td>Less than 500,000 RP.</td> <td>: 10%</td> </tr> <tr> <td>Over 500,000 RP. , Less than 1,000,000 RP.</td> <td>: 32%</td> </tr> <tr> <td>Over 1,000,000 RP. , Less than 1,500,000 RP.</td> <td>: 40%</td> </tr> <tr> <td>Over 1,500,000 RP. , Less than 2,000,000 RP.</td> <td>: 9%</td> </tr> <tr> <td>Over 2,000,000 RP. , Less than 2,500,000 RP.</td> <td>: 8%</td> </tr> <tr> <td>Over 3,000,000 RP. , Less than 3,500,000 RP.</td> <td>: 2%</td> </tr> </table> <p>The income of Jockey will be zero due to abolishment of 3 in 1 policy by installing ERP system.</p>	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%							
	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%																				
Economic burden increase of low income households owning car by introducing ERP system	<p>The monthly income of household based on the interview survey is as follows;</p> <table border="0"> <tr> <td>Less than 2,500,000 RP.</td> <td>: 10%</td> </tr> <tr> <td>Over 2,500,000 RP. , Less than 5,000,000 RP.</td> <td>: 17%</td> </tr> <tr> <td>Over 5,000,000 RP. , Less than 7,500,000 RP.</td> <td>: 21%</td> </tr> <tr> <td>Over 7,500,000 RP. , Less than 10,000,000 RP.</td> <td>: 15%</td> </tr> <tr> <td>Over 10,000,000 RP. , Less than 12,500,000 RP.</td> <td>: 15%</td> </tr> <tr> <td>Over 12,500,000 RP. , Less than 15,000,000 RP.</td> <td>: 6%</td> </tr> <tr> <td>Over 15,000,000 RP. , Less than 17,500,000 RP.</td> <td>: 6%</td> </tr> <tr> <td>Over 17,500,000 RP. , Less than 20,000,000 RP.</td> <td>: 2%</td> </tr> <tr> <td>Over 20,000,000 RP. , Less than 30,000,000 RP.</td> <td>: 4%</td> </tr> <tr> <td>Over 30,000,000 RP.</td> <td>: 4%</td> </tr> </table> <p>The rate of modal shift from car to public transportation is</p>	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 than 12,500,000 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%
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 than 12,500,000 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%																				

Category	Survey Item	Survey Method
		<p>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</p> <p>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.</p> <p>The average rider in one car is 2.3 persons. Economic burden will increase by purchasing motorcycle.</p>
	Economic burden and migration time increase by shifting to public transportation etc.	<p>Based on the interview survey, the reason holding back from using public transportation, especially Trans Jakarta, is as follows;</p> <ul style="list-style-type: none"> <li>• Traffic congestion</li> <li>• No punctuality / low frequency</li> <li>• Traveling time increase</li> </ul> <p>The main reason is inconvenience of public transportation instead of economic burden increase.</p>
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 Infrastructure and Social Services	Confirmation of residences, schools and hospitals in the project site and the surrounding area	<p>The medical facilities, schools and residence area are identified along Corridor 1 and 6, 1km each side.</p> <p>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.</p>
	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	<p>Based on the interview survey, the reason holding back from using public transportation, especially Trans Jakarta, is as follows;</p> <ul style="list-style-type: none"> <li>• Traffic congestion</li> <li>• No punctuality / low frequency</li> <li>• Traveling time increase</li> </ul> <p>The impacts for gender will be expected because of traveling time increase by using public transportation.</p> <p>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.</p>

Category	Survey Item	Survey Method									
		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.	<p>According to Ministry of Health, number of disease for HIV/AIDS in DKI Jakarta as of 2013 was as follows;</p> <table border="1"> <thead> <tr> <th></th> <th>DKI Jakarta</th> <th>Indonesia</th> </tr> </thead> <tbody> <tr> <td>HIV</td> <td>28,790</td> <td>127,416</td> </tr> <tr> <td>AIDS</td> <td>7,477</td> <td>52,348</td> </tr> </tbody> </table> <p>The rate of disease in DKI Jakarta is calculated as follows; HIV : 0.3% AIDS: 0.08%</p>		DKI Jakarta	Indonesia	HIV	28,790	127,416	AIDS	7,477	52,348
		DKI Jakarta	Indonesia								
HIV	28,790	127,416									
AIDS	7,477	52,348									
	Organization conducting Related activities	<p>The policy of DKI Jakarta to prevent transmission of disease is as follows;</p> <ul style="list-style-type: none"> <li>• Institution of No.5/2008</li> <li>• Prevention measure is consist of 12 components</li> <li>• Voluntary Counseling Test (VCT) is implemented in corporation with NGO</li> </ul>									
Working Conditions	Safety measures for labor	<p>The below items will be conducted as safety measures for labor.</p> <ul style="list-style-type: none"> <li>• Obeying Indonesian laws and regulations</li> <li>• Preparing implementation plan including accident prevention and safety management</li> <li>• Safety institution to workers</li> <li>• Pre maintenance of construction vehicles</li> <li>• Fall prevention of construction vehicles by wind speed monitoring</li> <li>• Nasty fall prevention of workers</li> <li>• Prevention of heat stroke</li> </ul>									

Source: JICA study team

**Table9-7-9 List of Medical Facilities in Corridor 1 and 6**

No.	Corridor	Facility name	Address
1-1	Corridor 1	CHC Clinic	Menara Kebon Sirih, Podium I, Jl. Kebon Sirih Kav. 17 - 19
1-2		Klinik Kantor Pusat Pertamina	Jl. Perwira No.2-4
1-3		Klinik Kwarnas Pertamina	Jl. Medan Merdeka Timur No. 6
1-4		Klinik Merdeka Timur Pertamina	Jl. Merdeka Timur No. 12
1-5		Praktek Dokter Bersama & Apotek Yes Care	Plaza Kebon Sirih Podium I PI-13 B, Jl. Kebon Sirih Kav 12-19
1-6		RS. Abdi Waluyo	Jl. HOS. Tjokroaminoto No. 31-33 Menteng
1-7		RSB. Budi Kemuliaan	Jl. Budi Kemuliaan No. 25 Jakarta 10110
1-8		Wellness Clinic	Jl. Lombok 38 Menteng
1-9		Klinik Triaz	Gedung Graha Niaga Lt.B-1 Jl. Jend. Sudirman 58

No.	Corridor	Facility name	Address
1-10		RS Jakarta	Jl. Jend. Sudirman Kav 49 Jakarta
1-11		RS. Pusat Pertamina	Jl. Kyai Maja No. 43, Kebayoran Baru
1-12		Semanggi Specialist Clinic	Plaza Semanggi Lt. 7
1-13		Sudirman Medical Center	Jl. Jend. Sudirman Kav. 25 Jak - Sel
1-14		Klinik Pakubuwono Pertamina	Jl. Dempo No.1 Jak - Sel
6-1	Corridor 6	RS. Medistra	Jl. Jend. Gatot Soebroto Kav. 49 Jakarta Selatan
6-2		Klinik Patra Jasa Pertamina	Jl. Jend. Gatot Soebroto Kav. 32-34 Jakarta Selatan
6-3		RS. MMC	Jl. H. R. Rasuna Said, Kav. C-21, Jakarta
6-4		RS. MATA Prof. DR. Isak Salim "AINI"	Jl. H. R. Rasuna Said, Kuningan, Jakarta Selatan
6-5		Easco Medical	Century Tower Lt.1 Jl. HR Rasuna Said Kav. X2 No.4 Kuningan
6-6		RS. Jakarta Medical Center (JMC)	Jl. Buncit Raya No. 15, Jakarta Selatan

Source: JICA study team

**Table9-7-10 List of Schools in Corridor 1 and 6**

No.	Corridor	Category	School Name	Address
1-1	Corridor 1	Elementary School	SDN Gunung 05 Pg.	Jl. Hang Lekir V/53
1-2			SDS Yayasan Triguna 1956	Jl. Hang Lekir III/ 17
1-3			SDS Al Azhar 1 Pusat	Jl. Sisingamangaraja
1-4			SDN Kebon Kacang 05 Pg.	Jl. Kebon Kacang
1-5			SDN Kebon Sirih 08 Pg.	Jl. H. Agus Salim
1-6			SDS Bunda Kasih Tamansari	Jl. Mangga Besar I
1-7			SDN Kebon Kelapa 01 Pg.	Jl. Batu Tulis Raya XIII
1-8			SDS Merpati	Jl. Batu Tulis Raya XIII/ 16
1-9			SDS Tarsisius	Jl. KH Hasyim Asyhari No. 23
1-10			SDS Kristen II BPK Penabur	Jl. Pembangunan I/ 23
1-11		SDN Setiabudi 01 Pg.	Jl. Setiabudi Barat No. 8	
1-12		Junior High School	SMP Triguna	Jl. Hang Lekiu
1-13			SMP Islam Al Azhar 1 Pusat	Jl. Sisingamangaraja
1-14			SMP Pelita Hati	Jl. Prof. Dr. Satrio No. 235



No.	Corridor	Category	School Name	Address
1-15			SMP 1 Pattimura	Jl. Setiabudi Timur Raya No. 26
1-16			SMP Negeri 58	Jl. Setiabudi Barat 8 K
1-17			SMP Negeri 181	Jl Masjid I 1 Bendungan Hilir Tanah Abang Jakarta Pusat
1-18			SMP PSKD 1	Jl. Kampung Bali
1-19			SMP Islam Al-Ihsan	Jl. Kebon Kacang IX No. 57
1-20			SMP Negeri 70	Jl. H. Awaludin IV
1-21			SMP St. Bellarminus	Jl. Lombok No. 58
1-22			SMP Santa Theresia	Jl. H. Agus Salim No. 75
1-23			SMP Budi Mulia	Jl. Mangga Besar Raya No. 135
1-24			SMP Santa Maria	Jl. Ir. H. Juanda No. 29
1-25			SMP Negeri 94	Jl. Tanah Abang V/ 29
1-26			SMPK II BP Penabur	Jl. Pembangunan III 1-A Petojo Utara Gambir Jakarta Pusat DKI Jakarta
1-27			SMP Negeri 39 Jakarta Pusat	Jl Gajah Mada 3 Petojo Utara Gambir Jakarta Pusat DKI
1-28			SMP Negeri 72	JL. Petojo Binatu Raya , Petojo Utara , Gambir
1-29			SMP Kristen Triana	Jl. KH Hasyim Ashari No. 54
1-30			SMP YPRI	Jl. Petojo Binatu No.2
1-31		Senior High School	SMA Negeri 6	Jl. Mahakam ½ Blok C
1-32			SMS Negeri 70	Jl. Bulungan Blok C
1-33			SMA Negeri 82	Jl. Daha II/ 15a
1-34			SMA Negeri 3	Jl. Setiabudi II
1-35			SMK 15	Jl. Mataram I Kebayoran Baru
1-36			SMA Ketapang 1	Jl. K.H. Zainul Arifin No. 35
1-37			SMK Pembangunan 2	Jl. Pembangunan II/ 18
1-38			SMK Santa Maria	Jl. Ir. H. Juanda No. 29, Kebon Kelapa
1-39			SMK Paramitha 2	Jl. Suryo Pranoto No. 20, Petojo Utara
1-40			SMK Rex Mundi	Jl. Alaydrus No. 42 Petojo Utara
1-41			SMK Muhammadiyah 5	Jl. Taman Bendungan Jatiluhur 18
1-42			SMK Bunda Mulia 1	Jl. A.M. Sangaji No. 20 Petojo Utara
1-43		UNIVERSITY	Politeknik Kesehatan Depkes Jakarta II	Jalan Hang Jebat III
1-44			Univ. Al Azhar Indonesia	Komplek Masjid Agung Al Azhar, Jl.

No.	Corridor	Category	School Name	Address
				Sisingamangaraja
1-45			Universitas Prof Dr Moestopo	Jl. Hang Lekir I No. 8 Senayan
1-46			Universitas Katolik Indonesia Atma Jaya	Jl. Jenderal Sudirman 51, Jakarta
1-47			London School of Public Relations - Jakarta	Jalan Kyai Haji Mas Mansyur Campus B and C
6-1	Corridor 6	Elementary School	SDN Ragunan 01 Pg.	Jl. Warung Jati
6-2			SDN Ragunan 04 Pt.	Jl. Warung Jati
6-3			SDN Ragunan 07 Pg.	Jl. Syaridin
6-4			SDN Tegal Parang 01 Pg.	Jl. Mampang Prapatan VIII
6-5			SDN Tegal Parang 03 Pg.	Jl. Mampang Prapatan VIII
6-6			SDN Tegal Parang 06 Pg.	Jl. Mampang Prapatan XIII
6-7			SDN Tegal Parang 08 Pg.	Jl. Mampang Prapatan XIII
6-8			SDN Duren Tiga 08 Pt.	Jl. SD Warung Buncit
6-9			SDN Guntur 03 Pg.	Jl. Halimun No. 2 B
6-10			SDS Islam RPI	Jl. H.R. Rasuna Said
6-11			SDS Ar Rahman Y Motik	Jl. Setiabudi Utara Blok D 1
6-12			SDK 9 PENABUR	Jl. Halimun No.9
6-13		Junior High School	SMP Negeri 41	Jl. Harsono RM Ragunan
6-14			SMP Sultan Hasanuddin	Jl. Buncit Raya KB
6-15			SMP Negeri 43	Jl. Kapt. Tendean
6-16			SMP Al Falah	Jl. Mampang Prapatan I
6-17			SMP Negeri 57	Jl. Halimun No. 2 B
6-18			SMP Islam RPI	Jl. H.R. Rasuna Said Kav. X2-2
6-19		Senior High School	SMU Fatahillah	Jl. Raya Buncit No. 67
6-20			SMA Negeri 55	Jl. Minyak Raya Duren Tiga
6-21			SMK 57	Jl. Margasatwa 38-B
6-22			SMK Daarul Uluum	Jl. Pedurenan Raya No. 53 Karet Kuningan Setia Budi
6-23			SMK RPI	Jl. H.R. Rasuna Said Kav. X2-2, Kuningan Timur, Setia Budi
6-24			SMK Sumber Daya Manusia	Jl. Amil Buncit Indah IB Rt 002/ 05 Pancoran
6-25			SMK YASDA	Jl. H. R. Rasuna Said Patra Kuningan

No.	Corridor	Category	School Name	Address
				XV Tebet
6-26			SMK Walisongo	Jl. Kapten Piere Tendean 9 Mampang Prapatan Mampang Prapatan
6-27		UNIVERSITY	Universitas Bakrie	Jl. H.R. Rasuna Said Kav. C-22, Jakarta
6-28			STIE Perbanas	Jl. Perbanas Karet Kuningan, Setiabudi
6-29			STIE Dharma Bumiputera	Jl. Warung Jati Barat No. 41 Duren Tiga Pancoran Jakarta Selatan
6-30			Universitas Islam Azzahra	Tegal Parang, Jakarta Selatan

Source: JICA study team

### 9.7.8 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.

**Table9-7-11 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	B-	C-	B-	D	DC: The noise level for medical

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	
		Vibration					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 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

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	
							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.

**Table9-7-12 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

### 9.7.9 Mitigation measures and Cost

The mitigation measures for all impacts evaluated as A, B or C are shown in Table9-7-13.

**Table9-7-13 Mitigation measures**

No.	Impacts	Proposed EMP	Implementing Organization	Responsible Organization	Cost (IDR)
During construction					
1	Air Quality	Implementation of idling stop for construction vehicles and efficient vehicles operation	Contractor	DKI Jakarta	0
2	Waste	Minimum excavation and cutting trees. Waste disposal complying with DKI Jakarta regulations	Contractor	DKI Jakarta	NA
3	Noise and Vibration	Applying noise reduction equipment at the construction	Contractor	DKI Jakarta	NA

No.	Impacts	Proposed EMP	Implementing Organization	Responsible Organization	Cost (IDR)
		site. Selecting low noise and vibration vehicles.			
4	Land Use and Utilization of Local Resources	Minimum cutting trees. Tree planting in designated area by DKI Jakarta. 10 trees planting per one cutting tree	Contractor	DKI Jakarta	10,000,000,000 (Be borne by contractor)
5	Infection including HIV/AIDS and Others	Instruction to workers	Contractor	DKI Jakarta	0
6	Working Conditions	Obeying Indonesian laws and regulation. Safety instruction to workers	Contractor	DKI Jakarta	0
During operation					
6	Living and livelihood	Mitigation measures for ERP users <ul style="list-style-type: none"> <li>· Charging vehicles excluding public transportation including taxi, motorcycle and cars for disability persons.</li> <li>· No charging on Saturday, Sunday and holidays.</li> <li>· Giving On-Board-Unit away free and recovering On-Board-Unit cost by ERP charging</li> </ul>	DKI Jakarta	DKI Jakarta	NA
		Implementation of vocational education training for Jockey	DINAS Social, DKI Jakarta	DINAS Social, DKI Jakarta	Decision-making of budget size by DUNAS Social
7	Gender	Increasing number of BRT buses (2.2 minutes to 1.5 minutes of headway) to implement modal shift and to ease congestion	DKI Jakarta	DKI Jakarta	NA

Source: JICA study team

### 9.7.10 Monitoring Plan

The Monitoring plan both during construction and during operation is indicated in Table9-7-14.

**Table9-7-14 Monitoring Plan**

Category	Measuring Items	Location	Frequency	Responsible Organization
During construction				
Air Quality	SO <sub>2</sub> , CO, NO <sub>2</sub> , O <sub>3</sub> , HC, PM10, PM2.5, TSP	Surrounding Construction site	Once per month	Contractor
Waste	amount	Construction site	Once per month	Contractor
Noise and Vibration		Surrounding Construction site	Once per month	Contractor
Land Use and utilization of	Number of Cutting trees	Construction site	Once per month	Contractor

Category	Measuring Items	Location	Frequency	Responsible Organization
Local resources				
During operation				
Air Quality	SO <sub>2</sub> , CO, NO <sub>2</sub> , PM10, TSP	ERP installation site	Once per month (one year after starting operation)	DKI Jakarta
Living and livelihood	Actual condition of charging	DKI Jakarta	Once per month (one year after starting operation)	DKI Jakarta
	Number of free distribution for On-Board-Unit and distribution list	DKI Jakarta	Once per month (one year after starting operation)	DKI Jakarta
	Number of job training and jobfinder for Jockey	Job training authority	Once per month (one year after starting operation)	DKI Jakarta

Source: JICA study team

### 9.7.11 Public Consultation

Acceptability of citizen for charging to vehicles is a point that is important. At a stage of creating business pan, it is necessary to conduct stakeholder analysis and public consultation including peripheral people of the project prior to review by JICA.