

**LINKING STAGES OF EVALUATION BY INCLUDING
SUSTAINABILITY AND EFFICIENCY AS CRITERIA ON
OPERATED TOLL ROAD IN INDONESIA**

Master thesis

A thesis submitted in partial fulfillment of the requirements for the Master Degree from the Institut Teknologi Bandung and the Master Degree from the University of Groningen

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DOUBLE MASTER DEGREE PROGRAMME

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SCHOOL OF ARCHITECTURE, PLANNING AND POLICY DEVELOPMENT
INSTITUT TEKNOLOGI BANDUNG**

AND

**ENVIRONMENTAL AND INFRASTRUCTURE PLANNING
FACULTY OF SPATIAL SCIENCES
UNIVERSITY OF GRONINGEN**

2012



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Double Master Degree Programme

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Abstract

LINKING STAGES OF EVALUATION BY INCLUDING SUSTAINABILITY AND EFFICIENCY AS CRITERIA ON OPERATED TOLL ROAD IN INDONESIA

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The aim of toll road development in Indonesia, as stated in Road Act No. 38/2004, is to increase the efficiency in distributing goods, services and passengers (Act No. 38/2004). However, the fact about efficient transport is not apparently seen in toll roads located in big cities. For example, an excessive traffic still remains in most of the toll roads, intensely in Jabodetabek. To handle this phenomenon, what firstly should be done is reviewing the evaluation practice of the toll road itself.

In present, toll road evaluation in Indonesia is more concerned on feasibility of toll road project. The implementation has not been managed schematically and integrally. Instead, the evaluation is delivered in ad-hoc enactment. Nonetheless, despite the inexistence of completed practice of evaluation, the linkage between all phases in evaluation is essential in pursuing sustainability in two different perspectives: sustainability of project evaluation and sustainability in project evaluation. Based on the literature, one finding is acquired about how to link all the stages gradually: all the three stages should use the same criteria. The reason to include sustainability and efficiency as criteria is twofold in this sense: the first is because sustainability has taken much attention in present corresponds to the increasing of environmental concern, and the second is because efficiency is the main goal of toll road operation that in present condition is regarded unsuccessfully attained by operated toll road in Indonesia.

From the case studies in two toll road sections in Indonesia, it can be seen that not all evaluations represented both criteria at the same time. Some are considered only sustainability while the others concern on efficiency as central foci. Furthermore, some crucial indicators also have not been included in existing evaluation. Overall, the link between three stages of evaluation has not apparently applied. This is because the criteria used within the evaluations are not resembled each other. Moreover, the criteria that are perceived essential in this research are only partly applied. It might be a phenomenon in developing country where these concepts have not been pursued by much effort. Economic concern is dominated the practice, thus, causes imbalance position between other concerns.

Keywords : criteria, efficiency, indicators, linkage of different stage of evaluation, sustainability, toll road operation, Indonesia

Guideline in using thesis

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Preface

The condition of toll road investment in Indonesia has grown since 1978. At that time, toll road was built to supply the increasing demand of transportation. However, as the population of urban area increases, the demand of transporting goods and passengers also continues to grow. However, the supply of road infrastructure has stagnantly risen; even toll road development has not been proven successfully in fulfilling transport demand. Congestion still exists within toll road sections. Hence, to tackle this problem, evaluation on toll road operation is required to be reviewed. One approach that is proposed in this research is to sustain the evaluation of toll road operation from pre-completion to post-completion of toll road sections. Grounded by theoretical insight, the resemblance of criteria in all stages of evaluation (ex-ante, in-itinere and ex-post) is required to sustain project evaluation. Thus, in this research sustainability and efficiency are used as criteria to link the different stages of evaluation. Why are these notions used in this research? It is because sustainability has taken much attention in present corresponds to the increasing of environmental concern, and efficiency has been the main goal of toll road operation.

I have a special attention in toll road development. I have been working in the Indonesia Toll Road Authority (*Badan Pengatur Jalan Tol/BPJT*) under the Ministry of Public Works. I realize that toll road development in Indonesia has tackled many challenges in fulfilling its goal even long before it has been constructed. One of obstacles of toll road operation is relieving congestion. It seems like difficult to find the best way to handle this problem. However, I personally believe that theoretical views can give insights to cope with this obstacle. Thus, I have been curious to dig more deeply into theories about project evaluation, sustainability and efficiency in facing the issue of operated toll road in Indonesia.

I realize that is impossible to write this thesis without any supports. First of all, I would like to devote my greatest gratitude to The Greatest Allah SWT. Moreover, I would like to express my greatest appreciation of tireless and attentive of dr. Eva Heinen, MSc and Dr. Ir. Krishna Nur Pribadi, MSc, MPhil who always encourage me and kept my thesis on the track. I would also give my big thankfulness to my family in Indonesia; to my beloved mother, to my treasured father and to my dear brothers and sisters who always calm and give me support within the storm. I owe appreciativeness to Bappenas, NESO and Ministry of Public Works that have given me an opportunity to continue my study in ITB and RuG. Furthermore, I give my great appreciation to my colleagues of DD ITB 2010 that has been regarded as a family for me, supporting each other and reaching our dream together. Last but not least, although I cannot acknowledge directly in this page, I would like to express my thankfulness to all people who have supported me in finishing my study.

Ira Ariani Chaerunisa
Groningen
August 2012

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Abbreviations

AMDAL (EIA)	: <i>Analisis Mengenai Dampak Lingkungan</i> (Environmental Impact Assessment)
BOT	: Built-Operate-Transfer
BPJT (ITRA)	: <i>Badan Pengatur Jalan Tol</i> (Indonesian Toll Road Authority)
CBA	: Cost-Benefit Analysis
FS	: Feasibility Study
GHGs	: Green-House Gases
GRDP	: Gross Regional Development Product
Jabodetabek	: Jakarta-Bogor-Depok-Tangerang-Bekasi
Jagorawi	: Jakarta-Bogor-Ciawi
LOS	: Level of Service
MCA	: Multi-Criteria Analysis
MPW	: Ministry of Public Works
PPJT (CA)	: <i>Perjanjian Pengusahaan Jalan Tol</i> (Concession Agreement)
PPP	: Public Private Partnership
RKL/RPL (EM/MP)	: <i>Rencana Pengelolaan Lingkungan/Rencana Pemantauan Lingkungan</i> (Environmental Management/Monitoring Plan)
SPM (SMS)	: <i>Standar Pelayanan Minimal</i> (Standard of Minimum Service)
WTP/ATP	: Willingness to Pay/Ability to Pay

Chapter 1 Introduction

This chapter introduces the content of this research. In subchapter 1.1, the background of this research is explained. Subsequently, the specific problem of the issue in this research is stated in subchapter 1.2 along with some questions that are addressed in order to attain the objective of this research. In subchapter 1.3, the methodology of this research is described by explaining the method of data collection (1.3.1) and the methods of research (1.3.2). Lastly, the structure of this research is presented in subchapter 1.4 with also describing the framework of this research afterwards.

1.1. Background

Toll road operation, mostly in form of tolled highway, has been held in financing road infrastructure in some developed countries: the United Kingdom (Pugh and Fairburn, 2008) and the United States (Rouhani, 2009); and developing countries (e.g. Indonesia, Malaysia, India). Tolled road practice has given benefit in financing road construction and operation through the involvement of private sectors on infrastructure provision (Li & Hensher, 2010). By this way, road infrastructure can be financed by sharing cost between public and private monies, hence, keep a tight rein on public funds (Fisher & Babbar, 2012). In addition to limit fiscal budget in infrastructure provision, other functions of toll road are extended in threefold: to extend the efficiency of distributing goods and services (Odeck, 2008); to serve as an alternative way in supplementing the existing road (Palma & Lindsey, 1997), and; to internalize the externality of congestion (Fisher & Babbar, 2012). These functions are related with specified category of road capacity and “congestion delays” (Litman, 2010), namely Level of Service (LOS), which in toll road operation is mostly focused on the highest level. Among six levels of LOS (A to F), toll road is designed to exhibit LOS A. In this category, toll road is expected to be uncongested. Thus, toll road is usually built as an additional road to relieve the existing congested road.

In Indonesia, toll road development has been aimed to fulfill development equity within nation, particularly in densely populated region (Government Regulation No. 15/2005). The need in pursuing equity is reasoned by a significant rise of population in Indonesia since early 1960s. According to statistics review, population

growth in urban area in 1961 was 15.61 per cent; exceeded for almost twofold from the estimation of population growth in the previous year (Pontoh & Kustiwan, 2009). The major increase in population has also continued up to present. The World Bank (2004) has predicted that population of Indonesia in 2020 will increase three forth from 80 million in 2000. In reality, this number has increased significantly in reality for more than 237 million of people¹. The increase of population is also in line with inclined number of motorized vehicles up to 268 per cent from 2001 to 2010. However, the total length of road has only built up for 35 per cent in the ten years period with a density of 158 vehicles per kilometer of road in 2010². In addition, approximately 46 per cent of the total length of road in this country suffered moderate to heavy deterioration in 2004 (Act No. 17/2007).

The aim of toll road development in Indonesia, as stated in Road Act No. 38/2004, is to increase the efficiency in distributing goods, services and passengers (Act No. 38/2004). However, the fact about efficient transport is not apparently seen in toll roads located in big cities. For example, an excessive traffic still remains in most of the toll roads, intensely in Jabodetabek (abbreviation of megapolitan cities: Jakarta-Bogor-Depok-Tangerang-Bekasi). Traffic congestion is a chronic problem faced in the Jabodetabek region and the situation is expected to worsen if there is no improvement of any kind made on the existing transportation system (Asri & Hidayat, 2005). Concerning this condition, the Government of Indonesia has admitted that toll road quality in Indonesia still needs much improvement compared to the quality of toll roads in other countries. In 2010, Indonesia ranked 84th of 136 countries regarding the quality of toll road³. Even more, much attention has been paid to toll road services lately because of excessive traffic in toll road and backlog in the toll road entrance become more frequent and severe⁴.

To handle this phenomenon, what firstly should be done is reviewing the evaluation practice of the toll road itself. Evaluation is predominantly required within decision-making process. However, the role is more extensively spread as transportation appraisal become more necessary to be reconnected with project cycle (Mackie & Nellthorp., 2003). In order to seek both positive and negative effects of road

¹ Based on census carried out in 2010 (BPS website, <http://www.bps.go.id/aboutus.php?sp=0>)

² Based on census carried out in 2010 (BPS website, <http://www.bps.go.id/aboutus.php?sp=0>)

³ "Toll road condition bad" in *Suara Pembaruan* (29 September 2011)
http://www.indii.co.id/news_daily_detail.php?id=1715

⁴ "Fix toll road services" in *Suara Pembaruan* (27 March 2012)
http://www.indii.co.id/news_daily_detail.php?id=3662

transport infrastructure; some assessments are conducted based on procedural guidance. A preliminary study and evaluation, namely *ex-ante* evaluation, is commonly established before the project is begun to be constructed. In theory, this initial evaluation is then followed by *in-itinere* evaluation (commonly known as monitoring phase during project implementation) and *ex-post* evaluation (established after the project has been accomplished) (Lichfield, 1998). In reality, this comprehensive evaluation is rarely conducted. Instead, 'post-*ex-ante*' evaluation is rather neglected. For instance, an *ex-ante* Environmental Impact Assessment (EIA) of road sector in the Netherlands is regulated to be followed by EIA follow-up, but it is still difficult to be applied in practice (Arts, 2004). Nonetheless, despite the inexistence of completed practice of evaluation, the linkage between all phases in evaluation is essential in pursuing sustainability in two different perspectives: sustainability *of* project evaluation and sustainability *in* project evaluation. The first phrase is more concerned to continuity of evaluation in maintaining the project and the second phrase is more focused in addressing sustainability as one of goals in certain project evaluation. However, the latter phrase is more discussed in depth within this research. In addition to sustainability, efficiency is viewed as an important component that should be inherent with road infrastructure project, in this case, toll road operation. The reason of this is the main goal of toll road operation, as mentioned before, is considered to be unsuccessfully obtained by public.

1.2. Problem statement and research objectives

In present, toll road evaluation in Indonesia is more concerned on feasibility of toll road project. The implementation has not been managed schematically and integrally. Instead, the evaluation is delivered in *ad-hoc* enactment. For example, there is no specific guideline in delivering both Feasibility Study and Environmental Impact Assessment for toll road project. These studies are obliged based by Government Regulation Number 15/2005. Meanwhile, the environmental concern as evaluated in Environmental Impact Assessment (EIA) is conducted separately based on Government Regulation number 27/1999. Both documents are arranged before toll road project start to be constructed (*ex-ante*). However, only one of two documents is followed by further evaluation (*in-itinere* and *ex-post*), namely

Environmental Management/Monitoring Plan (*Rencana Pengelolaan/Pemantauan Lingkungan*) that follows the implementation of EIA.

Furthermore, after the toll road construction has been finished, as the operation of toll road began, a monitoring standard namely Standard of Minimum Service (*Standar Pelayanan Minimal/SPM*) is established. This standard is purposed to monitor and control the performance of toll road. Based on regulation established by the Minister of Public Works No. 392/2005, it consists of six indicators: toll road condition, average speed, accessibility, mobility, safety, and aid service unit. However, public insists a re-evaluation of SPM⁵. This perception is underpinned by the existence of traffic delay, and often congestion, within toll road sections. Thus, in public perspective, the existing toll road operation is inefficient and should be followed by re-evaluation on the effectiveness of existing SMS.

Furthermore, the establishment and operation of toll road has not been fully focused on sustainability issue. Instead, toll road in Indonesia is focused on economical context regarding its role as an opportunity of private market investment. On one hand, built the toll road is one of the best solutions that provide sufficient facility in transportation requirement and generate economic growth in surrounding regions. On the other hand, built another road will trigger another puzzle to be solved. In the time to come, as the people travelling exceed the capacity of toll road itself, congestion will emerge. This occurrence might not even be expected in the existence of toll road as 'expressway'. In Jakarta Outer Ring Road, however, the toll road operation is not impressed as the best way of transporting goods immediately concerning steady-flow traffic. However, the high intensity of traffic congestion in arterial roads, including highways, affects to extravagant energy and declining environment quality. Traffic congestion that occurs in toll roads gives some impact to the region, particularly the breakdown of economic efficiency. Based on study conducted by Pribadi and Chaerunisa (2011), most of the toll roads operated by state-owned company are considered efficient. The linkage of toll road network is one of important aspects that affect toll road efficiency. However, this study has viewed the efficiency of costs and benefits from operator's perspective. Efficiency of operated toll road still needs much improvement in the view of society⁶. Congestion still exists, particularly in intra-urban toll road and every intersection of toll roads.

⁵ Source: (<http://bisnis-jabar.com/index.php/berita/jalan-tol-pemerintah-didesak-susun-standar-mutu-layanan>)

⁶ See line 9 of this page: "... However, public insists a re-evaluation of SPM..."

Thus, the function of toll road of which improves the efficiency in distributing goods and services is perceived to be unsuccessfully accomplished.

Correspond to the phenomena of perception about “inconsistency” in pursuing sustainability and efficiency above, the central question of this research is:

How are the different stages of evaluation in Indonesia linked (ex-ante, in-itinere and ex-post) and in what way are sustainability and efficiency included within those three stages of evaluation?

The objective of this research is imparted by the central question that is stated above. In answering the central question in detail, four more questions are addressed:

- What is the aim of conducting evaluation in different stages and how are the three stages of evaluation (ex-ante, in-itinere, ex-post) connected?
- What are the criteria in delivering sustainable and efficient road transportation?
- What is the official procedure to evaluate toll road in Indonesia?
- What is the actual practice of the link between different stages of evaluation and the inclusion of sustainability and efficiency as criteria on toll road evaluation in Indonesia?

1.3. Research methodology

1.3.1. Data collection

Analyses in this research use secondary data as source. Regarding the aim to seek the extent to which different stages of evaluation have been linked; therefore the data used in this research is focused on evaluation documents of operated toll road. These documents are obtained from *Badan Pengatur Jalan Tol* under the Ministry of Public Works. In addition, some information about toll road that have been published in media is derived by internet.

In exploring the implementation of evaluation in Indonesian toll road, the documents related with assessment of project from the initial evaluation (ex-ante), monitoring (in-itinere) and final evaluation (ex-post) are collected. This research focuses on operated toll road that have been operated until

present. Furthermore, Concession Agreement (*Perjanjian Pengusahaan Jalan Tol/PPJT*) of toll road that has been signed by government and private sector under Public Private Partnership (PPP) scheme is explored. This is meant to review the obligations of both stakeholders regarding the implementation of evaluation. In addition, policies and regulations connected to toll road operation in Indonesia are reviewed in order to explore the extent of policies and regulations in supporting evaluation on toll road sector. The required data is listed in *Table 1*.

The specific toll road sections that are assessed are determined by availability of data. Data collection is also limited by the form of available data. The data used in this research are: Preliminary Study (ex-ante), Environmental Impact Assessment (ex-ante), Environmental Management/Monitoring Plan (ex-ante, in-itinere, and ex-post) and Standard of Minimum Service (ex-post). Soft copy documents are not available in most of toll road sections. This is because length of concession period that has been established for more than 20 years and regime change within toll road sector. Among 30 toll road sections, only 1 section has sufficient documents to be analyzed: Bogor Ring Road. However, to give sufficient evidence in generalizing toll road evaluation in Indonesia, two sections of toll road are presented as case studies: Bogor Ring Road and Makassar section IV. Although the data is not complete (Preliminary Study is not available in soft copy), Makassar section IV is used in case study as well. *Table 2* presents the availability of data on operated toll road in Indonesia.

Table 1 Data requirements

<p>Central question:</p> <p>How are the different stages of evaluation in Indonesia linked (ex-ante, in-itinere and ex-post) and in what way are sustainability and efficiency included within those three stages of evaluation?</p>		Evaluation:			
				Preliminary Study	
				Environmental Impact Assessment	
				Environmental Monitoring/Management Plan	
				Standard of Minimum service	
				Concession agreement between government and private	
		Policies and regulations on toll road operation			
		Method	Data		
Question 1	What does the aim of conducting evaluation in different stages and how do the three stages of evaluation (ex-ante, in-itinere, ex-post) connected?	Literature review	International journals, reports, books		
Question 2	What are the criteria in delivering sustainable and efficient road transportation?	Literature review	International journals, reports, books		
Question 3	What is the official procedure to evaluate toll road in Indonesia?	Document analysis	Regulations, evaluation procedures, concession agreement, media (toll road in Indonesia)		
Question 4	What is the actual practice of the link between different stages of evaluation and the inclusion of sustainability and efficiency as criteria on toll road evaluation in Indonesia?	Case study	Evaluation documents of Bogor Ring Road and Makassar section IV		

Table 2 Data availability of operated toll road in Indonesia

No.	Toll section	Operator	Operated since	Ex-ante		Ex-ante, In-itinere, Ex-post	
				PS	EIA	EM/MP	SMS
1	Jakarta-Bogor-Ciawi	Jasa Marga	1978				sc
2	Jakarta-Tangerang	Jasa Marga	1983-1998				sc
3	Surabaya-Gempol	Jasa Marga	1984				sc
4	Jakarta-Cikampek	Jasa Marga	1985				sc
5	Padalarang-Cileunyi	Jasa Marga	1986				sc
6	Prof.DR.Sedyatmo	Jasa Marga	1986				sc
7	Jakarta Intra Urban Toll Road	Jasa Marga	1988				sc
8	Belawan-Medan-Tanjung Morawa	Jasa Marga	1989 & 1996				sc
9	Semarang Section A,B,C	Jasa Marga	1987, 1983 & 1998				sc
10	Ulujami-Pondok Aren	Jasa Marga	2001				sc
11	Palimanan-Kanci	Jasa Marga	1998				sc
12	JORR W2 North (Pondok Pinang-Veteran)	Jasa Marga	1991				sc
13	JORR E1 North (Taman Mini-Hankam Raya)	Jasa Marga	1998				sc
14	JORR E2 (Cikunir-Cakung)	Jasa Marga	2001-2003				sc
15	Cikampek-Padalarang I	Jasa Marga	2004				sc
16	Cikampek-Padalarang II	Jasa Marga	2005				sc
17	JORR E1-3, W2-S2, E3, E1-4	Jasa Marga	2005				sc
18	JORR North (Pondok Pinang-Taman Mini)	Jasa Marga	1995-1996				sc
19	Suramadu Bridge	Jasa Marga	2009	sc	sc		
20	Tangerang-Merak	Marga Mandala Sakti	1987 & 1996				sc
21	Ir. Wiyoto Wiyono, M.Sc.	Citra Marga Nusaphala Persada	1990				sc
22	Surabaya-Gresik	Marga Bumi Matra Raya	1993-1996				sc
23	Harbor Road	Citra Marga Nusaphala Persada	1995-1996				sc
24	Ujung Pandang Phase I	Bosowa Marga Nusantara	1998				sc
25	Serpong-Pondok Aren	Bintaro Serpong Damai	1999				sc
26	Waru IC-Juanda Airport	Citra Marga Surabaya	2008				sc
27	Makassar Section IV	Jalan Tol Seksi Empat	2008		sc	sc	sc
28	Bogor Ring Road Section I	Marga Sarana Jabar	2009	sc	sc	sc	sc
29	Kanci-Pejagan	Semesta Marga Raya	2010				sc
30	JORR W1	Jakarta Lingkar Baratsatu	2010				sc

- sc : available in soft copy
 SP : Studi Pendahuluan (Preliminary Study)
 AMDAL : Analisis Mengenai Dampak Lingkungan (Environmental Impact Assessment)
 SPM : Standar Pelayanan Minimal (Standard of Minimum Service)
 RPL/RKL : Rencana Pengelolaan Lingkungan/Rencana Pemantauan Lingkungan (Environmental Management/Monitoring Plan)

1.3.2. Methods of research

This research is begun by the occurrence of an issue on toll road evaluation in Indonesia. In the nature of inductive process of research, the proper method to support this research is a qualitative approach. Through qualitative method, hypothesis is built and theories are explored to explain the prevailing phenomenon (Merriam, 2002). Furthermore, this method requires strong data availability. Therefore, as the characteristics of most qualitative research, this research is *interpretative* and *descriptive* in nature (Sharan, 2002).

The methods are more focused on literature and toll road document. In addition, to follow research procedure of data triangulation (Anfara et al., 2002), source of internet media is used to also ascertain the validity of this research. Firstly, *literature review* is used in answering first question of this research about the link and necessity of ex-ante, in-itinere and ex-post evaluation. All criteria in evaluations (ex-ante, in-itinere and ex-post) are explored based on indicators from international publications. Secondly, *literature review* also is used in answering the second question about the criteria of sustainability and efficiency in road transportation. Sustainability and efficiency as focuses of this research are explored based on international publications. Furthermore, the concept of sustainability and efficiency are derived from journals, books and reports on road transportation, in addition to some literature that focus on specific issue of toll road. This is because the limited sources related specific to toll road sector. Thirdly, *document analysis* is used to answer the third question that explores the existing evaluation in Indonesia. In exploring the phenomenon of toll road operation in present, the first and foremost matter that should be comprehended is the procedure of evaluation process on operated toll road. This necessity is also underpinned by public pressure to evaluate toll road operation regarding unsatisfied service in some toll road sections⁷. By this reason, regulations, procedures and concession agreement are observed in distinguishing the current practice of evaluation in Indonesia. In addition, some sources from internet media also are exploited to comprehend the actual evidence of toll

⁷ See line 23 of page 2: "...much attention has been paid to toll road services ..."

road operation in Indonesia. Lastly, *case study* is presented in order to answer the fourth question concerning the extent of evaluation linkage with regarding sustainability and efficiency as criteria. In this part, Bogor Ring Road and Makassar section IV are used as case study. All data are reviewed and linked to the theory that has been explored in previous chapters regarding evaluation phases and indicators of sustainability and efficiency.

1.4. Structure of research

The framework of this research is inductively underpinned by the current situation of toll road in Indonesia. The main purpose of toll road operation is to improve efficiency on transportation, but the fact, this aim is not completely accomplished. Congested toll road still remains in some sections and causes market failures in some extent. To comprehend with these problems, it is required to explore the evaluation practice on toll road operation. Sustainability *of* toll road evaluation and sustainability *in* toll road evaluation are needed in tackling with the problems. The first notion is related to the linkage of stages of evaluation (ex-ante, in-itinere and ex-post) during the lifetime of toll road, while the latter is connected to the appropriate position in considering environmental, social and economic concern in toll road project at a time. Therefore, this research is aimed to know the extent of different stages of evaluation have been linked (sustainability of evaluation) and to explore the magnitude of sustainability and efficiency have been included in evaluation practice of Indonesian toll road. Several questions are addressed in order to pursue this objective. By using secondary data, the research questions are answered through theoretical aspect (by literature review) and practical aspect (by document analysis and case study). Subsequent step is linking the theory and the practice of evaluation in toll road operation. The result of this analysis is concluded afterwards with also linking to the objective mentioned formerly. The scheme of this framework is pictured in *Figure 1*.

The framework above is structured in six chapters. The background, objectives and methods that are employed within this research have been elaborated in *Chapter 1*. This chapter is aimed to give an overview of the issue concerning toll road evaluation in practice by taking the case of Indonesian toll road. The goal and research questions are posed in this chapter to be answered in specific through each

chapter in the remainder. The first question about the extent of conducting evaluation in different stages is answered in *Chapter 2*. In this chapter, theories about different stages of evaluation are explored through international publication. The linkage between all the stages is also sought out in order to comprehend the applicability of all the stages to be linked comprehensively in practice. In order to gain a sustainable evaluation process, the criteria used in each stage of evaluation should be parallel. In this research, sustainability and efficiency are used as criteria in bridging all stages of evaluation. Thus, these criteria are more explored in *Chapter 3*. The concept of sustainability and efficiency is explored through international journals and books, specifically the relevance of the concepts within road transportation subject. In this chapter, the indicators of sustainability and efficiency are studied to be used in analysis of searching the extent of these indicators have been included in practice. Subsequently, the evaluation of toll road in Indonesian context is analyzed in depth in *Chapter 4* and *Chapter 5*. In *Chapter 4*, the documents concerning toll road operation and evaluation are explored in order to comprehend how the evaluation on toll road should be conducted procedurally. The procedure of toll road evaluation is analyzed through regulations, concession agreement between government and private sectors, and media as well. Furthermore, to know how the evaluation on toll road is actually implemented in practice, two case studies are presented in *Chapter 5*. Bogor Ring Road and Makassar section IV are picked as case studies to be assessed further through the existing evaluation document. In the end, *Chapter 6* presents conclusion of this research by answering the main question with also connected to the answers in each chapter as well. In order to comprehend and improve the overall content of this research, reflection is represented afterwards. Some recommendations are given to improve the existing evaluation and bequeath the possibility for further study.

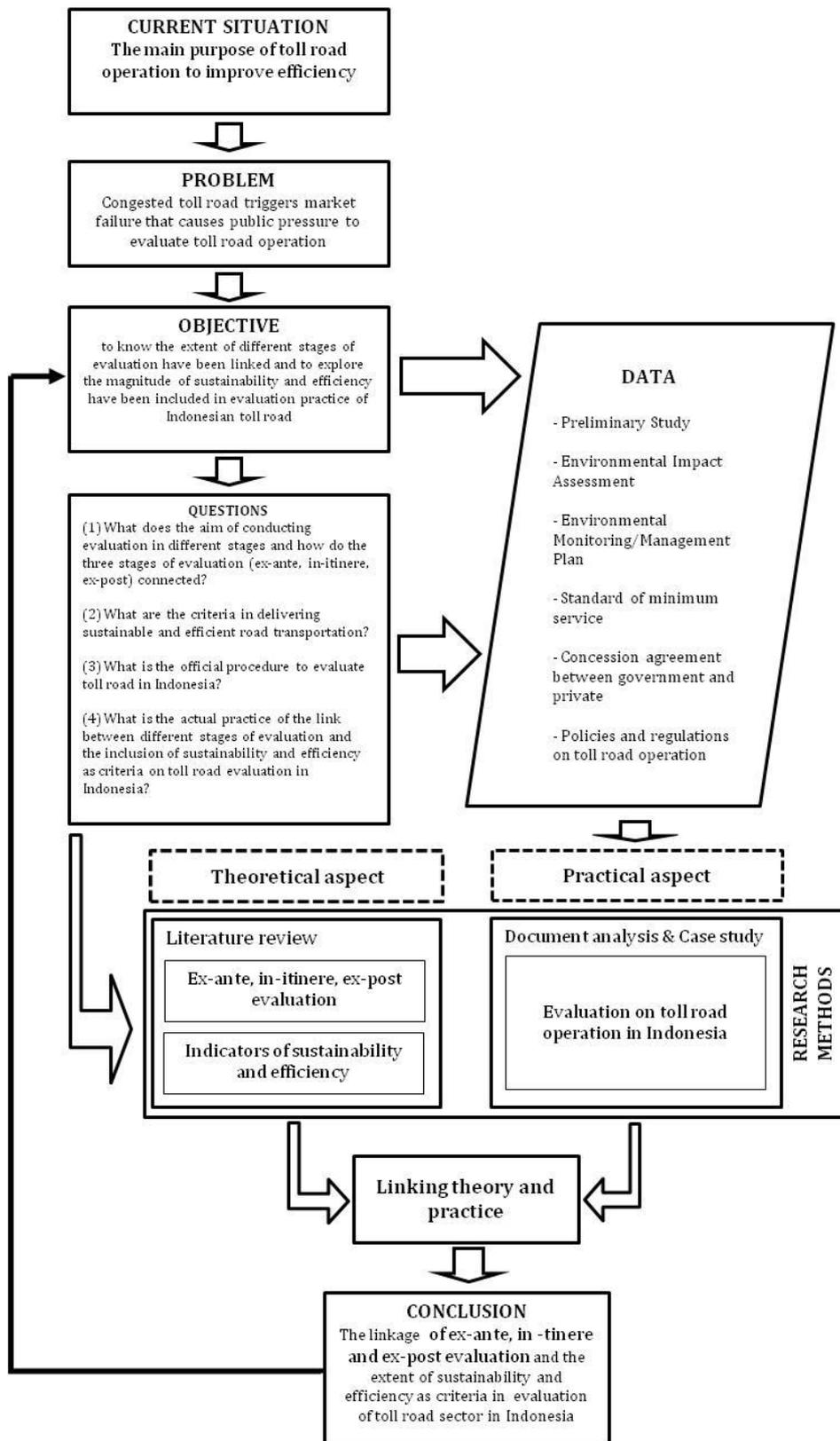


Figure 1 Research framework

Chapter 2 Ex-ante, in-itinere and ex-post evaluation in road transportation

This chapter delves more deeply into the theme of evaluation in road transportation. This research is focused on the utilization of evaluation in toll road sector. However, constrained by the limited sources of literature specific to this sector, the theoretical insights about evaluation are explored within wider subject on transportation and planning practice. International journals and books are reviewed in order to explore the theory and practice of evaluation worldwide, specifically the sources that explain about ex-ante, in-itinere, and ex-post evaluation.

Evaluation practice in planning has been regarded as a tool in valuing certain projects that correspond to benefits, costs and possible opportunities in economic and social context (Haughton, 1988 in Lichfield, 2001). Other definition of evaluation is an approach of assessing the significance, efficiency and effect of a project in pursuing its goal (Giorgi and Tandon, 2000 in Suarez, 2007). It has been established since decades ago, but the implementation has not comprehensively accomplished. Before a project, program, or policy is established, an important element that has to be conducted is ex-ante evaluation that is followed by in-itinere and ex-post evaluation. However, according to Lichfield & Prat (1998), the other two phases that should have to be conducted during the implementation and the end of the project, in-itinere and ex-post evaluation, are rather not considered as parts of evaluation, or even neglected in planning practice (pictured in *Figure 2*).

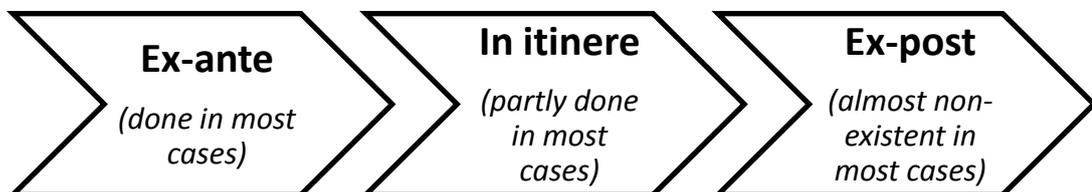


Figure 2 Linkage between ex-ante, in-itinere, and ex-post evaluation (Lichfield & Prat, 1998; Lichfield, 2001) (Visualized by author)

Such situation, however, is a crucial issue related to the sustainability and usability of a project, program, or policy. Even more, the implementation of evaluation has not conducted in completed phases in most of countries. One possible approach to

link all of the phases is through methodological framework (Lichfield & Prat, 1998). Method that is commonly used in ex-ante evaluation should also be applied in arranging both in-itinere and ex-post evaluation. However, the linkage between all of stages has not been applied in most cases of evaluation practice.

In this chapter, the description of each stage of evaluation (ex-ante, in-itinere and ex-post) is elaborated in subchapter 2.1, 2.2 and 2.3, respectively. The features of each evaluation are explored based on five concerns in each phases. These concerns are based on five questions that are posed by Crabbe & Leroy (2008) in exploring the significance of policy evaluation. These questions are used in this research in order to explore the theory about evaluation in systematic order. Besides used in this chapter, these questions are also used in Chapter 5 (case study). The five questions are:

- (1) *Why should evaluation be conducted?* This question is posed to explore the goal and objective of evaluation. Clear definition of objectives and goals affects the properness in determining a method of evaluation (Sijtsma, 2009). Unclear objectives and goals of project evaluation can cause drawbacks in financial aspect: both underestimated and overestimated budget might occur within life cycle project. An example of cost overrun is presented in road transport infrastructure (Flyvbjerg et al., 2003). Each stage of evaluation has distinct aims. Therefore, the goal and objective of each stage should be clarified.
- (2) *For who is the evaluation conducted?* This question is posed to explore the stakeholders in evaluation. In evaluating project, feedback that is revealed by stakeholders is essential to conclude the achievement of the project. Two different types of stakeholders remain within evaluation: decision-makers and (affected) stakeholders in decision-making (Lichfield & Prat, 1998). Both types of stakeholders are explored in this chapter because each stage involves different type of stakeholders. Nevertheless, the one that is concerned in this research is the latter stakeholders.
- (3) *What is the data that should be provided for evaluation?* This question is posed to explore the kind of data required in conducting evaluation. Data availability is one of important elements in conducting evaluation.

Comprehensive evaluation will be attained by sufficient data. However, this subject is also one limitation in policy evaluation. Both data scarcity and data overload might cause ineffective evaluation practice (Crabbe & Leroy, 2008). Furthermore, the data used also has to be suitable with the goal and objective of an evaluation, “agglomeration in evaluation” as taken the words of Sijtsma (2006). In some extent, the type of data is characterized by the aim and the method employed in evaluation. Each stage of evaluation requires different kind of data, or even, there is inter-connection of data used between the stages. This is explored in the remainder.

(4) *How does evaluation conducted?* This question is posed to explore methods to conduct evaluation. Vary methods have been employed in conducting evaluation. The utilization of the method depends on the goal of projects or programs and the complexity within the planning arena (Lichfield, 1998). The existence of multiple stakeholders also affects evaluation method. Combining some methods of evaluation is possible if projects or programs are involving scores of stakeholders that reveal different interests toward the subjects of planning arena. In the literature, the methods that are employed within all stages are diverse, yet, to link all the stages of evaluation needs the same methodological framework in nature (Lichfield & Prat, 1998).

(5) *When should evaluation be conducted?* This question is posed to explore the timeframe in each phases of evaluation. The timeframe of ex-ante evaluation is commonly represented only during the preparation of project, program, or policy design. In-itinere evaluation is conducted afterwards, whereas the project, program, or policy is assessed during its implementation (monitoring phase). This phase is important in refining the project. The last one, ex-post evaluation, is conducted after the project brought to the end.

Because of the timeframe of each stage has been clarified here and to avoid repetition of explanation, the fifth query is not used in the remainder. A table that represents the summary of explanation on each stage is presented in the end of subchapter 2.4 with also describes the framework of in connecting different stages of evaluation. In final words, conclusion is presented in the end of this chapter (2.5).

2.1. Ex-ante evaluation

Ex-ante assessment has been commonly accomplished in most of project evaluation (Nijland & van Wee, 2008). Many studies have been done in exploring this phase of evaluation. Arts (2004) emphasizes the significance of Environmental Impact Assessment (EIA) as ex-ante assessment to be carried out before projects or programs start. He also calls attention to the importance to follow-up this evaluation with subsequent assessment (ex-post). Further concern about the necessity of ex-ante evaluation is also put forward in planning practice. Ex-ante evaluation has been perceived as integral components of the whole process in planning realm (Voogd, 2004). In this research, some concerns are explored to comprehend this phase of evaluation: the goal and objective; the stakeholders involved; the data required; and the method used. These concerns are questioned in the remainder and answered through literature review of international publications.

First query: Why should evaluation be conducted?

The main goal of ex-ante evaluation is twofold in this sense: to predict possible obstacles that might come afterwards and even give a clear direction for decision makers in pursuing the purposed goals (Lichfield & Prat, 1998). Clear objective and specified goal are needed to be defined before a planning process is executed (Loorbach, 2010). In addition, another objective of ex-ante evaluation is to predict risks and uncertainties that become more considered in planning practice (Lichfield & Prat, 1998). The feasibility of most transport projects have to be assessed formerly, before they are developed. This approach is done in order to weigh the beneficial side of project implementation and its trade-off with generated cost. Corresponding to the argument asserted by Sijtsma (2009), project evaluation has a magnitude role in development perspective because of its merit in encouraging improvement. Otherwise, the result of evaluation will be overburdening budget and will be no worthy at all. Connected to environmental concern, for instance, the Environmental Impact Assessment (EIA) also has to be organized in measuring the effect of physical development to vicinity (Arts, 2004; Malloir et al, 2011). Furthermore, evaluation has significant role in conforming the road plan to the existing spatial planning and the existing road network (OECD, 2002). In some extent, ex-ante evaluation is aimed to justify the necessity of the project. Therefore, emphasizing the main goals that have been stated formerly, ex-ante evaluation has

an essential role in decision making process. In the following, these goals and function of ex-ante evaluation are found to be connected with the involvement of stakeholders and the use of data and method.

Second query: For who is the evaluation conducted?

In the past, straightforward approach in planning practice only involved policy makers, who had initiatives, and technical actors, who accomplished the plan into reality (Khakee, 1998). However, such circumstance has changed into more collaborative. Communicative ideology, as stated by Khakee (1998) and Voogd (1998) is emerging in present. Markeiwicz (2005) summarizes three broad categories of stakeholders based on some studies. In addition to policy makers and practitioners (academics, technical actors), another type of stakeholders is also included within evaluation: users. In these days, before a project is implemented, public perception is also regarded as one of main elements in planning, let alone evaluation of a project. This is because whatever the plan of project, it is held in public domain. In further extent, planning process is aimed to improve the livability of public vicinity. In present, road sector even involves a wider scope of stakeholders. Recently, private sectors have got underway to invest their money in public infrastructure (Li & Hensher, 2010). To make sure that they will not attain loss instead of getting profit from the project, private sectors also have concern on the evaluation, or at least on the result of formerly conducted evaluation. Hence, what can be clearly seen is that multiple stakeholders on ex-ante evaluation are persistence in nature. The existence of multiple stakeholders is a challenge for the evaluator, yet, needs neutrality in getting objective result of evaluation (Markiewicz, 2005). In decision making process, these multiplicity in interest possessed by different stakeholders are mapped in arranging strategic steps. As an example, a decision tree that is designed for location of intermodal terminals in Belgium represents the framework of stakeholders' involvement in road provision and management, (Macharis, 2007). In this model, three components of stakeholders are involved in decision making: user, operator/investor, and community. Each stakeholder reveals their own criteria in deciding the best alternative of terminal's location.

To conclude, considering the aims of ex-ante evaluation in road transport planning, stakeholders that has a central role in decision making process is policy makers.

However, in supporting the process of decision making, other stakeholders are also important to be included: practitioners (academics, technical actors) public (users and community), and private sectors (operator/investor).

Third query: What is the data that should be provided for evaluation?

Data requirement is bounded by the method applied for evaluating the project. Some projects might use quantitative data and some other projects might proper for using qualitative data to attain the result. In infrastructure project evaluation, data requirement is mostly focused on quantitative data by forecasting, for example, population forecast, traffic forecast and so forth (Parkin & Sharma, 1999). This data is needed to distinguish the impact of project implementation in the future and as a basis of further analyses. The use of qualitative data is extended by the shift of planning theory and practice into more communicative (Khakee, 1998) and “collaborative” (Healey, 2003). These shifts are corresponding to the existence of multiple stakeholders as mentioned earlier (in the second query of ex-ante evaluation). Thus, perception of stakeholders should be taken into account in ex-ante evaluation. Public perception, in term of users and society, can be obtained by utilizing many kinds of method of data collection: interview, questionnaire, Focus Group Discussion (FGD) and so forth. Furthermore, the combination between quantitative and qualitative data is also possible in practice, as it can be used in Multi Criteria Analysis (de Brucker & Verbeke, 2007) (further explanation about this method is presented in the remainder). Besides quantitative and qualitative data, another type of data that is important in ex-ante evaluation is spatial data. This data is important in road transport in conform the road plan to existing network and spatial plan. Conformity between both plans is essential in choosing the alternative in route determination (Bouwman & Linden, 2004). In Indonesia practice, this conformity is emphasized in Preliminary Study of road section (DTW, 1996). All the types of data represented in former paragraphs in some extent depend on what method that will be employed in ex-ante evaluation. This premise is explained in the following paragraphs by answering the fourth query as well.

Fourth query: How does evaluation conducted?

The use of Cost-Benefit Analysis (CBA) is common in ex-ante evaluation, particularly in road transport investment project (de Jong & van Wee, 2007). This method

focuses on the feasibility of a project in attaining efficiency that assessed by comparing how much benefits can be attained by certain amount costs of transport, and vice versa (Soderbaum, 1998). It relies on quantitative data, ordinarily in monetary term. In practice, CBA is used in determining the value of project by calculating the Interest Rate of return (IRR) and Cost Benefit Ratio (CBR) using preference discount rate (the variance between cost/benefit in present and future over operation or concession period) (Parkin & Sharma, 1999). Furthermore, the procedure in conducting evaluation has become more vary in present. As the existence of multi-stakeholders and complexity becomes more acquainted with planning realm, thus, an emergent method namely Multi Criteria Analysis (MCA) has started to be applied in many cases (Lauridsen, 2003). This method is commonly used in decision making process in order to choose the best one among available alternatives. Further improvement in this emergent method is MAMCA method, a multi-criteria analysis that involves the perspective of multi-stakeholders in decision making (Macharis, 2007). Another approach that can be carried out is by negotiation (Markiewicz, 2005) and discourse (Healey, 2003). Commonly, these approaches are performed because of the existence of multi-stakeholders. Both approaches are done to encourage stakeholders in revealing their perceptions and convincing them to support on certain project. Technological advancement also affects the emergence of computer-based choice models, namely Decision Support systems (DSS) (Voogd, 1998). This approach depends on the assumptions revealed by “the man behind the screen”. Therefore, the decision that is taken by this approach might be bias and not perceived objectively. The trend of using advanced technology in planning practice also occurs by the recognition on Geographic Information System (GIS) in arranging spatial plan as exemplified by Ike, Linden and Voogd (2004) about GIS in the city of Groningen. This tool gives benefit in facilitating planners to arrange each layer within spatial boundary (consists of ground layer, infrastructure layer and occupancy layer (Ike & Voogd, 2004). Besides the methods that are mentioned formerly, there are more methods employed in conducting ex-ante evaluation. These four methods are some methods that are commonly used and discussed in literature. These methods are in the light of science and practice in well-developed countries. Yet, the evidence of successful implementation on evaluation methods has not seen in developing countries.

2.2. In-itinere evaluation

In-itinere evaluation is known as monitoring phase of project implementation. In some cases, the evaluation that follows ex-ante evaluation is considered as ex-post evaluation (Arts, 2004). The same perception also implies to the concept of “monitoring phase”. Monitoring is regarded as ex-post study that follows the implementation of ex-ante evaluation and ensures the extent of project development after it has been accomplished. However, EC (1997) perceives differently between monitoring and evaluation. Monitoring is defined as systematic process of examination on results and outcomes during the accomplishment of certain projects, while evaluation is an assessment of criteria based on the purpose of certain projects within period of time. Although they are perceived differently, both monitoring and evaluation hold a significant role in decision-making process (EC, 1997). Considering all these perspective regarding monitoring and evaluation, this research specifies the scope of in-itinere evaluation as monitoring phase on project evaluation. Nonetheless, academic publication concerning in-itinere evaluation is rather limited. Hence, the discussion about this stage of evaluation is also not as extensive as other stages of evaluation. As applied in previous subchapter, four questions concerning the goal and objective; the stakeholders involved; the data required; and the method used are posed in exploring literature to gain insight about in-itinere evaluation.

First query: Why should evaluation be conducted?

In itinere evaluation, also entitled ex-nunc, is perceived as one of essential part in evaluation of project regarding its function in directing and facilitating improvement in on-going project (Crabbe & Leroy, 2001). This phase of evaluation is performed to supervise the implementation of certain project in order to attain its purpose. Its function is also as intermediate phase, connecting ex-ante and ex-post evaluation (Lichfield & Prat, 1998; Millichap, 1998) although, in some real cases, this function has not comprehensively accomplished. An example of this argument is shown by an analysis of evaluation in British town planning. Lichfield & Prat (1998) examine that the connection between ex-ante and ex-post evaluation was rather not linking each other in the implementation of British town planning. However, not only does a limited exposure on in-itinere evaluation, but different perception in defining this term also remains. Some studies perceive in-itinere evaluation is identical to

monitoring phase of project or program that is conducted (Lichfield & Prat, 1998). Other studies perceive monitoring phase in different time frame; it should be accomplished to observe the achievement of project or program after it has been completed. It is regarded as an ex-post study that is directly conducted after ex-ante evaluation (Arts, 2004; Khandker et al., 2010). Among these two perspectives, this research is following the first perception. There should be a stage connecting ex-ante and ex-post evaluation. Thus, in-itinere is necessary as a linkage between both components of evaluation.

Second query: For who is the evaluation conducted?

The implementation of in-itinere is determined by the purpose of the project and the policies impart with it (Lichfield & Prat, 1998). In this sense, public authority is the main stakeholder that has concern in monitoring phase of public infrastructure. The actors that establish operational stage also take in part on in-itinere evaluation. In toll road operation, specifically, the operational stage is handled by private sectors as operators. In some cases, both policy making and operational stage of toll road are inaugurated by public authority as single actor (e.g. toll road operation in Norway) (Odeck, 2008). However, these two types of concessionaires are different in some extents. Profitability is more concerned by private sector, while affordability is the main issue that is pursued by public authority. Furthermore, public perception is also regarded as an important component that should be involved in in-itinere evaluation, specifically affected community. Lichfield & Pratt (1998) introduced a framework that link ex-ante and ex-post evaluation in British Town Planning. This framework, namely Community Impact Evaluation, put forward necessity of conducting in-itinere to be held in between ex-ante and ex-post evaluation and including public perspective in all stages of evaluation.

Inferring the stakeholders involved in in-itinere evaluation, some parties are similar with the ones involved in ex-ante evaluation. Yet, the stakeholders in this stage of evaluation are become more specific to operational in nature. More discussion about this difference is presented in subchapter 2.4.

Third query: What is the data that should be provided for evaluation?

The first and foremost data that is required in in-itinere evaluation is the result of ex-ante evaluation (EC, 1997). Concerning the aim of this stage to monitor the

implementation of a project, the result of ex-ante is compared with the actual data that is acquired by survey and observation (Lichfield & Prat, 1998). For example, forecast information will be compared with real measurement from project arena. Thus, because of monitoring function of this stage, the data can be formed in quantitative or qualitative data depends on what has been used in previous stage of evaluation.

Fourth query: How does evaluation conducted?

Corresponding to its function, in-itinere evaluation is conducted based by factual information. Field survey and observation is commonly conducted to derive this site-based data (Federico et al., 2009). In common practice of project, monitoring process is done regularly (every quarter or every semester) in order to control the effects of project implementation. The indicators used in this stage should also resemble with the indicators utilized in ex-ante evaluation (Lichfield & Prat, 1998). This is purposed to compare the real condition of on-going project with the possible effects that have been predicted in ex-ante document. In short, the method used in this stage is simply monitoring and comparing the forecast data (in ex-ante evaluation) with the actual and observed data.

2.3. Ex-post evaluation

Theoretically, after a certain project has been accomplished, the final stage of evaluation should also follow. An ex-post evaluation is established in the last track of project implementation. Nonetheless, the arrangement of comprehensive project evaluation (including ex-ante, in-itinere and ex-post altogether) is rather limited (Lichfield & Prat, 1998). According to Lichfield (2001) this last stage has not been applied in many cases. Even more, the ex-post evaluation has been rarely implemented in a-long-period road operation, let alone, in toll road operation. Due to this condition, the needs of conducting ex-post evaluation have emerged in some practical evidence (OECD, 2002; Lauridsen, 2003). It also proves by the existence of some studies that are conducted in some countries as presented in *Table 3*.

Table 3 Ex-post case studies (OECD, 2002)

Country	Ex-post study	Title of the studies	Type of infrastructure projects
Australia	After 5 years	Berrima and Mittagong Bypass case studies	Highway system
France	Between 3 and 5 years after.	Studies identified by the number of the motorway and the main town at each end.	Motorway projects
Norway	After 3 years	Kristiansund Project	Road tunnels and bridges system project
United Kingdom	After 5, 10 or 20 years,	Severn Bridge, opened in 1966 Humber Bridge, opened in 1981 M62, opened in 1966 and 1976 M40 Motorway, A55 North Wales Expressway	Road crossing bridges
United States	Study (completed in 1998) on corridors built between 1965 and 1995	"Appalachian Development Highways Economic Impact Study"	Road projects: motorway Highway system made of different highway corridors from Mississippi to New York

Source: IM2 Group case studies

To explore ex-post evaluation in depth, four queries are questioned to gain more understanding about this stage of evaluation via literature review: the goal and objective; the stakeholders involved; the data required; and the method used.

First query: Why should evaluation be conducted?

Ex-post evaluation is mainly conducted to assess the implementation of certain projects, programs or policies in attaining their objectives after there are accomplished (Lauridsen, 2003). It signifies the achievement of the projects based on several indicators that have been used in previous stages, ex-ante and in-itinere evaluation (the indicators used in all stages should resemble each other) (Lichfield & Prat, 1998). What should be kept in mind is that the objectives of project that have been revealed in ex-ante also correspond to the establishment and result of ex-post evaluation. Thus, clear statement of goals in the initial step is essential in order to sustain the process of evaluation. Another aim of ex-post evaluation is to assess the implementation of certain projects, programs or policies in attaining their objectives after they are accomplished (Khandker et al., 2010). In some extent, this stage of evaluation is also functioned as monitoring phase. In Indonesian toll road, for example, the evaluation on standard on minimum service is held after the completion of toll road project (post-construction), yet, in reality it is included in monitoring system of toll road operation. This perception views monitoring phase in operational stage of project. However, this research views the implementation of standard of minimum service as ex-post evaluation. Further explanation is giving in Chapter 4.

Second query: For who is the evaluation conducted?

The project owner, commonly government, is the main actor in which responsible providing public infrastructure (Parkin & Sharma, 1999). Another proponent of road transport project, private sector, also has concern in ex-post evaluation. Specific in toll road management, private sector as operator should accomplish some requirements regarding toll road performance and operational effect, such as accessibility and environmental quality, respectively (Nijkamp, 1994; OECD, 2002). Last but not least, users and local community also takes part as “recipient” or “object” of infrastructure provision (OECD, 2002). Thus, public perspective also has to be taken into account in knowing the extent of project in affecting their transport activity (users) and livability (community).

Corresponding to the existence of stakeholders, the involvement of them in ex-post evaluation of road transport should be similar to the participants in previous two phases. Dissimilar with other phases, the result of ex-post evaluation is completely a depiction of real effect of implemented projects (Lichfield & Prat, 1998). As stated in previous paragraph, the stakeholders involved in this stage are government, private sectors and public. These stakeholders resemble with the ones in ex-ante evaluation (except practitioners) and in-itinere evaluation. Underpinned by the argument that poses the necessity of similarity on stakeholders’ involvement, practitioners should also be included in this stage. Academics and technical experts are beneficial to give recommendation if there is a need of improvement on the project or upcoming project. The similarity of stakeholders somewhat affects to the similarity in method of assessment as well. This claim is supported by the answer of fourth query in this subchapter.

Third query: What is the data that should be provided for evaluation?

Regarding its dependency on the formulation of project and policies, the data required is mostly related to survey and investigation of on-going project. The result of ex-ante evaluation is also required to compare the predicted effect with observed reality of certain project (de Jong & van Wee, 2007). Similarly, ex-post evaluation also utilizes primary data attained from direct survey and observation. Not only does quantitative data required for this evaluation, qualitative data is also needed in achieving valid, reliable and credible data (DiNardo, 2010). These requirement of

data might be seen resemble with the data needed in in-itinere evaluation. However, in some extent, data requirement is different in both stages. It depends on which stages of project the data is used. In-itinere evaluation is commonly conducted during construction while ex-post evaluation is conducted after project completion (operational phase). The difference is also affected by the method used in both stages of evaluation. Further explanation about the methods is presented in the following.

Fourth query: How does evaluation conducted?

In addition to field survey and observation in obtaining actual data, there are many approaches found in literature that can be used in ex-post evaluation. Khandker et al (2010) reveals a number of methods in terms of operational research, such as randomized evaluations, matching methods, double-difference methods, instrumental variable methods, regression discontinuity and pipeline methods and distributional impacts (Khandker et al, 2010: 27). The traditional method CBA is also utilized in some cases. The Department of Transport and Regional Services in Australia, for example, uses CBA method in analyzing both ex-ante and ex-post evaluation of Wallavile highway bridge (BTRE, 2007). The utilization of these approaches, however, depends on suitability and context of the project, because each project has 'unique' characteristics. The evaluator has a significant role in these aspects and has an independent concern that leads to reliable outcome (Markiewicz, 2005).

2.4. Connecting stages of evaluation

After exploring the three stages of evaluation, *Table 4* is presented to summarize the review of literature concerning evaluation. From the table it can be seen that all phases of evaluation are not completely connected each other. The stakeholders involved are not corresponded to each other. In monitoring phase (in-itinere) for example, the activity only involves limited actors compared to the other two phases. The applied method is also rather limited in this phase. These assumptions might be caused by the limitation in number of publication. The international publication that focuses on in-itinere evaluation as main topic is only a few compared with the publication that discusses ex-ante and ex-post evaluation.

Table 4 Five concerns in exploring evaluation at different stages and the availability of each step of evaluation in international publication

	Ex-ante	In-itinere	Ex-post
Goal(s) and objective(s)	<ul style="list-style-type: none"> - predicting possible obstacles that might come afterwards - giving a clear direction in pursuing the purposed goals - supporting decision making process 	<ul style="list-style-type: none"> - supervising the implementation of certain project in order to attain its purpose - directing and facilitating improvement in on-going project - connecting ex-ante and ex-post evaluation 	<ul style="list-style-type: none"> - assessing the implementation of certain projects, programs or policies in attaining their objectives after there are accomplished
Stakeholder(s)	<ul style="list-style-type: none"> - Government (policy makers) - Practitioners - Public (users & community) - Private sectors 	<ul style="list-style-type: none"> - Government (public authority) - Private sectors - Public (community) 	<ul style="list-style-type: none"> - Government (policy makers) - Practitioners - Private sectors - Public (users and community)
Data	<ul style="list-style-type: none"> - Forecast information - Public opinion - Spatial plan 	<ul style="list-style-type: none"> - Actual data - Result of ex-ante 	<ul style="list-style-type: none"> - Actual data - Result of ex-ante
Method(s)	<ul style="list-style-type: none"> - CBA - MCA - DSS - GIS 	<ul style="list-style-type: none"> - Field survey and observation - Monitoring and comparing 	<ul style="list-style-type: none"> - Field survey and observation - Operational Research methods - CBA
Timeframe	Before project construction	During project implementation	After project accomplished
International publication	Sufficient	Limited	Sufficient

As mentioned beforehand, only limited studies have proven the necessity of linkage between three stages of evaluation. It seems like there is a gap in the implementation as well as the discussion about each stage of evaluation. Many have known about the implementation of ex-ante evaluation through much improvement on method applied in this stage (CBA, MCA, GIS). It is also extended by the worldwide occurrence of environmental awareness recently that brings about such obligation to conduct EIA before completion of projects or programs. The next stage, in-itinere evaluation is limited in both theory and practice. The use of this term sometimes use interchangeably with “monitoring” in some literature, but both terms are differed in other literature. Yet, some researchers that expert in evaluation argue that this stage of evaluation has the same importance as the other stages because it links both stages in between (Lichfield & Prat, 1998). The last stage, ex-post evaluation is also not presented in abundant sources internationally. However, the example of implementation and the call for conducting this stage have been numerous in some countries⁸. From these explanations, it can be concluded that it is necessary to link the three stages of evaluation altogether.

The initial step to bind all the stages of evaluation is using the same criteria to assess a project or program within evaluation. As stated by Lichfield (1998), all stages of evaluation have to use the same criteria in order to attain a continuity of evaluation⁹. In this research, sustainability and efficiency are used as criteria in all three stages. Why are these criteria used to assess the achievement of project? This question is answered in the subsequent chapter (Chapter 3). The framework analysis of these criteria within all three stages is given in the following.

Taken the scheme of decision tree that was designed by Macharis (2007) for LAMBIT evaluation, the framework in connecting different stages of evaluation is designed as *Figure 3*. This framework is applied in all three stages of evaluation (ex-ante, in-itinere and ex-post). The framework of evaluation in this research is focused on two main stakeholders: toll road user and community in toll road vicinity. The following explanation describes all elements of evaluation framework.

⁸ See subchapter 2.3.

⁹ This argument is taken as the ground theory in conducting this research

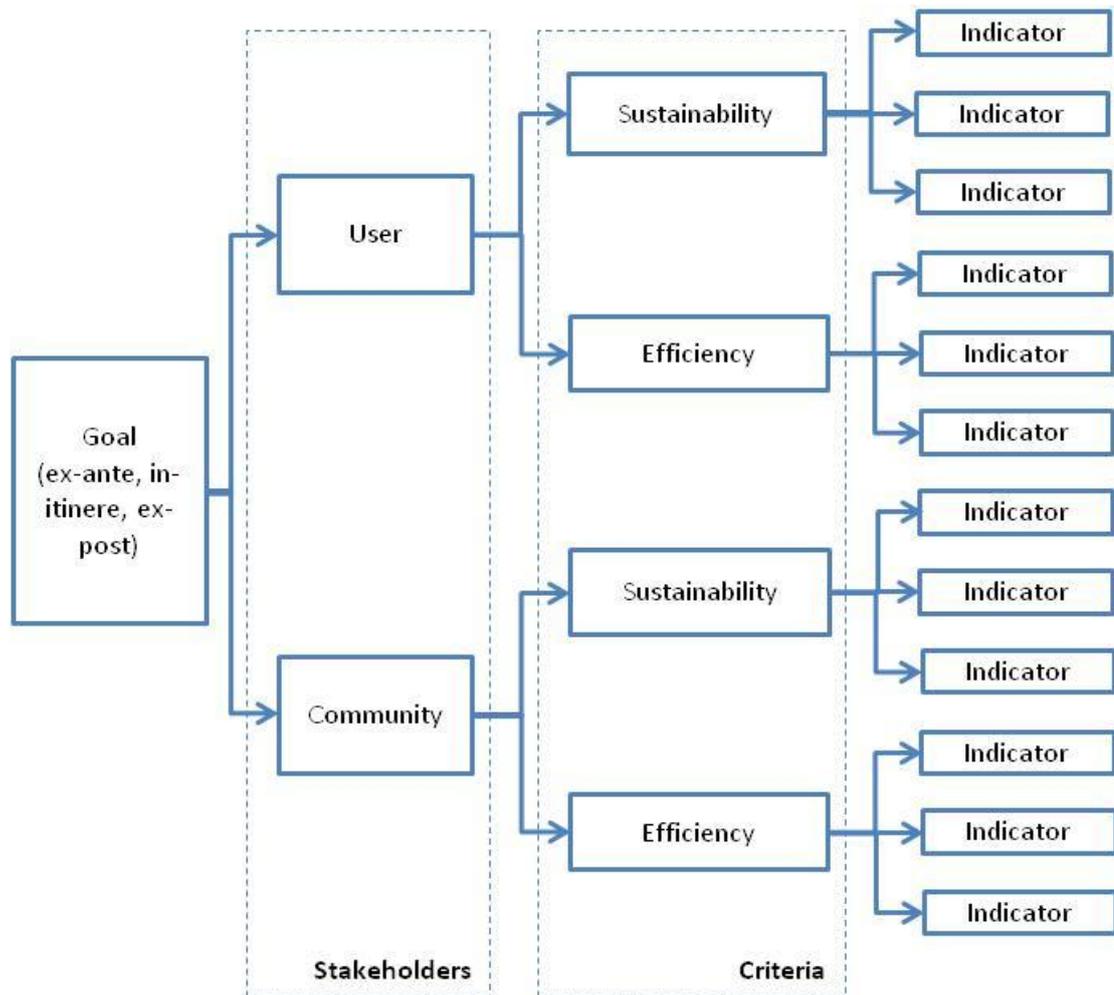


Figure 3 Theoretical framework of analysis (Author, 2012)

Goal: The goal of this research is to find the possibility to include sustainability and efficiency in toll road evaluation. This goal is applied in all stages of evaluation (ex-ante, in-itinere and ex-post).

Stakeholders: The stakeholders that are considered in this research are toll road user and community. It is underpinned by the extent of infrastructure development, in this case toll road operation, for improving the well-being of social subject. Thus, in this research, the perspective of users and community is considered in determining the criteria.

Criteria: The criteria are focused on sustainability and efficiency related to the stakeholders (viewed from users' perspective and community's perspective). The main concern in this research is sustainability and efficiency in road transportation. The limitation on sources that related to toll road sector cannot be obtained

sufficiently because of less publication discusses about sustainability and efficiency in toll road as specific topic.

Indicators: The indicators of sustainability and efficiency are explored based on literature. The indicators are focused on road transportation issue within the boundary of both concepts. The indicators are explored in general view in Chapter 3 and then distinguished into two perspectives of stakeholder in the analysis on Chapter 5.

2.5. Concluding remarks

The concept and applicability of different stages of evaluation has been explored in this chapter. The features of each evaluation are explored based on four concerns: (1) why the evaluation should be accomplished; (2) for whom the evaluation is conducted; (3) what data should be provided; and (4) how is evaluation performed. According to many sources, the linkage between all phases of evaluation is limited. The limitation also occurs in the existence of in-itinere evaluation in theoretical realm and empirical evidence as well. Based on the literature, one finding is acquired about how to link all the stages gradually: all the three stages should use the same criteria. This finding is used as initial step in exploring the extent of the stages have been linked in practice. For further exploration, this research concerns on the linkage of these phases with also considering sustainability and efficiency as criteria. The exploration about both concepts of sustainability and efficiency in road transportation is carried out in Chapter 3.

Chapter 3 Sustainability and efficiency in road transportation

This chapter explores the two most important concepts in-depth. The first part of this chapter (3.1) is focused sustainability and the second part (3.2) is concentrated on efficiency. These concepts are explored through literature review of international publication concerning road transportation in form of journals and books. By using keywords related with both notions, some indicators of sustainability and efficiency in road transportation are obtained. These indicators are presented as the result of this chapter that enables us to answer the questions of this research in the following chapter. Following the explanation of sustainability and efficiency, the link between both concepts is presented in subchapter 3.3. In the final subchapter (3.4), a conclusion is delivered to wrap up the magnitude of the two concepts in this research and straighten the boundary of both concepts in further analysis.

3.1. Sustainability as criterion in road transportation

At present, much attention has been given to the applicability of sustainability. Many studies related with this concept are deeply discussed in international publication (Campbell, 1996; Connelly, 2007; Berke & Conroy, 2000; Shore, 2006). The concept of balancing economic, social and environmental aspects in development become more ubiquitous as an effect of externalities arisen through growing population, particularly in urban areas. The externalities, such as climate change, fossil fuels depletion, pollution and urban sprawl, have not been considered until the consequences surpass the limit and affect the health of people living in urban areas with deteriorated environment as well (Dur et al., 2010). However, sustainability has been perceived as a fuzzy concept by many scholars (Campbell, 1996; Connelly, 2007). The fuzziness is underpinned by the ambiguous definition of this notion within the three concerns (economic growth, social equity and environmental protection). Despite its fuzziness, this concept has been considered as significant factor in recent praxis of planning because continuity is expressed as important component of development. Hence, in order to clearly answer the question of this research to include sustainability as a criterion in toll road project, this concept is

firstly defined 3.1.1. Subsequently, the sustainability in road transportation infrastructure is explored in 3.1.2. Lastly, the indicators of sustainability in transportation are listed in 3.1.3 as the basis of analysis in toll road project evaluation.

3.1.1. Concept of sustainability

The notion of sustainable development has been renowned since a couple of decades ago as defined in the 1987 Brundtland Report for the United Nations. Based on this report, the prominent definition of sustainable development is “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (in Black, 1996: 151). This definition has been widely known and used in many literatures. Yet, Wheeler (2004) argues about relativity in defining “needs”: every person has different perspective about their own needs. He also claims that there is no precise definition of sustainability because it depends on which point of view that has been considered. This argument is also in line with a claim posed by Harper & Stein (1995) that everybody has their own right but also limited by every other person that has the same rights. Up to this point, the concept sustainability is indeed fuzzy. So, why does this concept considered important? What is actually should be sustained? Needs? The answer of the magnitude of sustainability is basically underpinned by the emergence of environmental awareness in present. People start to realize about the limit of carrying capacity inherent with environment. They realize about what is called “limit to growth” (Wheeler, 2004) of their natural environment. Some scholars perceive sustainability as an important issue as human behavior has started to instigate multiplier effects to their environment, particularly natural environment. Urban development has been followed by degrading natural resources, urban sprawl, air pollution, noise and congestion that have been perceived as factors involved in sustainability issue (Dur et al., 2010; Shore, 2006; Nijkamp, 1994). So, what is important in this sense is not “the needs of generation”. Connecting this concept with “demand and supply” in economic literature, it can be posed that instead of sustaining demand, what is important is sustaining the

supply. So, in other words, it is essential in sustaining the environment in line with economic and social concern so that future generation will experience the same supply. This can be done by adjusting demand of people in present, as also supported by Shore that has described sustainability in terms of environment, social and economic contexts as “the future costs of today’s decision” (2006: 33).

In planning realm, approaching sustainability means anticipating and managing problems in advance before crises starting to emerge. This idea is defined by Berke and Conroy (2000) that further discuss the extent and achievement of sustainability in planning practice. They also emphasize on the necessity to tighten the link between sustainability in theory and praxis. In line with the compulsion of this connection, Campbell (1996) introduces the concept of sustainability in planning domain through “the planner’s triangle” that shows conflicting relation between three priorities of development: economic growth, environmental protection and social equity. The position of sustainability itself is at the intersection of these three priorities. The idea of planner’s triangle is also supported by later finding of “sustainable development map” that is discovered by Connelly (2007). In this map, all of the priorities are conflicting each other, thus, correspond to the ambiguous definition of sustainability as a “fuzzy” and “contested” concept (Jacobs, 1995 in Connelly, 2007). Nonetheless, the vagueness of sustainability instigates many debates among scholars about which matter that can be considered as the most essential point of sustainability: ones concern on environmental issue; others concern on economic issue, and the rests concerns on social issue.

Corresponding to what have been explained, these three perspectives of sustainability are somewhat underpinned by the necessity in sustaining environment. For example, Jacobs (in Connelly, 2007) has claimed that the relation between economic and environmental concern is mutually benefit. Focusing environmental concern on development will give benefit to economic concern. Reversely, emphasizing economic concern will give benefit to environment through technological advancement in improving the quality of environment. However, opposing argument also remains within

this notion, particularly in transportation sector. Further discussion about this is presented in the following.

3.1.2. Sustainability in road transportation infrastructure

In term of infrastructure systems, sustainability can be defined as “*the ability of a system to function long into the future*” (Martland, 2012: 5). Social perspectives on this issue are differently seen between developed and developing countries. In developing countries, infrastructure provision takes much interest of private sectors to invest by forming a partnership with public sectors, particularly in toll road projects. This is reasoned by multiplier effects that are expected to boost economic growth, to increase job opportunities and income with also give ample profit financially. Thus, before delivering certain kind of infrastructure, project evaluation is needed to assess the significance of the project. In this case, some aspects regarding sustainability have to be taken into account: financial, economic, social and environmental concerns. The first is more focused when private sectors are involved in delivering infrastructure, while the latter-three are concentrated to infrastructure provision delivered by public sector (Martland, 2012).

However, instead of describing the significance of sustainability as a concept in transportation, several findings are rather to be more focused on reversed context: *the unsustainability of transport* (Black, 1996: 151) or *nonsustainable transportation* (Black, 2010: 5). This perception is underpinned by the negative externalities that are caused by transport activity. Obviously in urban area, road transport exists as facility in delivering goods, services and passengers, yet, also contributes in producing externalities. As urban area developed within the last decades, people tend to live in the border or even outside the city. Commuters have been spread as scatter homes outside the countryside surrounded the “steel magnet” of city center; new towns are built being satellites around developed cities. Transportation facilities to ship food and other basic needs have been provided to support this condition (Shore, 2006). Based on study conducting by IPCC, transport activity shares 13.1 percent in producing Green House Gases (GHGs) emission that, further, affects to climate change (IPCC, 2007).

In addition, based on health effects of transport in Europe, traffic can harm people's health in urbanized area because of the emission derived from fossil fuel-vehicles that emit a range of gaseous air pollutants and suspended particulate matter (WHO, 2005). Some approaches have been established in some countries moving toward sustainability to internalize the externalities, one of which is road pricing (Shore, 2006; Litman, 1999; Nijkamp, 1994) and polluters' pay (Nijkamp, 1994). Unfortunately, measuring the cost of certain transport external effects is not an easy task. As exemplified by Nijkamp (1994), the occurrence of externalities such as congestion costs, environmental pollution and deterioration, and fatalities cannot be measured in specific quantity. However, other scholar has perceived sustainability in transportation by the factors involved in the notion of sustainability. In his article, Litman (1999) points out that efficiency, equity and sensitivity in environmental context are factors needed in approaching sustainability in transportation. In this research, efficiency is solely positioned as the same important as sustainability in toll road evaluation. It is connected with the function of toll road in improving efficiency. Further discussion about this matter is presented in subchapter 3.2.

Corresponding to the former paragraphs, inclusiveness of sustainability in road transport sector has not shown a positive response. Road transport has given negative externalities to environment. Based on report of Indonesia Climate Change Sectoral Roadmap (ICCSR), about 20 percent of CO₂ emission in Indonesia comes from road transport sector in 2005 (Bappenas, 2010). In extreme condition, pursuing sustainability in road transport sector might cause no development will be executed. Some approaches in internalizing the externalities are successful in some extent. Another way in pursuing sustainability in road transport is including this notion as criteria within the implementation of road project. Hence, to include this notion in road transport, the indicators of sustainability should be firstly explored. The exploration of the indicators within literature is performed in the remainder.

3.1.3. Indicators of sustainability in road transportation

Following the explanation concerning the use of sustainability as a concept in transportation, some indicators of this notion are explored based on findings in international publications. The indicators are divided based on the “*triple bottom line*” (Richardson, 2005: 30) related to sustainability: environmental protection, economic growth and social equity. The indicators are obtained from the exploration of international publications (journals, books and reports) that concerns on road transportation.

First objective: Environmental protection

The first and foremost concern in sustainability is basically environmental protection. Opinion about this factor of sustainability is found in one of Herman Daly's article (2006) which presents the argument about two distinct concerns of sustainability: “utility” in terms of happiness, and “physical throughput” in terms of natural sources. He argues that utility, or in this case happiness, is a vague concept because it can be defined in subjective and relative perception. Thus, among these two concerns, he views that sustainability should be more focused on the capacity and continuity of natural capital flow in supporting economy to be experienced by future generation. Consequently, he considers that the quality of ecosystem in supporting economy should be “non-declining” (2006:39), or in other words, should be sustained. His argument on “strong sustainability” (2006:40) that is more concentrated on “ecological concern” is also strengthened by “deep ecology” that was introduced by Arne Naess, and “limits to growth” (Wheeler, 2004). However, applied these deep perspectives on ecology in some extent will halt development activity. Thus, what is needed is to protect the environment by considering this criterion in development. To include this concern in road transportation sector, some indicators should be considered in advance. In the following, two important indicators of sustainability in road transport concerning environmental protection are presented through literature exploration: atmospheric quality and noise.

Atmospheric quality (pollution)

The recent environmental issue of climate change has taken much attention, correspondingly in road transportation. Some literatures argue that transport sector has been one of the causes contributing the happening of climate change (Dur et al., 2010; Black, 1996). The decreasing atmospheric quality is indicated as one of factors influencing sustainability in transportation (Black, 1996; Kennedy et al, 2005). This claim is underpinned by the negative side of motorized vehicles in producing emission (Richardson, 2005) and heat.

Noise

In this prevailing era, residential area has been widened up to periphery regarding the less cost of land. This vicinity is supported by the availability of access to highway or toll road. On the one hand, people live in proximity with highway or toll road, indeed, attain some benefits: easy access, less travel time and so forth. On the other hand, such condition also costs some negative externalities affecting the livability of their neighborhood (Malloir et al, 2011). After air pollution, noise nuisance is also another side effect of transport infrastructure to environment (Nijkamp, 1994; Black, 1996).

Second objective: Economic growth

The position of economic in sustainability concern has been argued in some literature. Conflicting position between economic, social and environmental concern is implied in economic theory. In this theoretical bound, economic produces externalities on social and environmental (e.g. pollution) (Wheeler, 2004). However, more positive argument also remains that perceives economic growth can also improve the other two concerns (Connelly, 2007). Even more, Daly (2006) has emphasized the needs of adjusting consumption of natural resources in steady level to pursue sustainability, known as “steady-state economics” introduced by John Stuart Mill (Wheeler, 2004: 56). Nevertheless, among these opposing arguments, economic growth still cannot be detached from sustainability concept, because it attaches to social well-being and ecological improvement. Some scholars have presented many indicators of sustainability in road transportation that has concerned with economic growth. In this research, three indicators are considered essential

in indicating economic sustainability (welfare, cost effectiveness and accessibility and mobility) as explained in the following.

Welfare

Essentially, discussion about welfare cannot be separated from the interconnectedness of the three concerns of sustainability. One of dimensions of welfare that is obviously measured is Gross Domestic Product (GDP), whereas not only shows economic growth of a country but also represents social prosperity within the nation. However, environment can also affect the advantages of social welfare both directly and indirectly. The first influence is shown by affability of environment and the second one is indicated by the level of producing goods and services (Nijkamp, 1994).

Cost effectiveness

Many concerns in social, economic and political interests can be sorted out through the presence of cost effectiveness in infrastructure provision for public prominence (Kennedy et al, 2005). Delivering sufficient infrastructure in certain spatial boundary will also escalate the economic performance of the area. Hence, this element can also be perceived as indicator of economic growth.

Accessibility and mobility

The ease to approach goods and services also affects the level of sustainability of a transport project. The more advantage given by the transport system in accessing destination, the more sustainable the project would be (Litman & Burwell, 2006). In line with this argument, Richardson (2005) and Kennedy et al (2005) also regards accessibility as one of vital elements in measuring sustainability in transportation.

Third objective: Social equity

The last objective of sustainability is seen from social perspective. Wheeler (2007) argues that the notion of social equity has been poorly defined in practice. In line with Forester's argument (1989) the existence of power domination in decision-making realm in some extent affects equity in development, particularly in developing countries. However, as planning arena now involves collaborative approach, social concern has been put

forward in pursuing sustainable development. Berke and Conroy (2000) focuses sustainability on actions that are delivered by community in anticipating and accommodating the needs of future generations in terms of planning practice. Hence, public perspective is regarded as important element to be included in planning process to pursue equity, particularly in delivering road transport project. Corresponding with this claim, the indicators of this concern should be explored. By using international journals and books, four indicators are found to be essential in indicating sustainability in road transport concerning social equity: public acceptance, safety, congestion and crash fatalities.

Public acceptance

In delivering transport infrastructure, particularly road transport, public acceptance is one of important factors that have to be considered. Specific in toll road project, public approval of intruding their environment is a critical issue, mostly in pre-construction stage of land acquisition and resettlement. Furthermore, the impact of highway or toll road development should also be considered in Environmental Impact Assessment that involves the community as project's proponent (Wood, 2003; Litman & Burwell, 2006). In some extreme cases, once public oppose to support the development; they can constrain the project to be delayed or even halted, commonly termed "*not in my backyard*" (NIMBY) (Malloir et al, 2011). In the perspective of community as road users, specifically the tolled one, a survey known as *willingness to pay* (WTP) and *ability to pay* (ATP) is usually conducted to comprehend public acquiescence of the project, in addition to recognize public expectation of the toll tariff.

Safety

Some scholars perceive this indicator as significant factor in assessing whether a transport project is sustainable or not. This indicator is, somewhat, related to other indicator (crash fatalities) that is further presented in the remainder. The level of safety can be measured by the occurrence of crash within the transport system (Richardson, 2005; Litman & Burwell, 2006). Furthermore, Lee (2000) and Nijkamp (1994) argue that a transport project benefits and sustainable when it can improve safety.

Hence, the improvement in safety can also enlarge the capacity of (road) transport that allows an increase in speed limit at the same time (Lee, 2000; Black, 1996).

Congestion

External effects of transport activity always remain both positives and negatives. One of the negatives, congestion, has been an obvious problem in transportation, particularly in urban areas. Hence, the recent condition of urban transport is considered unsustainable because of this obstacle (Black, 1996; Richardson, 2005; Nijkamp, 1994). One approach proposed by Litman (2010) in reducing congestion is increasing highway capacity. Moreover, the level of congestion is also related to other indicators in this research: Level of Service (LOS) and travel time.

Crash fatalities

Connected with safety as sustainability indicator (Litman & Burwell, 2006), crash fatalities is also indicated road transport sustainability. This argument is caused by the following cost effect innate with road accidents: *material damage, productivity and production loss, medical costs, prevention costs and public services expenditures* (Nijkamp, 1994: 268). Hence, in public perspective, this indicator triggers many drawbacks in economic and greater downside in social concern.

To sum up, the indicators of sustainability in road transportation as explicated above are listed in *Table 5* below based on literature. The sign (+) and (-) following each indicators imply the negativity or positivity of impact in social perspective. The measurement of each indicator is also presented, yet, it is differently performed in practice.

Table 5 Indicators of sustainability in road transportation

<i>Objectives</i>	<i>Indicators</i>	<i>measurement</i>	<i>References</i>
environmental sustainability	<i>Air pollution (-)</i>	<i>Concentration of NO, HC, CO</i>	<i>Black, 1996; Kennedy et al, 2005; Richardson, 2005</i>
	<i>noise (-)</i>	<i>Noise level</i>	<i>Nijkamp, 1994; Black, 1996; Malloir et al, 2011</i>
economic growth	<i>welfare (+)</i>	<i>GDP</i>	<i>Litman, 1999; Nijkamp, 1994; Kennedy et al, 2005</i>
	<i>cost effectiveness (+)</i>	<i>Travel time saving</i>	<i>Kennedy et al, 2005</i>
	<i>Accessibility and mobility (+)</i>	<i>travel rate, traffic speed</i>	<i>Litman & Burwell, 2006; Kennedy et al, 2005; Richardson, 2005; Nijkamp, 1994; Malloir et al, 2011</i>
social equity	<i>public acceptance (+)</i>	<i>Willingness to pay/ability to pay</i>	<i>Wood, 2003; Litman & Burwell, 2006</i>
	<i>safety (+)</i>	<i>Speed limit</i>	<i>Richardson, 2005; Litman & Burwell, 2006; Black, 1996; Nijkamp, 1994</i>
	<i>congestion (-)</i>	<i>Total delay, queue time</i>	<i>Black, 1996; Litman, 2010; Richardson, 2005; Nijkamp, 1994</i>
	<i>crash fatalities (-)</i>	<i>number of accidents</i>	<i>Nijkamp, 1994; Litman & Burwell, 2006</i>

3.2. Efficiency as criterion in road transportation

To be clearly defined, firstly in 3.2.1, the concept of efficiency is explained in general. In this subchapter, broad concept of efficiency viewed from various scholars and different perspectives is explored. The remainder part (3.2.2) delves into more specific utility of the concept of efficiency in transportation sector. In the end of this subchapter, indicators of efficiency in transportation are presented (3.2.3) to be brought into the next chapter of analysis.

3.2.1. Concept of efficiency

The concept of efficiency has been explained differently viewed from different perspective. Essentially, broad definition of efficiency has been represented mostly in economic context since 1970s. In term of exchange economy, efficiency is implied if the marginal rate of substitution between two goods is the same for two individuals (Glaister, 1981). Observed from macroeconomic theory, efficiency or *Pareto Optimum* (Friedman, 2002: 26), is defined as the condition in term of resource allocation which “*no person can be made better off without making another person worse off*”. The latter definition also has been utilized in a broader subject, such as development studies and fiscal arrangement (Fisher, 1996). Furthermore, efficiency can also be formed in vary category based of which perspective is concerned: economic efficiency and transportation efficiency. The first concern - economic efficiency- has to do with “the use of society’s resources to achieve maximum net benefit” (Litman, 2010). This perspective is more concerned with the benefits derived by the existence of the transportation system related to the revenue obtained. The instance for this perspective is the implementation of road pricing. The more beneficial the road exists, the more efficient the system in term of economic.

The latter concern –transportation efficiency- is more focused to the connection of supply and demand in transportation system, about the appropriate supply of transportation infrastructure to fulfill the demand of citizens. It means that this perspective more affects to provide more supply to satisfy the demand, or in other words, built more roads to satisfy the population. This perspective has been regarded as one way to reduce transport problem, namely congestion. Toll road, for example, has been developed in order to provide sufficient facility for public and to improve efficiency to support economic activity (TDA, 2003; Ahua, 2004; Cox & Pisarski, 2004; Hartgen & Fields, 2006; Poole, 2006; all in Litman, 2010). Conversely, some contrasting opinions also come to light against this point of view (Black, 1996). They claim that provide more supply on road transport instead of providing sufficient service on public transport (e.g. Mass Rapid Transit) will trigger more demand and, thus, more private motor vehicles. These conflicting arguments depend on which perspective is taken to view

the issue. The latter is seen efficiency as a conflicting concept toward sustainability. On the other hand, efficiency is a part of sustainability. These different opinions are discussed further in subchapter 3.3. To be more clearly defined, the use of efficiency as concept in transportation is needed to be explored.

3.2.2. Efficiency in road transportation

In the existence of efficiency, transportation can extend the utility of goods through geographic specialization, large-scale production, increased competition, and increased land values (Coyle et al, 2000). In this sense, the concept of transportation consists of place and time utility regarding value of goods. Place utility can be obtained if the value of goods after transporting is higher than before transportation activity occurs. Time utility means that the goods can be attained when it is required because of transport activity. Transportation also imparts with some characteristics as movement service, affected by the equipment utilized, related to the cost of transporting service, and lastly, as one of the economic factors in the production of goods and services.

Transportation and economic productivity have a strong connectivity. Economic efficiency is related with benefit and cost. Thus, to attain economic efficiency, the costs of transporting resources (time, land, risk, energy) should be as lower as possible. In other case, economic efficiency can also be obtained if the value derived from the transportation activity increases, means that the higher the value of opportunity costs, the efficient the transportation. Furthermore, there are some principles in maximizing economic efficiency and productivity: user options, efficient pricing, prioritization, and economic neutrality (Litman, 2010). Specific in Indonesian transportation infrastructure project, *Feasibility Study* has been a common procedure that has to be rehearsed in order to assess the benefits and costs of the project, in other words, measuring whether the project is efficient or not. Obviously, Cost-Benefit Analysis (CBA) has been applied in measuring both components of efficiency (Banister, 2002).

In addition to economic perspective, efficiency in transportation also can be viewed from other perspectives: engineering, management and planning (Levinson, 2003). If economic perspective relates efficiency with utility and consumer's surplus on benefit versus cost of service, the other three connect efficiency with different theme. Engineering view relates efficiency with mobility and safety; management view connects efficiency with productivity, and; planning view associate efficiency with accessibility. The combination of these perspectives is pondered by Morisugi (2000). He claims that to attain efficiency, transportation project should generate significance impact (positively) on social net benefit that includes utility, mobility and accessibility. This also in line with Lee (2000) that views the magnitude of project benefits by also taking the externalities into consideration in obtaining efficient transportation project. Among these different perspectives, relevance components in pursuing efficient road infrastructure are indicated by mobility, safety and accessibility. Besides these indicators, there are more indicators of efficiency in road transportation that are also found within literature. Further exploration about these indicators is presented in the remainder.

3.2.3. Indicators of efficiency in road transportation

Many scholars have explored the significance of using efficiency as a concept in road transport, some of which have established improvement in method to measure efficiency. Some experts in transport planning have discerned the assessment of efficiency by employing frontier analysis. Data Envelopment Analysis (Odeck, 2008; Parker & Tavares, 2008), for example, has been conducted in benchmarking efficiency in a number of toll road companies in Norway. Some researchers also employ other approaches, namely, Artificial Neural Networks (ANNs) (Curram et al, 2004; Delgado, 2005), and Stochastic Frontier Analysis (SFA) (Moesen & Persoon, 2002).

In infrastructure project, efficiency can be perceived differently among stakeholders, namely government, private sectors or community. In this research, efficiency is viewed from social perspective as stakeholders: users and community. Furthermore, the use of efficiency as concept is further

listed based on its indicators on two components of efficiency as the objective: benefit and cost. The indicators are obtained from the exploration of international publications (journals, books and reports) that concerns on road transportation.

First objective: Benefits of road transportation

In assessing project feasibility, what should be firstly considered is the extent of project in giving benefit. As affirmed by Morisugi (2000), an efficient transportation project is weighed by its magnitude in maintaining social benefit. To be specific, toll road is fostered to enhance efficiency in term of improvement on social surplus (Palma & Lindsey, 2000). Thus, the objective of enhancing benefit of road transportation should be considered in obtaining efficiency. Based on literature review, the indicators of this objective are reliability, vehicle operating cost saving, mobility and accessibility and transport quality. The explanation of these indicators is performed in the following.

Reliability

First indicator of efficiency in road transportation is reliability in term of time value. This indicator has a focus on the capability of transport system in influencing *waiting time* and *travel time* (Talley, 1981). One of these two obvious measurements regarding efficient transport is travel time. The beneficial side of road is measured based on the capacity of the road in lessening the travel time. To evaluate congestion regarding highway improvement, Litman (2010) uses *Travel Time Index (TTI)* as one of indicators, besides *travel time rate* and *percent travel time in congestion* (2010: 4). In this case, highway or toll road is considered efficient because it eases transport problem in relieving congestion on other routes (Lee Jr., 2000). In his analysis of transportation projects in Japan, Morisugi (2000) also indicates savings in travel time as one of criteria in transport evaluation using CBA.

Vehicle operating cost saving

Operating costs can be perceived as one of externalities affected by transport activity (Lee Jr., 2000), in addition to pollution and noise. However, this

externality should also be included in project evaluation because of it influences feasibility of the project economically and financially. Generally in many articles concern with CBA, transport system is regarded efficient if vehicle operating costs can be lessened significantly (Talley, 1981; Morisugi, 2000).

Mobility and accessibility

In addition to conventional measurement on transport system performance (level of service, traffic speed and travel time), there are also two criteria that have to be taken into account: *mobility (the movement of people and goods)* and *accessibility (the ease of reaching desired goods, services and activities)* (Litman, 2010: 3). Furthermore, not only affecting efficiency, accessibility also connects to the other criteria. The easiness derived by people to arrive at their destination also influences the amount of operating costs (Talley, 1981).

Transport quality

Efficient transport system can be indicated by its quality. The quality of transport means that the system can provide comfort and security for its users with also convenience and reliability as an added value of the transport system (Lee Jr., 2000). In transport issue, the quality of performance is measured by its Level of Service (LOS), particularly in road transportation. The LOS of road is graded from A to F, based on its carrying capacity in giving service to its users.

Second objective: Costs of road transportation

Corresponding to beneficial side of transportation, efficiency of road transportation also relates to cost and trade-off between both components. In transport sector, there are two components of cost: economic cost and environmental cost (Kleist & Doll, 2005). The first component of cost is measured in monetary term, such as operating and maintenance cost and capital cost. Meanwhile, the latter is determined in the scale of effect to environment, commonly known as external costs of project (e.g. pollution and noise). Further exploration of the indicators of costs of road transportation is performed in the remainder.

Toll payment

In some cases, the benefits that have been attained by users of highway or toll road are, however, should be paid off by paying toll (Morisugi, 2000). The calculation of the toll itself is measured from all expended costs to build the toll road with also considering the benefits attained by using the road. *Willingness to pay* (WTP) and *ability to pay* (ATP) also become added components in determining the initial tariff of toll road.

Air pollution

Obviously, one of externalities that are usually generated by transport activity is pollution. Specific in the case of road transport, air pollution commonly becomes a problem start from the construction to the operational stage of the project. However, the impact of air pollution in transport project can be perceived differently depended to the extent this externality has been taken into account. Morisugi (2000) identifies the change in air pollution as positive effect on transport investment, since the project has taken the reduction of air pollution as the benefit of project implementation.

To sum up, the indicators of efficiency in road transportation as explicated above are listed in *Table 6* below based on literature. The sign (+) and (-) following each indicators imply the negativity or positivity of the indicators in social perspective. The measurement of each indicator is also presented, yet, it is differently performed in practice.

Table 6 Indicators of efficiency in road transportation

<i>objectives</i>	<i>Indicators</i>	<i>measurement</i>	<i>references</i>
benefit	<i>Reliability (+)</i>	<i>Waiting time, travel time</i>	<i>Litman, 2010; Morisugi, 2000; Lee Jr., 2000; Talley, 1981</i>
	<i>vehicle operating cost saving (-)</i>	<i>Operating cost</i>	<i>Talley, 1981; Morisugi, 2000; Lee Jr., 2000</i>
	<i>Mobility and accessibility (+)</i>	<i>Travel rate</i>	<i>Litman, 2010; Litman, 2011; Talley, 1981; Ditmar, 1995; Levinson, 2003</i>
	<i>Transport quality</i>	<i>Comfort, security, level of service (LOS)</i>	<i>Lee Jr., 2000</i>
Cost	<i>toll payment (-)</i>		<i>Morisugi, 2000; Levinson, 2003</i>
	<i>Air pollution (-)</i>		<i>Morisugi, 2000</i>

3.3. Link of two concepts

The correlation between two concepts discussed in this chapter, sustainability and efficiency, is described in order to indicate the reciprocity of both concepts. The relation between efficiency and three concerns on sustainability (environment, social, and economic) presents dependency to attain equilibrium state of sustainable transportation. To a large extent, the position of transportation issue in sustainability concept, however, brings about a conflicting standpoint between the three considerations. On one hand, transports will immediate environmental degradation through the consumption of natural capital and the production of pollution. One fact of this drawback is that transport sector has been regarded as heavy polluter of environment since the seventies era (Nijkamp, 1994). On the other hand, transport is significance in supporting social livability and productivity that improves economic condition, and further, increases efficiency. An example of this is toll road development that is aimed to enhance efficiency in transporting goods and services.

According to these arguments about the connection of sustainability and efficiency, basically both concepts have two sides of relation. The first is *sustainability with efficiency*. This relation is based by the position of efficiency in sustainability. Efficiency is closely inherent with sustainability viewed from economic concern. The second relation is *sustainability and efficiency*, whereas both concepts are viewed from different perspective but supporting each other. Litman (1999) supports both views concerning sides of relation between sustainability and efficiency. On the one hand, he declares that efficiency is one of goals in planning sustainable transport, both of which concepts should be attained at the same time. On the other hand, he is also focusing sustainability in transportation on the sufficiency in social welfare outcomes. In his perspective, sustainability is much concerned on the trade-off between benefits and costs of transportation existence, in other words, efficiency. Corresponding to this dualism, this research is following the second side of relation between both concepts. Both concepts are considered have the same importance in toll road operation. According to the previous subchapters, there are two indicators that present in both concepts: air quality and accessibility and mobility. In sustainability, air quality is a (negative) effect of project, while in efficiency air quality is a cost to environment, in negative perception as well. The reason is twofold in this sense: the first is because sustainability has taken much attention in present corresponds to the increasing of environmental concern, and the second is because efficiency is the main goal of toll road operation that in present condition is regarded unsuccessfully attained by operated toll road in Indonesia. Hence, both concepts have the same magnitude in this research: they should be considered as criteria in toll road evaluation.

3.4. Concluding remarks

To encapsulate this chapter, both concepts of sustainability and efficiency in road transportation are summarized. First of all, the concept of sustainability has been explored in this chapter. It links up to the continuity of development system regarding three points of planning concern: economic growth, social equity and environmental protection. Although this concept is rather “fuzzy”, it has been cogitated as a crucial issue because of emerging (external) effects of development that have occurred since a couple of decades. Hence, to be further analyzed, the

indicators of sustainability in road transportation are also explored through literature. The indicators are categorized into three objectives of sustainability: (1) economic growth consists of three indicators: welfare, cost effectiveness, and accessibility and mobility; (2) social equity consists of four indicators: public acceptance, safety, congestion, and crash fatalities; and (3) environmental protection consists of two indicators: air pollution and noise.

The second notion that has been explored is the concept of efficiency that has been utilized in many fields of studies. Corresponding to economic concept, the use of this notion in transportation infrastructure has also been connected to the trade-off between costs and benefits of a project, mainly assessed in project evaluation. To be analyzed further in this research, some indicators of efficiency in road transportation are listed. The indicators are categorized into two objectives of efficiency: (1) benefits consist of four indicators: reliability, vehicle operating cost saving, distribution of goods and services, and transport quality; and (2) costs consist of two indicators: toll payment and air pollution.

After reviewing the concepts of sustainability and efficiency and obtaining the indicators of both concepts in road transportation, this chapter is followed by the exploration on empirical context of toll road evaluation in Indonesia in Chapter 4 and the analysis in Chapter 5 in which part the indicators presented above are evaluated.

Chapter 4 Toll road evaluation in Indonesia

This chapter describes the practical context of this research. As mentioned in Chapter 1, this research focuses on the implementation of toll road evaluation in Indonesia. Therefore, a description about toll road evaluation in Indonesia is explained in depth in this chapter. The practice of evaluation in toll road operation is explored to be connected to Chapter 5. The aim of this approach is to find the extent of evaluation theory has been implemented in practice and seek the gap between theory and practice at the same time. The description is based on several sources: publications, documents and reports attained from the Indonesian Toll Road Authority; toll road regulations; toll road Concession Agreement (CA) between government and private sectors, and; information related to toll road in Indonesia that is attained through internet media. To begin with, the general fact of toll road operation in Indonesia is described in subchapter 4.1. Subsequently, procedure and regulation on toll road in Indonesia are explained in subchapter 4.2 and followed with the practice of evaluation in operated toll road in subchapter 4.3. In the end, the conclusion of overall description about toll road evaluation in Indonesia is presented in subchapter 4.4.

4.1. General fact of toll road operation in Indonesia

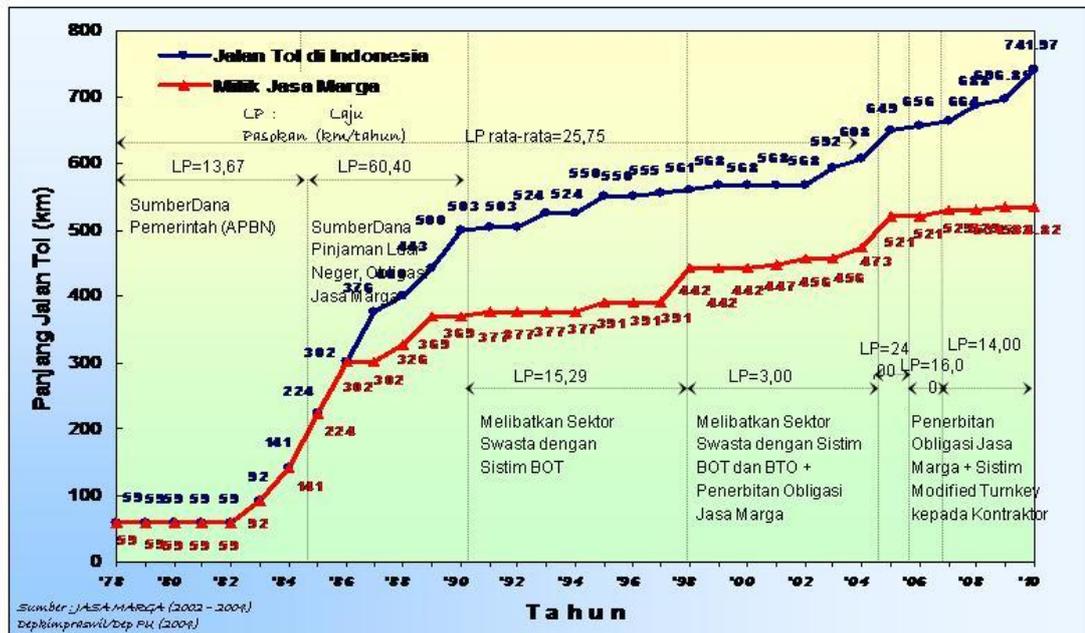
Government of Indonesia started to build toll road in 1978 managed by state-owned company, PT Jasa Marga (Persero), of which name after Initial Public Offering (IPO) become PT Jasa Marga (Persero) Tbk. The first operated toll road was Jagorawi connecting Jakarta, Bogor, and Ciawi (BPJT, 2010). At that time, the state-owned company became the one and only actor in operating and regulating toll road sector behalf the government. Starting in 1987, private sectors were then joined to participate in managing toll road investment and operation by applying Build-Operate-Transfer (BOT) scheme. The toll roads under this scheme are Tangerang-Merak, Ir. Wiyoto Wiyono, M.Sc., Surabaya-Gresik, Harbor Road, Ujung Pandang Tahap I, and Serpong-Pondok Aren. Up to present, Jasa Marga has operated 12 toll roads in Java and Sumatera. Yet, after encountering economic crisis in 1997 which

caused many infrastructure projects halted, in 2005, Government split the functions into two institutions: Indonesia Toll Road Authority (*Badan Pengatur Jalan Tol/BPJT*) as regulator and Jasa Marga as operator. Since then, Jasa Marga has only functioned as operator and investor as other private sectors (BPJT, 2010). Toll road has been managed under Public-Private Partnership (PPP) scheme involving national and foreign private enterprises. Up until present, there are 28 sections of toll road have been operated by different companies¹⁰. The growth of operated toll road in Indonesia since the early emergence until 2010 can be seen in *Figure 5*.

Before it started to develop in 2005, toll road business was halted in 1997 because of economic crises. Many projects whether in tender process, investment, or even construction have been stopped during the catastrophe. In 2006, the Government began to arrange tender process and continue delayed projects. Until 2010, there are 22 on-going toll road projects that have been bound by Concession Agreement (CA), namely *Perjanjian Pengusahaan Jalan Tol* (PPJT) (BPJT, 2010). As stated in the PPJT, each toll road has concession for 35 years and specified initial tariff to be adjusted every 2 years. The toll roads operated before 2005 have the same precondition about the tariff, yet, distinct in term of concession. The operated toll roads should convert the former CA, namely *Perjanjian Kuasa Penyelenggaraan* (PKP) into PPJT. In these cases, the outcome of business plan analyses determines the concession and tariff (Government Regulation No.15/2005). Up to present, 741.97 km of toll road has been operated, and 534.82 km is operated by Jasa Marga. These toll roads are assessed by BPJT annually through the monitoring team applying the minimum standard of service as regulated in Minister of Public Works Decree No. 392/2005. The parameters examined in the standard are toll road condition, average speed, accessibility, mobility, the condition of safety attachment, and the availability of aid service units. The minimum standard, or prominently called "*Standar Pelayanan Minimal*", is aimed to serve the users of toll road with a better and qualified service (Minister of Public Works Regulation No. 392/2005). Furthermore, this standard is also used as an assessment before tariff adjustment implemented. In other words, the toll road of which tariff will be adjusted, should fulfill the minimum standard, or better, in order to give a good quality of service and satisfy the road users.

¹⁰ Based on the official website of BPJT (bpjt.net)

Figure 4 The growth of operated toll road in Indonesia from 1978 to 2010 (Source: BPJT, 2010)



However, the efficiency of operated toll road has been doubted recently concerning the condition of toll road itself. The consumers are often not satisfied by congested toll road, particularly in Jabodetabek area. Reconstructed toll road is suffered by the users of Jakarta-Tangerang and Tangerang-Merak, hence, affecting the public in objecting the tariff to be adjusted. The dissatisfaction of public at toll road operation occurs lately although the operation on toll road is less than one year¹¹. By this reason, the pressure to enhance the evaluation on standard of minimum service has been pushed toward government and toll road operators. Correspond to this condition, operators of toll road has prepared on the possibility of policy change within operated toll road¹². Thus, this phenomenon shows that the existing evaluation on toll road operation is needed to be reviewed. However, how should evaluation be done in toll road operation? This question is answered in the following by seeing the procedure of evaluation in toll road operation in Indonesia.

¹¹ http://www.indii.co.id/news_daily_detail.php?id=4021 "Cracks on Section I of the toll road happened again"

¹² http://www.indii.co.id/news_daily_detail.php?id=3690 "Jasa Marga agrees to enhancement of toll road minimum service standards"

4.2. Regulation including procedure of toll road in Indonesia

The procedure of toll road evaluation in Indonesia is ordered within several types of administrative document. There are six documents related with evaluation and private involvement in toll road operation. These documents consist of regulations and contract: Act No. 38/2004, Government Regulation No. 15/2005, Presidential Regulation No. 67/2005, Minister of Public Works regulation No. 392/2005, Minister of Public Works regulation No. 02/2007 and Concession Agreement. These documents are explored in the following.

1) Road (Act No. 38/2004)

This act is basically “the mother” of toll road regulation in Indonesia which regulates the provision and operation of road infrastructure within Indonesia, including toll road control and management. A specific section of toll road is depicted in article 43 to 57 which states the general requirement of toll road, the authorities, and the ruling of toll road control and management. Some concerns have been taken into account in term of toll road function in social perspective in some articles:

- Toll tariff is calculated based on users’ ability to pay, reduction on vehicles’ operational costs and investment feasibility.
- ***Evaluation and tariff adjustment*** that *are* calculated based on inflation flow should be performed every two years.

2) Toll road (Government regulation No. 15/2005)

This regulation is basically formed in corresponding to Road Act No. 38/2004. Rulings related to toll road is covered in this regulation in responsibility of state government (correspond to the status of toll road as national road). As stated in article 2 of this regulation, toll road establishment is aimed to distribute the equity of development and regional improvement. This aim is also extended by the objective of toll road development to improve efficiency in distributing goods and services and generating economic growth, specifically in developed region.

Furthermore, as pointed out in this regulation, toll road network plan should also conform and integrate with national road network plan and national

spatial plan. However, to be accomplished, toll road plan should be firstly qualified through some evaluation (ex-ante) as described in the following paragraphs. These assessments will be used as bases of toll road procurement. *Firstly*, a pre-feasibility study should be conducted soon after toll road trace has been planned. In this study, some assessments are conducted to evaluate whether the plan is feasible to be carried out or not. The contents of this study are analyses on socio-economic, analyses on traffic forecast, selection of toll road corridor, analyses on construction cost and analyses on economical feasibility. *Secondly*, a feasibility study is composed with referring to the pre-feasibility study that has been approved. This study comprises analyses on local socio-economic condition, analyses of traffic forecast, preparation of preliminary design, analyses on construction cost, and analyses on technical, economical and financial feasibility. *Finally*, an Environmental Impact Assessment should be conducted to assess the possible impact of toll road plan to environment. The implementation guideline of this assessment is comprised through Government Regulation No. 27/1999 under the control of Ministry of Environment.

Moreover, this regulation sets some points related to toll road sector: management of toll road, formation of the Indonesian Toll Road Authority, rights and obligation of toll road (private) companies and obligations of toll road users. It also covers specification, technical and legal aspects of toll road management in Indonesia. Specifically, this regulation comprises some important factors in transportation planning as explained in the following

- *Safety and mobility.* Toll road has a high qualification of Level of Service that is aimed to serve high mobility traffic. To support this feature, toll road is designed for high velocity above 80 kph for intercity connection and 60 kph for intra-city mobility with also supported by advanced road markings and traffic signs. In addition, communication facility, safety detectors and rest area (for intercity connection) should be provided by toll road operators as well.
- *Accessibility.* Toll road is functioned as alternative road that parallel with existing *main* road. It connects existing main roads, preferably collector and arterial roads that possess extremely heavy traffic and

need an alternative road to relieve congestion problem. Thus, this connectivity should be accessible for the users in order to improve transportation efficiency.

To fulfill the criteria that have been mentioned above, a standard of minimum service is levied through this regulation. A more detail explanation about this standard is described in the reminder (see the explanation of *Minister of Public Works regulation No. 392/2005*).

3) *Public Private Partnership (Presidential regulation No. 67/2005)*

Essentially, this regulation is a basis of private sectors' involvement in toll road sector. In other words, it has a paramount role in the implementation of Public Private Partnership (PPP) in Indonesian toll road. Among several objectives of partnership projects under this regulation, important goals related to public perspective are pursued by paying attention to the ability of users in paying toll and the quality of toll road management in infrastructure provision.

4) *The establishment of Indonesian Toll Road Authority (Minister of Public Works regulation No. 295/2005)*

This regulation denotes the establishment of Indonesian Toll Road Authority (*Badan Pengatur Jalan Tol/BPJT*) as toll road regulator. In this regulation, the functions and obligations of BPJT are mentioned, including its responsibility in preparing toll road management, encouraging private investment and observing toll road performance from procurement phase, construction phase, and operation phase to the end of concession period. Furthermore, BPJT is also obliged to perform **toll road evaluation** by **monitoring** on the standard of minimum service of each toll road section. The result of evaluation will be the basis of toll road adjustment every two years (see *Government regulation No. 15/2005*).

5) *Standard of Minimum Service (Minister of Public Works regulation No. 392/2005)*

This directive is functioned as a guideline in monitoring the standard of minimum service of toll road in giving benefit to its users. There are six

substantial concerns of service should be fulfilled by toll road operators: (physical) toll road condition; average speed; accessibility; mobility; safety, and; rescue and service assistant units. The indicators of these criteria are presented in *Table 7*.

Table 7 Substance of service and indicators of standard of minimum service (based on Minister of Public Works Regulation No. 392/2005)

No.	Substance of service	Indicator
1.	(Physical) toll road condition	a) Roughness b) Unevenness c) Non cavity
2.	Average speed	Average speed
3.	Accessibility	a) Average transaction time b) Number of toll gate
4.	Mobility	Promptness in handling traffic constraints
5.	Safety	a) Traffic signs b) Road lighting c) Road space fences d) Emergency evacuation e) Security service
6.	Rescue and service assistant units	a) Ambulance b) Tow vehicle c) Police patrol d) Toll road patrol (from operator) e) Rescue vehicle f) Information system

**6) Implementation guideline of toll road maintenance and access
(Minister of Public Works regulation No. 02/2007)**

This regulation is a guideline in maintaining toll road performance in order to fulfill the standard of minimum service. As mentioned in this regulation, the plan of toll road maintenance should be approved by BPJT and published by operators to be comprehended by public. The scope of maintenance that should be accomplished by operators includes routine and periodic maintenance, road improvement, and urgent treatment. Subsequently, the completion of maintenance activity in toll road will be assessed by BPJT through the regular monitoring of standard of minimum service.

7) *Concession Agreement*

One of important subjects in toll road concession is the regulation about Concession Agreement (*Perjanjian Pengusahaan Jalan Tol/PPJT*) between public authority (state government/Ministry of Public Works) and private sector (toll road company). There are several directives reveal the rulings of this concern:

- *Act No. 38/2004*. The obligation to arrange Concession Agreement between public and private parties is ordered in this act.
- *Government regulation No. 15/2005*. This regulation states the minimum requirement of Concession Agreement between public and private parties. It should consists of: the scope of agreement; the initial toll tariff with the prescription of adjustment; the rights, obligations and risk sharing between both parties; the change of concession period; the standard of service performance and the treatment of public complaints; the sanctions for failures by any party; the settlement of disputes; the discontinuation of concession; the supporting assets of toll road function; the binding legal system, and; the possibility of force majeure. The obligation to conduct *Due Diligence* in the end of concession period is levied in this regulation. It means that the toll road should be financially and legally feasible to be operated as public road in the end of concession period.
- *Minister of Public Works regulation No. 27/2006*. This regulation oppresses toll road establishment from the preparation of toll road procurement to the end of concession period.

Among all these regulations and contract, an extensive procedural obligation is explained in Government Regulation No. 15/2005 concerning Toll Road. This regulation is basically a main rule in toll road establishment. The implementation of this regulation is followed by operational regulation, such as Minister of Public Works regulation No. 392/2005. Furthermore, a specific criteria in evaluation of standard of minimum service is explained within the regulation (Minister of Public Works regulation No. 392/2005). This is because this evaluation is established by specific public authority in toll road operation (BPJT) and

operators of toll road. Other evaluations, such as FS and EIA are conducted by other institutions. Thus, the implementation of evaluation is not integrated in nature. However, to be more clearly analyzed, the evaluation of toll road in Indonesia is explored in depth in the next subchapter.

4.3. Evaluation on toll road in Indonesia

In this subchapter, the implementation of evaluation on operated toll road is explored. Some documents related with evaluation are observed based on Government regulation No. 15/2005, Investment Opportunity that is established by BPJT and the remaining documents. Each document is explored by distinguishing the goal, stakeholder involvement, data, procedure and timeframe.

4.3.1 Toll road evaluation document

As mentioned in Government Regulation No. 15/2005, there are obligations of three documents that should be conducted before project is started and one assessment after the project is accomplished (during operational stage). The obligations are: pre-feasibility and feasibility study; Environmental Impact Assessment; Environmental Management/Monitoring Plan; and Standard of Minimum Service. The explanation about these documents is performed in the remainder by observing the goal; the stakeholders; the data; and the procedure (correspond to the exploration of evaluation in Chapter 2).

Pre-feasibility and feasibility Study

The aim of both studies, pre-feasibility and feasibility study is to assess the viability of toll road project and to prepare the project to be implemented. In the implementation, general pre-feasibility study will be followed by route determination plan if the project is considered feasible to be built. Subsequently, financial pre-feasibility study is conducted in order to weigh the viability of the project to be financed (Government Regulation No. 15/2005). This step is taken because of

private involvement in toll road sector under PPP scheme¹³. If the project is considered feasible to be accomplished, a feasibility study will be conducted afterwards. Feasibility study is intended to measure the viability of project in technical, socio-economic and environmental aspects. The result of this study will be used as the basis of toll road procurement. The general pre-feasibility study is conducted by the Ministry of Public Works, specifically Directorate General of Highway. Meanwhile, financial pre-feasibility and feasibility study are held by BPJT. Because of the utilization of these studies is to support toll road procurement process, the applicants of the procurement (private sectors) are concerned with the result of both studies (Government Regulation No. 15/2005). According to *Directive of pre-feasibility and feasibility study on road and bridge projects*¹⁴, the data needed in pre-feasibility study is different from the data required in feasibility study. The arrangement of pre-feasibility study only needs secondary data to be analyzed. Conversely, feasibility study requires more data on both primary and secondary data because of the more comprehensive and deeper analyses on many aspects. The procedure of both pre-feasibility study and feasibility study is similar in some extents. The difference between both procedures is that in feasibility study, the accomplishment of analyses is more detail. Furthermore, the result of pre-feasibility study is also used in feasibility study. The procedures of both studies are presented in *Table 8*.

¹³ Based on *Investment Opportunity Book (BPJT, 2010)*, there are several types of PPP (investment) scheme. (1) If the toll road is considered feasible economically but not feasible financially, land acquisition and construction will be done by government, while private sector performs operation and maintenance phases. (2) If the toll road is considered feasible economically but negligible financially, land acquisition and construction will be done by sharing responsibility between government and private sector, then private sector continue to perform operation and maintenance phases. (3) If the toll road is considered feasible both economically and financially, private sector performs all phases from land acquisition and construction to operation and maintenance phases.

¹⁴ The directives are established by Ministry of Public Works: "*Pre-feasibility study Guideline*" No. Pd.T-18-2005-B and "*Feasibility study Guideline*" No. Pd.T-19-2005-B.

Table 8 Procedure of pre-feasibility and feasibility study (based on Directive of pre-feasibility and feasibility study on road and bridge projects)

Pre-feasibility study	Feasibility study
Policy formulation on planning	Policy formulation on planning
Current condition within study area	Current condition within study area
Data collection on physical, economic and environmental aspects	Data collection on physical, economic and environmental aspects
Comparison study on determined alternatives	Prediction on quantitative analyses results of all alternatives
	Comparison study of alignment that has been determined in pre-feasibility study
	Study on alternative type of pavement and project standard

Environmental Impact Assessment

Environmental Impact Assessment (EIA) is included as a part of feasibility study of a project. This assessment is obliged to acquire development permit for project activity that exposes impacts to environment under supervision of authority. The result of EIA is Environmental Impact Statement (EIS) that states the feasibility of the project to be accomplished in term of environmental quality (Act No. 32/2009). EIA document should be conducted by the initiator of project with also involving public during the arrangement. The initiator can be a project opponent within government (state, province or local) or outside government (private sectors). Public opinion is also considered in assembling the EIA document. The scope of public in this case consists of: (1) affected residents, (2) environmentalists and academics, and (3) stakeholders who are also affected by the result and process of EIA. According to Act No. 32/2009, the determination of project

development impacts is based on several criteria: the extent of population that is affected by project activity; the size of affected area; the intensity and time of impact occurrence; the amount of affected environmental components; the property of cumulative impact; the reversibility of the impact, and; other criteria correspond to advanced knowledge and technology. Taken the example of Bogor Ring Road EIA report, the required data is resembled with these criteria. Most primary data is obtained from field survey and observation of some components: physic-chemical component; biological component, and; socio-economic-culture component. The general procedure in conducting EIA report basically consists of three essential stages: scoping, analyzing and controlling. According to Bogor Ring Road EIA report, the main steps that are focused in this report are: (1) examining the effect of project activity to the initial condition of environment (potential impact), (2) determining the important impact and study area (hypothetical important impact), and (3) evaluating the possible impact in each stage of development (pre-construction, construction and post-construction).

Environmental Management/Monitoring Plan

Environmental Management Plan is aimed as a guideline in handling the important impact of project development, particularly to lessen the negative impact and increase the positive impact of development. This guideline is connected to Environmental Monitoring Plan that intends to monitor the condition of environment and evaluate the result of environmental monitoring. These documents are targeted as information for planners, decision makers or other related institutions. Environmental Management/Monitoring Plan are included as sequences of EIA. Thus, these documents also should be conducted by the initiator of project with also involving public during the arrangement. The initiator can be a project opponent within government (state, province or local) or outside government (private sectors). According to Environmental Management/Monitoring Plan of Bogor Ring Road, data that is used for the implementation is primary data. The data is obtained by survey and observation on the possible impacts that are revealed in

Environmental Impact Assessment. The procedural approach that has been implemented in Environmental Management/Monitoring Plan consists of three approaches: technological approach, socio-economic approach and institutional approach.

Standard of Minimum Service

The goal of this assessment is to provide sufficient service for toll road users, the operated toll roads have to fulfill the standard of minimum services (*Standar Pelayanan Minimal/SPM*) established by Government in Minister of Public Works regulation No. 392/2005 in order to supply good services for users. Furthermore, the assessments are used as the basis in increasing toll tariff every two years, as stated in the Road Act number 38/2004. According to Minister of Public Works regulation No. 392/2005, the standard of minimum service should be evaluated regularly by BPJT. The subject of this evaluation is all operated toll road sections. Therefore, all operators have responsibility in fulfilling this standard. Furthermore, the result of evaluation will be the basis of toll adjustment every two years. The data is obtained from survey or report from operated toll roads based on several indicators: (physical) toll road condition; average speed; accessibility; mobility; safety, and; rescue and service assistant units. The result of observation or report will be compared with the benchmark of minimum services. Basically, there is no certain procedure that is mentioned in Minister of Public Works regulation No. 392/2005 concerning the measurement of indicators. According to the monitoring practice held by BPJT, the indicators are measured by field observation, but no specific guidelines about the method of this task. Monitoring of standard of minimum service is established during operational phase, or in other words, post-construction phase. It is done regularly every semester in operated toll roads that are assessed by using the standard.

The specific criteria that are regulated are only shown by the assessment on standard of minimum service (through Minister of Public Works regulation No. 392/2005). The others do not have specific criteria (in toll road operation). This might be reasoned by a different institution that is obliged

to conduct the evaluations. Furthermore, the implementation of these assessments is different in timeframe. Each assessment is conducted in different stage of evaluation, although there are two assessments are connected each other (Environmental Impact Assessment and Environmental Management/Monitoring Plan). How do all these assessments connected within toll road evaluation in Indonesia? This question is answered in the next part of this chapter (4.3.2).

4.3.2 Stages of evaluation

The overall process of evaluation in toll road operation is presented in *Figure 6*. In preparation of toll road establishment, some steps of evaluation should be conducted. The first is pre-feasibility study that consists of several assessments to determine the viability of the project before it is planned in national road network. Subsequently, this study is followed by feasibility study after the trace of toll road is approved by government. This study is basically an in-depth assessment as a continuation from pre-feasibility study. After the project is stated as a feasible project, Environmental Impact Assessment should be conducted to assess the magnitude of impact derived by the project. The result of these assessments (pre-feasibility study, feasibility study and EIA) is used as basis of procurement. However, the procedure of evaluation after the procurement has not been regulated legally.

Corresponding to the link between three stages of evaluation, the visualization of toll road evaluation in Indonesia is pictured in *Figure 7*. The regulations and contract that bind the implementation of evaluation are also pictured in the figure. From the visualization it can be seen that pre-feasibility study, feasibility study and EIA are considered as ex-ante evaluation because they are conducted and used before construction is started. In this research, Environmental Management/Monitoring Plan is considered in all of three phases because it is applied from pre-construction to post-construction period. The assessment on standard of minimum service is considered as ex-post evaluation because it is established after the project is finished, during the operational phase. The obligation to perform

Due Diligence in the end of concession period is perceived as ex-post evaluation, yet, it is limited to financial and legal context. In the picture, a straight line shows a direct link between evaluations. Thus, it can be seen that only Environmental Impact Assessment that is directly linked to Environmental Management/Monitoring Plan. The other relations are linked with dotted line that shows unconnected relation on criteria used within the evaluation. Hence, besides the connection between EIA and EM/MP, there is no link between other evaluations. However, the evaluation that should be established after toll road has reached the end of concession period has not presented in toll road operation.

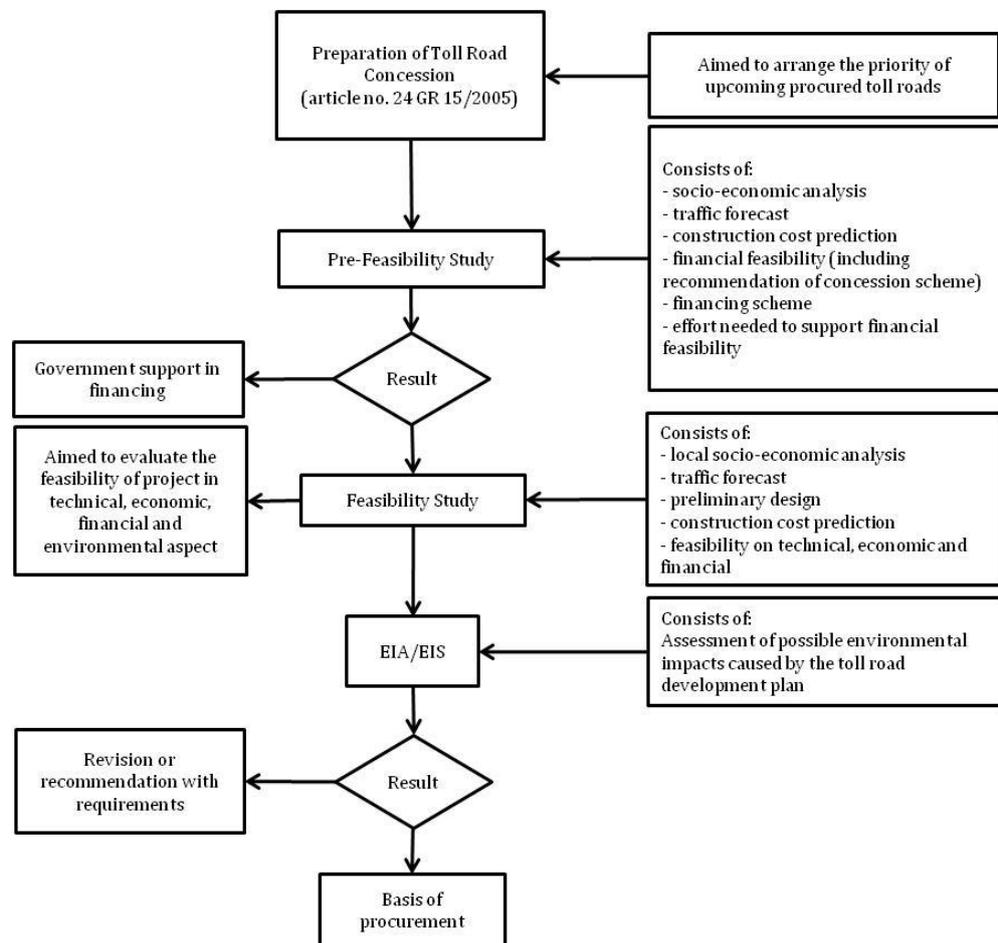


Figure 5 Procedure of toll road pre-development in Indonesia (BPJT, 2010)

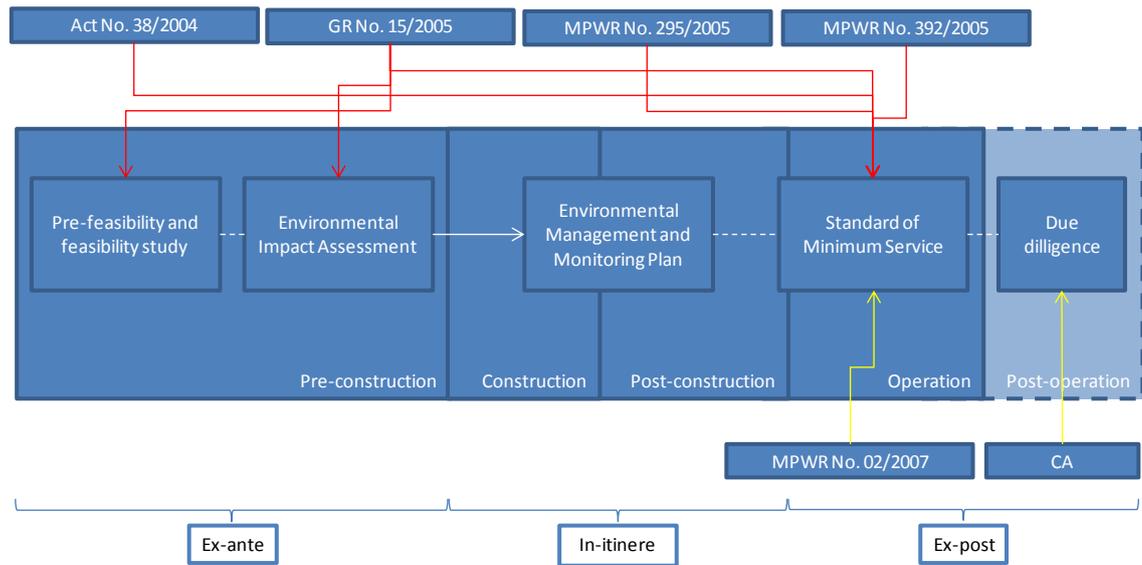


Figure 6 Evaluation in toll road development in Indonesia (Author, 2012)

4.4. Concluding remarks

Toll road has been operated by private involvement since the last seven years. The evaluation on toll road has been conducted based on many regulations: Act No. 38/2004, Government regulation No. 34/2006, Government regulation No. 15/2005, Presidential regulation No. 67/2005, Minister of Public Works regulation No. 295/2005, Minister of Public Works regulation No. 392/2005 and Minister of Public Works regulation No. 02/2007. Corresponding to these regulations, there are some assessments that should be available in toll road operation: Pre-feasibility and feasibility Study, Environmental Impact Assessment, Standard of Minimum Service and Environmental Management/Monitoring Plan. However, in some extents, these assessments are not comprehensively linked. The criteria that are considered in each assessment are not corresponded each other. There is only two parts of evaluation are connected to each other concerning environmental assessment. Furthermore, not all criteria that are used within evaluation are regulated legally. There is only the assessment on standard of minimum service that has been bound by regulation. To find the extent to link all these evaluation phases needs the same criteria to be connected to practical evidence. The approach to link the stages of evaluation through case study is performed in Chapter 5.

Chapter 5 Linking evaluation with sustainability and efficiency as criteria: Case study

This chapter links the theory that has been presented in Chapter 2 (the linkage of evaluation) and Chapter 3 (the concept of sustainability and efficiency) and the practice in toll road evaluation in Indonesia. To be more detail, the analyses are focused on two sections of toll road, namely Bogor Ring Road and Makassar section IV. The decision to take these sections of toll road as the case study is because the availability of data that is required for the analyses. The analyses are elaborated through document review method. The documents that are used for the analyses are: Concession Agreement of Bogor Ring Road and Makassar section IV; feasibility study of Bogor Ring Road; Environmental Impact Assessment of Bogor Ring Road and Makassar section IV; result of standard of minimum service of Bogor Ring Road and Makassar section IV, and: Environmental Management/Monitoring Plan of Bogor Ring Road and Makassar section IV.

Furthermore, this chapter is presented in three subchapters. In subchapter 5.1, the analyses on Bogor Ring Road are presented. In this subchapter, explanation about evaluation in practice of Bogor Ring Road is described (5.1.1). Subsequently, an analysis in linking ex-ante, in-itinere and ex-post evaluation is presented in 5.1.2. Furthermore, subchapter 5.2 presents the analyses of evaluation on Makassar section IV. This subchapter also consists of evaluation in practice (5.2.1) and analysis in linking ex-ante, in-itinere and ex-post evaluation in Makassar section IV (5.2.2). A table that summarizes the result of analyses is presented in the end of each analysis, followed by discussion about the result in subchapter 5.3. Finally, the conclusion of analyses is elaborated in subchapter 5.4.

5.1. Case study: Bogor Ring Road

5.1.1 Evaluation in practice

Bogor Ring Road is located within two administrative regions of Bogor Municipality and Bogor Regency in West Java Province. It is built as expansion from the existing toll road connecting Jakarta-Bogor-Ciawi (Jagorawi). Up to present, there is only one section that has been operated (Sentul-Kedung Halang), while the second section has started to be constructed since the early August 2012¹⁵. To establish this section of toll road, several documents have been conducted. In this sub subchapter, four documents are analyzed supplemented by some information from media: Preliminary Study (consists of Feasibility Study), Environmental Impact Assessment, Environmental Management/Monitoring Plan and Standard of Minimum Service.

1) Preliminary Study

First consideration that is explored in this study is area investigation. However, the aggregation of information in this part is somewhat less sufficient. According to the study, the investigation mentions about **conformity with spatial plan**, specifically spatial plan of both affected administrative area, Bogor Municipality and Bogor Regency (DTW, 1996). Nevertheless, there is little information about the conformity of spatial plan with toll road plan. This limitation is also seen in the explanation about **land use change**. The given information is limited and less than enough because it also only covers Bogor Municipality. However, **socio-economic condition** is presented in a more informative by posing the forecast of population growth and GRDP improvement. The explanation about **transport system** also gives relevant information for the establishment of toll road plan.

Two important contents of this study are (1) route determination and (2) feasibility study. In the route determination, some aspects are considered in determining the best alternative of toll road route: *Technical aspect*

¹⁵ From bisnis.com on 8 August 2012: "The construction of Bogor Outer Ring Road section 2a targeted to be completed in the end of 2013" <http://www.bisnis.com/articles/bogor-outer-ring-road-konstruksi-seksi-2a-ditarget-tuntas-akhir-2013>

consists of route length and alignment; scale of difficulty in technical execution (interchange with existing road, soil state, etc); interchange location, and; construction costs. *Environmental aspect* consists of land use change (from agricultural purpose); resettlement, and; difficulty in land acquisition. *Socio-economic aspect* consists of public concern regarding land use and road network plan. *Transport aspect* consists of toll road users' comfort and toll road traffic flow. Further in this study, the technical feasibility of toll road is assessed through some analyses: forecast on traffic condition, forecast on Level of Service (LOS), and forecast on traffic divert and road capacity during operational phase.

One of important aspects to be fulfilled by the development of Bogor Ring Road is economic concern. The economic feasibility of this section of toll road is assessed through Cost-Benefit Analyses by comparing the cost and benefit aspects on two alternatives: with or without toll road being existed. The component of costs (for toll road operator) consists of direct construction cost, indirect cost, engineering cost, contingency cost, land acquisition cost, and operation and maintenance cost. In addition, vehicle operating cost and time travel value (for users) are also assessed in order to extend the beneficial side of toll road in lessening the amount of these costs. Moreover, these components of costs and benefits are used in suggesting the amount of toll tariff. What is missing in this study is the utilization of survey on Willingness to Pay and Ability to Pay regarding the determination of toll tariff. However, the levied tariff should also conform to public acceptance. The final analysis in this study is the financial feasibility of Bogor Ring Road. By calculating the discounted cash flow and Net Present Value (NPV), the best alternative is chosen as the most viable alternative to be financed.

2) *Environmental Impact Assessment*

The EIA report of Bogor Ring Road is conducted in order to fulfill the obligation based on Minister of Environment regulation No. 11/2006. The report is arranged by the initiator of project, namely Jasa Marga (Jasa Marga, 2007). Basically, this EIA is focused on assessing the extent of impact produced by the implementation of Bogor Ring Road project

during its completion: pre-construction, construction and post-construction (BN, 2007). In pre-construction, there are some activities that give impact to environment: survey and dissemination and land acquisition. In construction phase, the possible impact comes from mobilization of personnel, mobilization of heavy vehicles and materials, operational offices and engineering works (land clearing, land works, drainage works, pilling works, structure works, pavement works and installation of supporting facility). In post-construction phase, environmental impact originates from toll road operation and maintenance. In addition to the possible impacts derived by toll road development, potential impacts that are caused by existing activity (e.g. industrial activity, residential activity, waste-water treatment installation. etc) and planned activity (e.g. development plan of passenger terminal, frontage road and business district) nearby project location are also explored.

The initial condition within Bogor Ring Road project location is explored based on primary and secondary data. On physics and chemical components, exploration is done on some aspects: climate, air quality, noise, vibration, geography, topography, geology, hydrology, spatial plan and land use plan. On biological aspect, vegetation and animal existence are examined. On socio-economic and culture components, the condition of people, socio-economic, socio-culture, public utility, social facility and road transportation is observed through survey and observation. On public health, the current condition of residents' and environment healthiness with also the condition of health facility are examined.

Furthermore, according to the result of observation, there are some conceivable impacts found during the process of project completion. In pre-construction phase, this approach is used to cope with community apprehension and asset conversion. In construction phase, there are some impacts considered: the impact of air quality degradation, noise and vibration proliferation, water pollution, disturbance on slope stability and public utility, traffic problem, damaged road infrastructure. In post-construction phase, this approach is used to handle degradation on air quality, noise and vibration proliferation, traffic problem, disturbance in

residents' accessibility and mobility, and land use change. Based on the observation, Environmental Management/Monitoring Plan are required to cope with these impacts. Furthermore, some recommendations are also posed to be carried out afterwards.

3) Environmental Management /Monitoring Plan

The function of Environmental Management/Monitoring Plan basically corresponds to the result of EIA report that has been done beforehand. The goal of these plans is to guide the evaluation of toll road accomplishment within acceptable environmental margin in term of lessening the negative impact and improving the positive one (BN, 2007). The Environmental Management Plan is correlated with the Environmental Monitoring Plan. The explanation of both plans is elaborated in the remainder.

In Environmental Management Plan, there are three approaches that are recommended in coping with environmental impacts of Bogor Ring Road development: (1) technological approach, (2) socio-economic approach, (3) institutional approach. These approaches are applied differently in three phases of development. **Technological approach** is implemented in most of all phases. In pre-construction phase, technological method is utilized to tackle asset conversion problem. In construction phase, this approach is used in handling the impact of air quality degradation, noise and vibration proliferation, water pollution, disturbance on slope stability and public utility, traffic problem, damaged road infrastructure. In post-construction phase, this approach is used to handle degradation on air quality, noise and vibration proliferation, traffic problem, disturbance in residents' accessibility and mobility. **Socio-economic approach** is applied in pre-construction and construction phases. In pre-construction phase, this approach is used to cope with community apprehension and asset conversion. In construction phase, socio-economic approach is employed in tackling vibration proliferation, increasing job opportunity, disturbance on public utility, damaged in road infrastructure. **Institutional approach** is carried out in most of all phases. In pre-construction phase, it is used to handle the problem of community

apprehension. In construction phase, this approach is utilized in coping with disturbance on public utility. In post-construction phase, this approach is used to cope with land use change. Among the possible impacts assessed in this evaluation, social apprehension is seems important to be focused. In 2010, affected residents claimed about their compensation that has not been given ¹⁶Furthermore, to control the establishment of Environmental Management Plan, an Environmental Monitoring Plan is also performed. Environmental Monitoring Plan is aimed to comprehend the condition of environment before and after the Environmental Management Plan is established.

4) *Standard of Minimum Service*

The result of monitoring on standard of minimum service in Bogor Ring Road that is explored in this research is the result of monitoring in Semester I of 2010 (held in August 2010), Semester II of 2010 (held in February 2011) and Semester I of 2011 (held in August 2011). Monitoring activity is conducted by BPJT twice in one year, the first in August of the remaining year and the second in February of the year after. The measurement consists of: (physical) toll road condition; average speed; accessibility; mobility; safety, and; rescue and service assistant units. The result will affect tariff adjustment of toll road sections in every two years. In Bogor Ring Road, the result of monitoring that is held in August 2011 was used as the basis of toll road adjustment from Rp. 3,000 (0.25 €) Rp. 3,500 (0.30 €) for Category I vehicles (cars, jeep, small truck, bus), the first time of adjustment since its initial operation in November 2009¹⁷. This adjustment has been opposed by public concerning the short length of toll road compared to the toll levied to the users. They criticize the service of toll road that has not been satisfying during its operation¹⁸.

¹⁶ From MetroTVnews on 14 December 2010: "Bogor Ring Road still in problem" <http://www.metrotvnews.com/read/newsvideo/2010/12/14/118780/Tol-Bogor-Outer-Ring-Road-Masih-Bermasalah>

¹⁷ Based on the official website of BPJT (bpjt.net)

¹⁸ From bogorplus on 2 December 2011: "Users opinion about Bogor ring Road toll adjustment" <http://bogorplus.com/arsip/3347-tanggapan-pengendara-tentang-kenaikan-tarif-tol-bor.html>

5.1.2 Linking ex-ante, in-itinere and ex-post evaluation

In this subchapter, an analysis on existing evaluation is reconnected with theoretical context of evaluation and criteria of sustainability and efficiency as well. To connect all the stages of evaluation, the same criteria are used in each stage, namely sustainability and efficiency. The analysis is conducted based on five queries that have been used in exploring evaluation in Chapter 2. A table represented the result of analysis is performed in the following. The complete table that describes the analysis is given in Appendix. Discussion about the result of analysis is performed in subchapter 5.3 (together with a discussion on analysis of Makassar section IV).

Analysis

In analyzing the connectivity between all stages of evaluation (ex-ante, in-itinere and ex-post), five questions are posed as following:

- (1) *When should evaluation be conducted?* All of evaluation documents of Bogor Ring Road are categorized in three phases of evaluation (ex-ante, in-itinere and ex-post). Corresponding to the visualization of evaluation stages in Indonesia, each evaluation document of Bogor Ring Road is differed in each stage. The classification is based on its implementation in practice with regarding the definition of each phase of evaluation¹⁹: ex-ante in pre-construction phase, in-itinere in construction phase, and ex-post in post-construction (operation and post-operation phases are regarded to be included in this stage). Preliminary study that consists of feasibility study of Bogor Ring Road project is included in ex-ante evaluation. Environmental Impact Assessment is classified in this stage as well. Environmental Management/Monitoring Plan is represented in all stages of evaluation, because the implementation of this evaluation is held in pre-construction, construction and post-construction. Lastly, the assessment of standard of minimum service is categorized as ex-post evaluation because it is held during the operational phase (post-construction).

¹⁹ See Figure 7 in page 63

- (2) *For who is the evaluation conducted?* The stakeholders that are concerned on this research are limited to social concern: toll road users and community (residents in vicinity with toll road section). Furthermore, the indicators of sustainability and efficiency are distinguished by these interested parties.
- (3) *Why should evaluation be conducted?* The indicators of sustainability and efficiency as criteria in road transportation that are explored in Chapter 3 are utilized in this analysis. They are listed indicated by the two perspectives of public as stakeholders (users and community). Some indicators are used in both perspectives because they have the same magnitude for users and community. In users' perspective, the indicators of sustainability consist of accessibility and mobility; cost effectiveness; safety; congestion; and crash fatalities. Meanwhile, the indicators of efficiency revealed by users are reliability; operating cost; mobility and accessibility; transport quality; and toll payment. In community's perspective, the indicators of sustainability are welfare; public acceptance; safety; congestion; air pollution; and noise. The indicators of efficiency revealed by community are transport quality and air pollution.
- (4) *What is the data that should be provided for evaluation?* The data that is used in each evaluation document is explored. By seeing the availability of data, the inclusion of criteria and indicators within the evaluation document is determined. Among all evaluation documents, only PS that reveals both perspectives. In PS, only one of five indicators of sustainability from users' perspective is included (congestion), and three of five indicators of efficiency are included (reliability, operating costs and toll payment). From community's perspective, one of five indicators of sustainability is included (welfare) and one of two indicators of efficiency is considered (transport quality).

Single perception is revealed in other evaluation documents. EIA is concerned only one perspective (community). By seeing this perspective, four of six indicators of sustainability are considered (public acceptance, congestion, air pollution and noise) and one of two

indicators of efficiency is considered (transport quality). EM/MP is concerned on one perspective (community) in all stages but less indicator of efficiency is considered in this evaluation. In ex-ante, it includes only one of six indicators of sustainability (public acceptance). In in-itinere, it includes three of six indicators of sustainability (public acceptance, air pollution and noise) and one of two indicators of efficiency (transport quality). In ex-post, it includes three of six indicators of sustainability (public acceptance, air pollution and noise). Another single perception is revealed by the assessment of SMS, differently, it focuses on users' perspective. It includes two of five indicators of sustainability (safety and crash fatalities) and one of five indicators of efficiency (mobility and accessibility).

(5) *How does evaluation conducted?* The method that is used in evaluation documents is observed. After reviewing the documents, it is found that some evaluations do not have a clear guidance of method. For instance, the assessment of SMS is only based on monitoring without a clear method in assessing the criteria.

To sum up, *Table 9* represents the summary of the inclusion of sustainability and efficiency as criteria in three stages of evaluation. Further discussion about this is presented in subchapter 5.3.

Table 9 Inclusion of sustainability and efficiency as criteria in three stages of evaluation of Bogor Ring Road

		Stakeholders		Criteria	
		User	Community	sustainability	efficiency
Ex-ante	Preliminary Study	Y		1 of 5	3 of 5
	Environmental Impact Assessment	N	y	4 of 6	1 of 2
	Environmental Management/Monitoring Plan (pre-construction)	N	y	1 of 6	0 of 2
In-itinere	Environmental Management/Monitoring Plan (construction)	n	y	3 of 6	1 of 2
Ex-post	Environmental Management/Monitoring Plan (post-construction)	n	y	3 of 6	0 of 2
	Standard of Minimum Service	y	n	2 of 5	1 of 5

5.2. Case study: Makassar section IV

5.2.1 Evaluation in practice

Makassar section IV is located on the island of Sulawesi and is a continuation of the highway project phase I Ujung Pandang which has been operating since the year 1998. Highway construction is intended to complement the network of toll roads as well as address the congestion around the toll road alignment plan and improve the local economy around the highway. To realize this project, evaluation has been done before the construction period. After the highway was completed and started operating since 2008, monitoring has been conducted to assess the performance of toll road operator serving the users. Further explanation of the evaluation which was performed on sections Makassar section IV is outlined below on the basis of documents obtained from the Ministry of Public Works. Through exploration of these documents, the criteria which are used in the evaluation are revealed. Subsequently, the extent to which sustainability and efficiency has been included as criteria in the evaluation is to be explored.

1) Environmental Impact Assessment

In this study, evaluation on important impact is executed by using a method called EQAM (Environmental Quality Assessment and Management) in order to attain a holistic and causative assessment quantitatively (EP, 2006). By this method, assessment on environmental impact is carried out in four criteria. Firstly, a criterion on the intensity of impact is aimed to comprehend the level of impact to the existing condition of environment. This level is classified from low to high scale of impact based on the change of environmental quality. Secondly, a criterion on the importance of impact is used in assessing the magnitude of environmental impact in more detail, classified in three scales from unimportant, fairly important, to very important. Thirdly, a criterion on totality is pursued in order to comprehend the extent to which impact has influenced environmental component and to which activity has given impact to environment. Lastly, a criterion on causality between activity and impact is assessed in order to arrange alternative actions in mitigating the impact.

The results of analysis on these criteria are mostly negative impacts on technical (traffic problem, water-flow problem, road degradation, land settlement), social (public apprehension, public perception, disturbance on accessibility, potential conflict, social jealousy, prevalence of disease) and environment (change on landscape, air quality, land conversion). Possible positive impacts that are given by toll road plan are job opportunity and local economic growth. Based on these impacts, alternative of actions are then arranged in order to mitigate the magnitude of impact. The actions are set up based on four approaches: technological approach, institutional approach, socio-economic approach and spatial management approach. These alternatives of actions will be followed up in the later document (Environmental Management/Monitoring Plan).

After exploring the content of EIA document of Makassar section IV, it can be concluded that some important indicators of impact have included sustainability. Social, environment and economic context have been considered in assessing the impact of the project.

2) Environmental Management/Monitoring Plan

Both documents (Environmental Management Plan and Environmental Monitoring Plan) are arranged as continuation from Environmental Impact Assessment (EP, 2006). The stakeholders involved in the preparation of these documents are initiator, government and society. In tackling the possible impacts that might be caused by Makassar section IV project, there are four approaches that are suggested in these documents. The first approach is technological method that is used to cope with technical problem and lessen environmental degradation. The second is socio-economic approach that is employed in tackling with problems that involves social interaction. The third is institutional approach that is used in handling environmental impact according to institutional mechanism. The fourth approach is through regulation that is aimed in correspond the project area with environmental assessment according to existing regulation. Each approach is employed differently in each period of project development (pre-construction, construction and post-construction).

In pre-construction period, socio-economic approach is employed in tackling with social apprehension during the preparation of land acquisition. It is also combined with institutional approach in tackling the conflict with institutions that manage utility network. In construction period, technological approach is mostly used in handling environmental problem (air quality and the change on landscape), technical problem (land settlement, water-flow disturbance, traffic problem and road degradation) and social problem (disease prevalence). In this period, socio-economic approach is used to cope with two opposing effects of Makassar section IV: the positive impact is increasing job and business opportunity and the negative impact are social jealousy because of migrant workers from outside the area, disturbance on local accessibility, and social apprehension and public perception because of construction works. In post-construction period, technological approach is applied in mitigating land subsidence and tackling impact on accessibility both negatively (local accessibility) and positively (regional accessibility). In some extent, technological approach should also be combined with spatial management (lessening potency of flood and optimizing land conversion). Socio-economic approach is used to enhance the positive impact of economic growth and public perception on job opportunity.

3) *Standard of Minimum Service*

The result of monitoring on standard of minimum service in Bogor Ring Road that is explored in this research is the result of monitoring in Semester I of 2010 (held in August 2010), Semester II of 2010 (held in February 2011) and Semester I of 2011 (held in August 2011). Monitoring activity is conducted by BPJT twice in one year, the first in August of the remaining year and the second in February of the year after. The result will affect tariff adjustment of toll road sections in every two years. In Makassar section IV, the result of monitoring that is held in May 2010 was used as the basis of toll road adjustment, the first time of adjustment since its initial operation in

2008²⁰. The measurement consists of: (physical) toll road condition; average speed; accessibility; mobility; safety, and; rescue and service assistant units.

5.2.2 Linking ex-ante, in-itinere and ex-post evaluation

In this subchapter, an analysis on existing evaluation is reconnected with theoretical context of evaluation and criteria of sustainability and efficiency as well. Similar with what has been done in the case study of Bogor Ring Road, to connect all the stages of evaluation, the same criteria are used in each stage, namely sustainability and efficiency. The analysis is conducted based on five queries that have been used in exploring evaluation in Chapter 2. A table represented the result of analysis is performed in the following. The complete table that describes the analysis is given in Appendix. Discussion about the result of analysis is performed in subchapter 5.3.

Analysis

(1) *When should evaluation be conducted?* All of evaluation documents of Bogor Ring Road are categorized in three phases of evaluation (ex-ante, in-itinere and ex-post). The classification is based on its implementation in practice with regarding the definition of each phase of evaluation²¹: ex-ante in pre-construction phase, in-itinere in construction phase, and ex-post in post-construction (operation and post-operation phases are regarded to be included in this stage). Environmental Impact Assessment is classified in this stage as well. Environmental Management/Monitoring Plan is represented in all stages of evaluation, because the implementation of this evaluation is held in pre-construction, construction and post-construction. Lastly, the assessment of standard of minimum service is categorized as ex-post evaluation because it is held during the operational phase (post-construction).

(2) *For who is the evaluation conducted?* The stakeholders that are concerned on this research are limited to social concern: toll road users and community (residents in vicinity with toll road section).

²⁰ From Makassartribun on 2 May 2011: "Toll adjustment on Makassar section IV start tomorrow" <http://makassar.tribunnews.com/2011/05/02/mulai-besok-tarif-tol-seksi-iv-makassar-naik>

²¹ See Figure 7 in page 63

Furthermore, the indicators of sustainability and efficiency are distinguished by these interested parties.

(3) *Why should evaluation be conducted?* The indicators of sustainability and efficiency as criteria in road transportation that are explored in Chapter 3 are utilized in this analysis. They are listed indicated by the two perspectives of public as stakeholders (users and community). Some indicators are used in both perspectives because they have the same magnitude for users and community. In users' perspective, the indicators of sustainability consist of accessibility and mobility; cost effectiveness; safety; congestion; and crash fatalities. Meanwhile, the indicators of efficiency revealed by users are reliability; operating cost; mobility and accessibility; transport quality; and toll payment. In community's perspective, the indicators of sustainability are welfare; public acceptance; safety; congestion; air pollution; and noise. The indicators of efficiency revealed by community are transport quality and air pollution.

(4) *What is the data that should be provided for evaluation?* The data that is used in each evaluation document is explored. All evaluations are considered only a single perspective. Community's perspective is considered in EIA and EM/MP. In EIA, four of six indicators of sustainability are considered (welfare, public acceptance, congestion and air pollution) and one of two indicators of efficiency is considered (transport quality). In EM/MP, efficiency is less included as criteria. Only one of two indicators is included in in-itinere evaluation (transport quality). The other stages only include sustainability as criteria: in ex-ante, one of six indicators is included (public acceptance); in in-itinere, three of six indicators are included (public acceptance, congestion and air pollution); and in ex-post, two of six indicators are included (welfare and public acceptance). Different with others, the assessment on SMS is taken users' perspective into account. Two of five indicators of sustainability (safety and crash fatalities) and one of five indicators of efficiency (mobility and accessibility) are included within this assessment.

(5) *How does evaluation is conducted?* The method that is used in evaluation documents is observed. Similar with the finding in Bogor Ring Road, it is found that some evaluations do not have a clear guidance of method. The assessment of SMS is only based on monitoring without a clear method in assessing the criteria.

To sum up, *Table 10* represents the summary of the inclusion of sustainability and efficiency as criteria in three stages of evaluation. Further discussion about this is presented in subchapter 5.3.

Table 10 Inclusion of sustainability and efficiency as criteria in three stages of evaluation of Makassar section IV

A		Stakeholders		Criteria	
		user	community	sustainability	efficiency
Ex-ante	Environmental Impact Assessment	n	Y	4 of 6	1 of 2
	Environmental Management/Monitoring Plan (pre-construction)	n	Y	1 of 6	0 of 2
In-itinere	Environmental Management/Monitoring Plan (construction)	n	Y	3 of 6	1 of 2
Ex-post	Environmental Management/Monitoring Plan (post-construction)	n	Y	2 of 6	0 of 2
	Standard of Minimum Service	y	n	2 of 5	1 of 5

5.3. Discussion

From *Table 9* and *Table 10* it can be seen that all evaluation documents are not considerably linked to each other in both cases. Some assessments even only concern on one perspective of stakeholder, whether users' perspective or community's perspective. Environmental Impact Assessment and Environmental Management/Monitoring Plan are more focused on community perspective. Conversely, Standard of Minimum Service is more concerned on users' perspective. Furthermore, what can be clearly seen is that many indicators have not been fulfilled by the existing evaluation. Further attention can be given to "congestion" as indicator of sustainability. In ex-ante evaluation (Preliminary study and Environmental Impact Assessment), this indicator is considered essentially to be assessed. However, it cannot be found in the other stages of evaluation. In Environmental Management/Monitoring Plan (considered as ex-ante, in-itinere and ex-post evaluation) is not taken congestion as indicator. The same case occurs in

Standard of Minimum Service whereas congestion is not considered important as indicator.

Nevertheless, the linkage between all stages of evaluation is clearly seen inexistent. In linking these stages, more exploration on method in assessing the indicators should be performed. This approach might be accomplished by taken the lesson from other countries that have established well-managed evaluation on toll road sector. However, not only method to measure indicators, but the establishment of regulation and procedure that legally binding the linkage of evaluation also should be accomplished. Institutional approach is important in its role as “decision procedures” (de Brucker & Verbeke, 2007: 56) in supporting social concern. Furthermore, the extent of sustainability and efficiency in evaluation practice of toll road in Indonesia has not been completely accomplished. It can be seen by inexistent measurement of indicators in existing evaluation.

5.4. Concluding remarks

After analyzing the existing evaluation in Bogor Ring Road and Makassar section IV operation, the linkage between all stages of evaluation is not connected to each other. The indicators that are used are different between all stages. Another evidence of unlinked relation between evaluation practices in toll road is the perspective in conducting each evaluation is not resemble; some concern on users’ perspective and the other concern on community’s perspective. Furthermore, sustainability and efficiency also have not been considered comprehensively within evaluation.

If both cases are compared, the inclusion of sustainability and efficiency is similar in some extent. What is different is in the method and data that are used to evaluate the projects. However, although it is found that both cases are similar; this analysis cannot comprehensively show the precise situation because of limitation in data availability. The PS is not included in Makassar section IV. The result might be different if this study is also included within this analysis. However, up to this point, the conclusion comes at one point: the actual implementation of evaluations has not connected to each other and sustainability and efficiency have been partly included within the evaluations.

Chapter 6 Conclusions, reflections and recommendations

This chapter wraps up this research by presentation of conclusion, recommendation and reflection. In subchapter 6.1, conclusion of this research is presented by answering the questions that have been presented in Chapter 1. This is aimed to also pursue the objectives of this research that has been posed beforehand. Subsequently, some recommendations are suggested in subchapter 6.2. This recommendation is expected to give some insights in the implementation of evaluation practice in relevant issue, particularly on toll road sector. In the end, reflections on this research are presented in subchapter 6.3. The reflections offer a possibility of further study based on this research.

6.1. Conclusions

In attaining the answer of the central question and obtaining the objective of this research, the four additional questions are firstly answered beforehand. As posed in Chapter 1, the research questions consist of four queries that are presented in the remainder.

Question 1: What does the aim of conducting evaluation in different stages and how do the three stages of evaluation (ex-ante, in-itinere, ex-post) connected?

The answer of this question is attempted by literature review in Chapter 2. As mentioned in many literatures, the main role of evaluation is basically to support the process of decision-making. In some extent, this role is more appropriate to be applied before projects or programs are delivered. In this sense, ex-ante evaluation is seen as important tools of appraisal on certain projects or programs implementation. Many have known the application of this stage of evaluation and many have applied it as well. However, the following stages of evaluation, in-itinere and ex-post evaluations have not taken much notice of international practice although both stages are also essential to improve the achievement of projects or programs. However, some practices have found that ex-post evaluation is needed to see the extent of projects or programs have been successfully applied. Yet, in a long-

term project, this stage is often not implemented sufficiently. Furthermore, in-itinere evaluation has the same function as monitoring phase of project, although it is found confusion in defining both terms in literature. In addition to monitoring function, this stage of evaluation is also aimed to control the implementation of on-going project. An important function of this stage -that has been paid less attention- is to link ex-ante and ex-post evaluation. In some extent, this stage supports the sustainability of project evaluation from the start to the end of projects or programs. Little attention has been given to the sustainability of project evaluation. According to many sources, the linkage between all phases of evaluation is limited. The limitation also occurs in the existence of in-itinere evaluation in theoretical realm and empirical evidence as well. Based on the literature, one finding is acquired about how to link all the stages gradually: all the three stages should use the same criteria. This finding is used as initial step in exploring the extent of the stages have been linked in practice.

Question 2: What are the criteria in delivering sustainable and efficient road transportation?

Chapter 3 of this research seeks the answer of this question. Both concepts taken into account in this research is reasoned by: *firstly*, because sustainability has taken much attention in present corresponds to the increasing of environmental concern, and *secondly* because efficiency is the main goal of toll road operation that in present condition is regarded unsuccessfully attained by operated toll road in Indonesia. The first concept, sustainability, links up to the continuity of development system regarding three points of planning concern: economic growth, social equity and environmental protection. Although this concept is rather “fuzzy”, it has been cogitated as a crucial issue because of emerging (external) effects of development that have occurred since a couple of decades. The indicators of sustainability in road transportation are categorized into three objectives of sustainability: (1) economic growth consists of three indicators: welfare, cost effectiveness, and accessibility and mobility; (2) social equity consists of four indicators: public acceptance, safety, congestion, and crash fatalities; and (3) environmental protection consists of two indicators: air pollution and noise. The second notion of efficiency in transportation infrastructure has been connected to the trade-off between costs and benefits of a project, mainly assessed in project evaluation. The indicators are categorized into two objectives of efficiency: (1) benefits consist of four indicators: reliability, vehicle

operating cost saving, distribution of goods and services, and transport quality; and (2) costs consist of two indicators: toll payment and air pollution.

Question 3: What is the official procedure to evaluate toll road in Indonesia?

This question is answered in Chapter 4 of this research. The evaluation on toll road has been conducted based on many regulations: Act No. 38/2004, Government regulation No. 34/2006, Government regulation No. 15/2005, Presidential regulation No. 67/2005, Minister of Public Works regulation No. 295/2005, Minister of Public Works regulation No. 392/2005 and Minister of Public Works regulation No. 02/2007. Corresponding to these regulations, there are some assessments that should be available in toll road operation: Pre-feasibility and feasibility Study, Environmental Impact Assessment, Standard of Minimum Service and Environmental Management/Monitoring Plan. However, in some extents, these assessments are not comprehensively linked. The criteria that are considered in each assessment are not corresponded each other. There is only two parts of evaluation are connected to each other concerning environmental assessment. Furthermore, not all criteria that are used within evaluation are regulated legally. There is only the assessment on standard of minimum service that has been bound by regulation. To find the extent to link all these evaluation phases needs the same criteria to be connected to practical evidence.

Question 4: What is the actual practice of the link between different stages of evaluation and the inclusion of sustainability and efficiency as criteria on toll road evaluation in Indonesia?

The answer of this question can be found in Chapter 5. After analyzing the existing evaluation in Bogor Ring Road and Makassar section IV operation, the linkage between all stages of evaluation is not connected to each other. Hence, the indicators that are used are also different. The perspective in conducting each evaluation is not resemble, some concern on users' perspective and the other concern on community's perspective. Furthermore, sustainability and efficiency also have not been considered comprehensively within evaluation. The inclusion of sustainability and efficiency is similar in some extent. What is different is in the method and data that are used to evaluate the projects. The actual implementation of evaluations has not connected to each other and sustainability and efficiency have been partly included within the evaluations.

Finally, after answering the questions that have mentioned above, we have come to the point to answer the central question of this research:

How are the different stages of evaluation in Indonesia linked (ex-ante, in-itinere and ex-post) and in what way are sustainability and efficiency included within those three stages of evaluation?

An approach in linking the three stages of evaluation by using the same criteria has been done in previous chapter. The finding of the implementation of this approach is that the link between all evaluations that should have been done in toll road operation is not found. Accordingly, the indicators of criteria are not corresponded to the practical context in Indonesia as well. These findings are shown not only by the case studies presented in Chapter 5, but also shown by the procedural guidance of toll road establishment. Both procedures of evaluation and criteria that should be used in evaluation are not stated and regulated in specific. This occurrence might be because of many institutions are involved within the process of planning. Multiple stakeholders have not connected integrally in managing the infrastructure. Furthermore, it can be concluded that sustainability and efficiency has not accomplished in existing evaluation. From the case studies it can be seen that not all evaluations represented both criteria at the same time. Some are considered only sustainability while the others concern on efficiency as central foci. Furthermore, some crucial indicators also have not been included in existing evaluation. For example, one issue that has been put forward by public in toll road operation, congestion, is not included as indicators in most of evaluations. Overall, the link between three stages of evaluation has not apparently applied. This is because the criteria used within the evaluations are not resembled each other. Moreover, the criteria that are perceived essential in this research are only partly applied. It might be a phenomenon in developing country where these concepts have not been pursued by much effort. Economic concern is dominated the practice, thus, causes imbalance position between other concerns.

6.2. Reflections

This research is basically aimed to apply some “newly emergent” concepts within relatively “old” toll road. The application of evaluation and the concept of

sustainability and efficiency have been recognized lately, underpinned by environmental degradation within last century. However, the sources of these notions within international publication are rather limited in specific case of toll road sector. Thus, the exploration of all concepts in this research is based on a wider scope of road transportation. Furthermore, in exploring the concepts that have been discussed in this research, the exploration should have been more focused on international practice. Seeking the best practice internationally can extend the richness of this study.

For further research, some limitations that are mentioned above might be handled beforehand to improve the research. In addition, this research needs more exploration in continuing the objectives mentioned in Chapter 1. After understanding the extent of sustainability and efficiency to be used in evaluation, it is needed to know how to include these concepts more in depth in existing evaluation. However, it requires institutional approach in including the criteria because toll road project involves many stakeholders. Hence, there should be specific rules to put these concepts in practical guidance. Therefore, this research requires future exploration on the attainment of objectives.

6.3. Recommendations

Generally, evaluation on road transportation has been extended by political interests in addition to financial issue and economic benefit (Larsen, 2003). This argument might be true by seeing the reality in Indonesia. The regulation on toll road evaluation has not been performed systematically. This is because in its process of development, toll road involves multi-stakeholder within government (both horizontal and vertical) and outside government as well. To cope with this issue, institutional approach can be used in integrating and sustaining evaluation in its life cycle process. According to de Brucker & Verbeke (2007), institutional approach is focusing on the role of stakeholders in decision making process. However, not only is involved during decision making process, but relevant stakeholders also have to be involved afterwards until the project has been ended. Thus, the stakeholder that are involved within evaluation practice should be resembled each other within all three stages of evaluation (ex-ante, in-itinere and ex-post).

Furthermore, sustainability issue in Indonesia has been focused more on economic sustainability, as it obviously occurs in developing country. It is not really a bad situation regarding limited capacity of developing country in economic context. Sustainability is indeed a fuzzy notion, as implied by Connelly (2007). Yet, it needs a balancing view between all of three concerns (environmental protection, social equity and economic growth). In toll road evaluation, sustainability has not been considered on environmental context. The phenomenon concerning the occurrence of traffic congestion in toll road shows that some section of toll road, particularly in Jabodetabek and other big cities, are considered unsustainable and inefficient in term of environmental and social contexts. The first assumption, unsustainable and inefficient in environmental context, is underpinned by the existence of traffic congestion in operated toll road that affects environmental problem (e.g. air pollution, noise). The second assumption, unsustainable and inefficient in social context, is also underpinned by traffic congestion as externality that influences on social activity (e.g. delay on accessibility). These assumptions can be regarded as background of improvement on toll road evaluation. For example, adding some indicators on measurement of standard of minimum service: in environmental context, added indicator is measurement on air quality; in social context, added indicator is queue time to assess the accessibility of toll road regarding the existence of congestion. In addition, toll road should conform to spatial plan and attempt other policy to support. The continuity of toll road network is also important to attain efficiency. The study conducted by Pribadi and Chaerunisa (2011) shows that unattached network of toll road causes inefficiency. Unconnected network is causing bottleneck in the entrance and outlet of toll road. Hence, this component should also be taken into account before toll road is conducted.

Moreover, corresponding to the data availability, the database system of toll road should pay more attention both on regulator and operator. This is underpinned by the concession period of toll road that is held for 35 years in average. Author has difficulty in obtaining sufficient evaluation data of operated toll road, mainly on operated toll road that have been operated for over than 20 years. Furthermore, linking all stages of evaluation means that the result of each evaluation phase should be preserved sufficiently.

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Appendix

Table 11 List of existing evaluation with sustainability and efficiency as criteria in Bogor Ring Road

Evaluation document	When	for whom	why		what	How
			criteria	indicators		
Preliminary study	Ex-ante	user	sustainability	accessibility and mobility	NA	NA
				cost effectiveness	NA	NA
				Safety	NA	NA
				Congestion	LOS	forecast and comparison
				crash fatalities	NA	NA
			Efficiency	Reliability	travel time, time value	Calculation
				operating cost	vehicle operating cost	Calculation
				mobility and accessibility	NA	NA
			transport quality	NA	NA	
			toll payment	toll tariff	CBA	
			sustainability	Welfare	GRDP improvement	Forecast
				public acceptance	NA	NA
				Safety	NA	NA
				Congestion	NA	NA
				air pollution	NA	NA
				Noise	NA	NA
		efficiency	transport quality	comfortness	NA	
			air pollution	NA	NA	
Environmental Impact Assessment	Ex-ante	user	sustainability	accessibility and mobility	NA	NA
				cost effectiveness	NA	NA
				Safety	NA	NA
				Congestion	NA	NA
				crash fatalities	NA	NA
			efficiency	Reliability	NA	NA
				operating cost	NA	NA
				mobility and accessibility	NA	NA
				transport quality	NA	NA
				toll payment	NA	NA
			sustainability	Welfare	NA	NA
				public acceptance	Avoiding public opposition	Public hearing

		Safety	NA	NA		
		Congestion	Traffic problem during construction	survey		
		air pollution	The level of air pollution	observation		
		Noise	The level of noise	observation		
	efficiency	transport quality	Disturbance in accessibility and mobility during construction	survey		
		air pollution	NA	NA		
Environmental Management/Monitoring Plan	Ex-ante	user	sustainability	accessibility and mobility	NA	NA
				cost effectiveness	NA	NA
				Safety	NA	NA
				Congestion	NA	NA
				crash fatalities	NA	NA
			efficiency	reliability	NA	NA
				operating cost	NA	NA
				mobility and accessibility	NA	NA
				transport quality	NA	NA
		toll payment	NA	NA		
		community	sustainability	welfare	NA	NA
				public acceptance	Community apprehension and asset conversion	Socio-economic approach; institutional approach
				safety	NA	NA
				congestion	NA	NA
				air pollution	NA	NA
				noise	NA	NA
			efficiency	transport quality	NA	NA
		air pollution	NA	NA		
Environmental Management/Monitoring Plan	In-itinere	user	sustainability	accessibility and mobility	NA	NA
				cost effectiveness	NA	NA
				safety	NA	NA
				congestion	NA	NA
				crash fatalities	NA	NA
			efficiency	reliability	NA	NA
				operating cost	NA	NA
				mobility and accessibility	NA	NA
				transport quality	NA	NA
				toll payment	NA	NA
		community	sustainability	welfare	NA	NA
				public acceptance	Disturbance on public utility, increasing job	Institutional approach; socio-economic

			opportunity	approach	
			safety	NA	
			congestion	NA	
			air pollution	air quality degradation technological approach	
			noise	noise proliferation technological, socio-economic approach	
	efficiency	transport quality	Damaged in road infrastructure	Socio-economic approach	
			air pollution	NA	
Environmental Management/Monitoring Plan	Ex-post	user	sustainability	accessibility and mobility NA	
				cost effectiveness NA	
				safety NA	
				congestion NA	
				crash fatalities NA	
			efficiency	reliability NA	
				operating cost NA	
				mobility and accessibility NA	
				transport quality NA	
		toll payment NA			
		sustainability	welfare NA		
			public acceptance disturbance in residents' accessibility and mobility land use change technological approach; institutional approach		
		community	safety	NA	
			congestion	NA	
			air pollution	air quality degradation technological approach	
			noise	noise proliferation technological approach	
	efficiency		transport quality NA		
			air pollution	NA	
	Standard of Minimum Service	Ex-post	user	sustainability	accessibility and mobility NA
				cost effectiveness NA	
				Safety traffic signs, road lighting, road space fences, emergency evacuation, security service Monitoring	
				congestion	NA
				crash fatalities	emergency unit the availability of rescue and other emergency units
efficiency				reliability NA	
				operating cost NA	

		mobility and accessibility	average transaction time, number of toll gate promptness in handling traffic constraints	monitoring	
		transport quality	NA	NA	
		toll payment	NA	NA	
	community	sustainability	welfare	NA	NA
		public acceptance	NA	NA	
		safety	NA	NA	
		congestion	NA	NA	
		air pollution	NA	NA	
		noise	NA	NA	
		efficiency	transport quality	NA	NA
		air pollution	NA	NA	

Table 12 List of existing evaluation with sustainability and efficiency as criteria in Makassar section IV

Evaluation document	when	for whom	Why		what	How	
			criteria	indicators			
Environmental Impact Assessment	Ex-ante	user	sustainability	accessibility and mobility	NA	NA	
				cost effectiveness	NA	NA	
				Safety	NA	NA	
				congestion	NA	NA	
				crash fatalities	NA	NA	
			efficiency	Reliability	NA	NA	
				operating cost	NA	NA	
				mobility and accessibility	NA	NA	
				transport quality	NA	NA	
				toll payment	NA	NA	
		sustainability	Welfare	Social jealousy, job opportunity, economic growth	Socio-economic approach		
			public acceptance	Community apprehension, public perception, disease prevalence	Socio-economic approach; institutional approach		
			Safety	NA	NA		
		community	congestion	Traffic problem	Technological approach		
			air pollution	Air quality degradation	Technological approach		
			Noise	NA	NA		
			efficiency	transport quality	Disturbance on local accessibility, road degradation	Technological approach	
	Environmental Management/Monitoring Plan	Ex-ante	user	sustainability	accessibility and mobility	NA	NA
					cost effectiveness	NA	NA
				safety	NA	NA	
				congestion	NA	NA	
				crash fatalities	NA	NA	
efficiency				reliability	NA	NA	
				operating cost	NA	NA	
				mobility and accessibility	NA	NA	
				transport quality	NA	NA	
				toll payment	NA	NA	
		community	sustainability	welfare	NA	NA	

			public acceptance	Community apprehension, disturbance on public utility	Socio-economic approach; institutional approach	
			Safety	NA	NA	
			congestion	NA	NA	
			air pollution	NA	NA	
			noise	NA	NA	
		efficiency	transport quality	NA	NA	
			air pollution	NA	NA	
Environmental Management/Monitoring Plan	In-itinere	user	sustainability	accessibility and mobility	NA	NA
				cost effectiveness	NA	NA
				safety	NA	NA
				congestion	NA	NA
				crash fatalities	NA	NA
			efficiency	reliability	NA	NA
				operating cost	NA	NA
				mobility and accessibility	NA	NA
				transport quality	NA	NA
				toll payment	NA	NA
		sustainability	welfare	NA	NA	
		community		public acceptance	Disturbance on public utility, disease prevalence Increasing job opportunity, social jealousy, disturbance on local accessibility, social apprehension, public perception	Technological approach; socio-economic approach
				Safety	NA	NA
				congestion	Traffic problem	Technological approach
				air pollution	air quality degradation	technological approach
				Noise	NA	NA
	efficiency		transport quality	Damaged in road infrastructure	Technological approach	
	air pollution		NA	NA		
Environmental Management/Monitoring Plan	Ex-post	user	sustainability	accessibility and mobility	NA	NA
				cost effectiveness	NA	NA
				safety	NA	NA
				congestion	NA	NA
				crash fatalities	NA	NA
			efficiency	reliability	NA	NA
					NA	NA

			operating cost	NA	NA		
			mobility and accessibility	NA	NA		
			transport quality	NA	NA		
			toll payment	NA	NA		
		community	sustainability	welfare	Economic growth	Socio-economic approach	
				public acceptance	disturbance on local and regional accessibility land conversion public perception on job opportunity	technological approach with spatial management; socio-economic approach	
				safety	NA	NA	
				congestion	NA	NA	
				air pollution	NA	NA	
				noise	NA	NA	
			efficiency	transport quality	NA	NA	
				air pollution	NA	NA	
		Standard of Minimum Service	Ex-post	sustainability	accessibility and mobility	NA	NA
					cost effectiveness	NA	NA
user				safety	traffic signs, road lighting, road space fences, emergency evacuation, security service	monitoring	
				congestion	NA	NA	
				crash fatalities	emergency unit	the availability of rescue and other emergency units	
				efficiency	reliability	NA	NA
	community				operating cost	NA	NA
					mobility and accessibility	average transaction time, number of toll gate promptness in handling traffic constraints	Monitoring
transport quality					NA	NA	
toll payment					NA	NA	
				sustainability	welfare	NA	NA
					public acceptance	NA	NA
					safety	NA	NA
					congestion	NA	NA
		air pollution	NA		NA		
		efficiency		noise	NA	NA	
				transport quality	NA	NA	
			air pollution	NA	NA		