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Thesis

ENVIRONMENTAL MANAGEMENT IN TOLL ROAD SECTOR TOWARDS SUSTAINABLE URBAN TRANSPORT

A Study of Jakarta Intra Urban Toll Road, Indonesia

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Summary

Transportation plays a crucial role in our daily lives. Positive side of transportation is undeniable and largely contributes to raise the quality of life. Transportation, as one the main infrastructures, brings broad multiplier impacts to the economy by acting both supply and demand. However, despite the wide range of benefit, transportation brings variety of adverse impacts to degradation of the environment. Such negativity of transportation addresses four major categories of impacts covering local pollution, global pollution, land, water, air space and material use and other quality of life effects. The key is to optimize the positive impacts and mitigate the negative impacts in order to gain optimum benefit of transportation. To do so, transportation must be managed and organized in accordance to sustainability principals.

Sustainable transport includes three interrelated system; economic efficiency *(profit),* distributional/social equity *(people)* and environmental stability *(planet).* An emerging trend in sustainable transport policy include, among others, is the introduction of road pricing mechanism. Road pricing is the term used to refer a system where the road users pay for entering an area or a roadway. The term *road tolls* and *road (user) charges* refers to a charge for entering a certain area or a passing a certain point of a road.

Toll road development has been implemented in Indonesia since 1978 and currently about 659 km toll road in operation. Main objectives of the development are to alleviate traffic congestion in urban area and to support regional growth. Private participation in toll road financing is encouraged due to the government limited budget for infrastructure provision. That is why most of the toll road development is situated in urbanized area such as in Jakarta with high traffic volume which is financially feasible from the private sector perspective.

The study was aimed at exploring the two aspect of development (toll road and environment). The objective of this study is to study the performance of toll road, as a road pricing mechanism, towards an environmentally sustainable transport. To achieve such objective, research question was formulated as follows; “how is the environmental management organized and implemented in toll road sector and how does it contribute to sustainable urban transport?”

The study is qualitative research with combined descriptive and explanatory methods. Instruments of the study include compilation of primary data with in depth interview with the key respondents directly involved in the development of toll road and environmental management (purposive sampling), literature review and desk study (secondary data includes policy documents, reports and archival data).

The study finds that there is lack of emphasis on the environment aspect in toll road development. There is no explicit environmental requirement in toll road network planning or in tender evaluation to choose the private operator. Environmental concern is very much centered on AMDAL (Environmental Impact Assessment) and its implementation while there are still remaining problems attributed to AMDAL implementation.

The main problems with AMDAL implementation is poor enforcement. At least three aspects are marked upon the control mechanism. Firstly is limitation in manpower and financing in both the governmental institutions as well as in the private sector. There are not enough staffs in the Ministry to deal with loads of project while from the available staffs, those who has sufficient knowledge and experience with environmental management is also still limited in number. Secondly, the reason for lack of enforcement is poor coordination between stakeholders/agencies. This is due to the still evolving and restructuring institutional in most of the government organizations. Thirdly, is public lack of accessibility for environmental

documents and supervision reports. This reduces the opportunity for public to actively involve in the supervision to compensate the lack of this action from the government.

Main recommendations of this study based on the findings are to put more environmental concern in toll road development and to improve enforcement mechanism for environmental management. The first may be done by stating environmental requirement in every stage of the development such as requirement for private company's environmental certification. The later can be achieved by reinforcing the environmental institution with improved quality of human resources, putting more financing for environmental supervision or by introducing reward and punishment mechanism.

Regarding environmental impacts of toll road to urban environmental qualities, this study recommends that there is potential positive contribution of toll road to the environment by smoother traffic (less congestion) and reduced emission. However, this positive contribution can be quantitatively measured due to the complexity of the transport system and limited data on environmental parameters. Overall, the finding results show that toll road development's emphasis in Jakarta is very much put on the economic goal and less in the social goal while very little on the environmental goal.

***Keywords**: sustainable development, transportation, toll road, road pricing, environmental impact assessment*

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Abbreviations

Abbreviations	*English*
ADB	: Asian Development Bank
ALS	: Area Licensing System
ASEAN	: Association of South East Asian Nations
AMDAL	: Environmental Impact Assessment (EIA)
APBN	: National Budget
BAPEDAL	: Environmental Impact Management Agency
BOT	: Build Operate Transfer
BPS	: Central Bureau of Statistics
DKI Jakarta	: Special Capital City Jakarta
EIA	: Environmental Impact Assessment
ERP	: Electronic Road Pricing
GDP	: Gross Domestic Product
GNP	: Gross National Product
GOI	: Government of Indonesia
GRDP	: Gross Regional Domestic Product
HOV	: High Occupancy Vehicle
Jabotabek	: Jakarta, Bogor, Tangerang and Bekasi
Jabodetabek	: Jakarta-Bogor-Depok-Tangerang-Bekasi (Greater Jakarta)
JIUT	: Jakarta Intra Urban Toll Road
Jl.	: Street
JORR	: Jakarta Outer Ring Road
MENLH	: Ministry of Environment
MPW	: Ministry of Public Works
MRT	: Mass Rapid Transit
NGO	: Nongovernmental Organization
NO_x	: Nitrogen Oxide
ODA	: Official Development Assistance
Pb	: Lead
PPP	: Public Private Partnerships
RKL	: Environmental Management Plan
RPL	: Environmental Monitoring Plan
SITRAMP	: Study on Integrated Transport Master Plan for JABODETABEK
SO_2	: Sulphur Dioxide
TDM	: Travel Demand Management
TSP	: Total Suspended Particles
VQS	: Vehicle Quota System
WB	: The World Bank
WHO	: World Health Organization

Chapter 1. Introduction

1.1 Background

Transportation has been a central part of our daily lives as it becomes crucial to development and the economy. Transportation, as one of the main infrastructures, brings broad multiplier impacts on economic development by acting through both supply and demand. Transportation also contributes to raise the quality of life. Button (1993) stated that *"a comprehensive transport provision is an important input into the efficient functioning of modern industry and commerce as it is also affords individuals and households the benefits of mobility and access"*.

Positive side of transport is undeniable. However, despite the wide range of benefits, transport activities bring variety of adverse impacts to degradation on environment qualities and human health. The impacts associated to transport is widely diversified, however the following are widely accepted as important transport-based sources of environmental degradation (Button, 1993): (i) noise, (ii) vibration, (iii) accident risk, (iv) atmospheric pollution, (v) excess depletion of natural resources, (vi) community severance, (vii) water pollution, (viii) congestion, and (ix) visual intrusion and aesthetics.

To address the diversified transport impacts, Gwilliam and Geerlings (1992) mentioned four major categories of impacts covering local pollution, global pollution, land, water, air space and materials use and other quality of life effects.

(1) Local pollution, includes all of the physical emissions other than those considered under the global pollutions category (those causing global warming and ozone layer depletion); (i) *air pollution* including carbon monoxide (CO), oxides of nitrogen (NOx), particulate matter, sulphur oxide (SO2), organic compounds, benzene, PAH's, photochemical precursors (VOC's) and trace metals (Pb and PAN), secondary pollutants formed by the atmospheric photochemical reaction such as ozone (O3) and PAN, (ii) *water pollution* includes toxic compounds release by suspended solids, (iii) *soil pollution* which contaminate the soil in the similar manner with water pollution and effect the environment including on crops and vegetation, health and safety issues.

(2) Global pollution includes those which are of significance to global warming (the greenhouse effect) and stratospheric ozone layer depletion; (i) *the greenhouse gasses* including carbon dioxide (CO2), methane (CH4) and ozone precursors such as hydrocarbon (HC's) and nitrous oxide (N2O), (ii) *ozone depletion*, which principally caused by reaction of chlorine from CFC's in the atmosphere.

(3) Quality of life effects includes the direct effects of transport on urban life which mainly associated with high traffic volume and the congestion that results, (i) *noise* may generates stress, impedes verbal communication and social activity, and impairs job performance, (ii) *vibration* which at lower frequencies may cause damage to buildings structures, (iii) *visual impact* of traffic caused by the vehicle, infrastructure, interaction of transport network structure and the land use or the air pollution generated by the transport particularly smoke emissions, (iv) *community severance* is the perceived or objectively measurable loss of local accessibility caused both by the traffic itself and the infrastructure designed for the traffic, (v) *perceived safety and security*, the associated high levels of traffic accidents to high motorization levels which causes loss of income an puts economic pressures on hospital and the services.

(4) Land, water, air space and materials use for transport vehicle and environmental impacts imposed during manufacturing, operation and operation also those impacts associated with the construction of infrastructure and land space occupation.

The key is to optimize the positive impacts and mitigate the negative impacts in order to gain optimum benefit of transportation. To do so, transportation must be managed and organized in accordance to sustainability principals.

Milestone for sustainable development has been the concept delivered by Brundtland Report; sustainable development is one that *"meets the needs of the present without compromising the ability of future generations to meet their own needs"*. Geerlings and Lohuis (2008) interpret sustainability as *"a process of change in which the exploitation of resources, the direction of investment, the orientation of technical development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations"*. Moreover, sustainability incorporates three interrelated systems within sustainable development which include the ecological system ("planet"), the economic system ("profit") and the socio-cultural system ("people").

To translate the concept of sustainability into practice, different approaches have been introduced to transport sector policy making. Geerlings and Lohuis (2008) mentioned the following approaches (from higher preference of sustainability perspective); (i) spatial planning, (ii) transport prevention, (iii) pricing, (iv) stimulating public transport, (v) mobility management, (vi) modal shift, (vii) infrastructure capacity management, (viii) infrastructure upgrading, and (ix) infrastructure constructing.

Road pricing is normally used for a designed system aimed at reducing congestion by diverting traffic to other less congested alternative routes and hours. Road pricing may take on different kind of form and objectives. Types of road pricing mentioned by Schwaab and Thielmann (2001) are; (i) road pricing scheme for the complete road network, (ii) tolls, often used to recover investment and maintenance costs, (iii) urban road pricing can take different forms: congestion pricing restricts the use of congested urban roads; area licensing imposes a charge on the actual road use; and cordon pricing is equivalent to an entrance fee, (iv) vignettes schemes as a fee for temporarily accessing certain road networks, and (v) an electronic mileage-tax for Heavy Goods Vehicles.

The objectives of road pricing are also comes in many forms. As stated by May (1992), the objectives may be to increase efficiency of the road network, to reducing environmental impacts, to improve accessibility or to generate revenue generation as finance for transport infrastructure has become more limited. The objectives are not in conflict and in most systems, the scheme was designed aiming to fulfil all functions to some extent. For example, The Singapore Area Licensing Scheme was designed specifically to reduce congestion although during the implementation the environmental benefits were also realized.

1.2 Statement of the Problem

Jakarta is the national capital and the largest city in Indonesia. Its role is vital as the national centre of economic and political activities and has been grown into one of the emerging competitive cities in the regional level. Like many other big cities of developing countries, Jakarta suffers urbanization problems in many sectors. For some time, Jakarta has attracted a large number of visitors which evident with the doubled population during weekdays compared to that of weekends. Incoming flows of people are increasing from other areas as well as visiting residents from neighbouring cities like Bandung city. Such high activities level and sharp rise in population accompanied with inadequate transportation system resulted in severe traffic jams that occur almost every day. Air pollution is also a severe problem suffered by the city.

To cope with growing demand for transportation as well as to facilitate growth, development of toll road was initiated in 1978. It was aimed to reduce congestion especially in the inner

city. Toll road development has been nationally implemented and accepted as an effective tool to facilitate growth and increasing demand.

From environmental point of view, smoother traffic and less congestion on toll road also reduce vehicle emissions hence contribute to environmental sustainability. However, in practice, transportation issues in Jakarta still remains as the environmental qualities not yet improved. Sustainability, particularly in term of ecological and environmental aspects, is often perceived apart from toll road development itself. Focus on the environmental benefits of toll road surfaced as the urban problems related to transport become more urgent.

The study aimed at exploring the implementation of the toll road development and how it contributes to the sustainable urban transport focusing on the following themes; (i) Is there an environmentally sound regulatory framework for toll road development? (ii) How is it being implemented in reality?, (iii) What aspects influenced its implementation? and (iv) What are the impacts (outcome) of such arrangement to the environment?

1.3 Justification of the Study

Urban transport accounts for major part in environmental performances of an urban area as in air quality degradation and high traffic accidents. The study aims to analyze the implementation of environmental management in toll road sector, its effectiveness and its contribution to deal with transport related issues on urban environment. The findings of this study are expected to contribute to the development of knowledge in urban sustainability, specifically focusing on the urban transportation management and the environmental policies. Due to a large number of toll road projects that have been or are going to be implemented in many big cities in Indonesia, it is also hoped that the outcome of the study will be applicable on such cities and contributes to a better implementation in the future. Finally this study is a part of the requirements to obtain MSc in Urban Management and Development.

1.4 Conceptual Framework

The topic of this research is about transport and the environmental with particular attention to the emerging concept of sustainable transport. Transport sector today is still experiencing an unprecedented growth. The background for this is continuously increased demand for transport triggered by the rapid urbanization and growth in industrial and economic activities; in this term transport serves as *supply* for growth. Another background is the relevance of transport as the basic infrastructure from which undeveloped area can be able to experience more growth with open accessibility and improved mobility; in this term transport acts to create *demand* thus support development. These in turn require improved management in order to keep pace with its growth.

The emerging approaches in transport policies offer various tools for improved transport management. It extends from spatial planning to infrastructure constructing (as shown in Figure 1) offering different preference in term sustainability perspectives. Road pricing is a concept mentioned to be an effective tool for transport policy basis as practiced in different parts of the world.

Toll road is an example of road pricing implementation and is the main topic in this research. The research was aimed at analyzing toll road development in Jakarta and how it impacted the environment. Environmental management in toll road and its implementation is the core of the empirical part. The next part is to look at toll road development in term of sustainability perspective.

Case studies of urban transport management in three different cities are also conducted to enrich the literature review and gain more practical information on how cities deal with their transportation sector and how to overcome environmental impacts of transport.

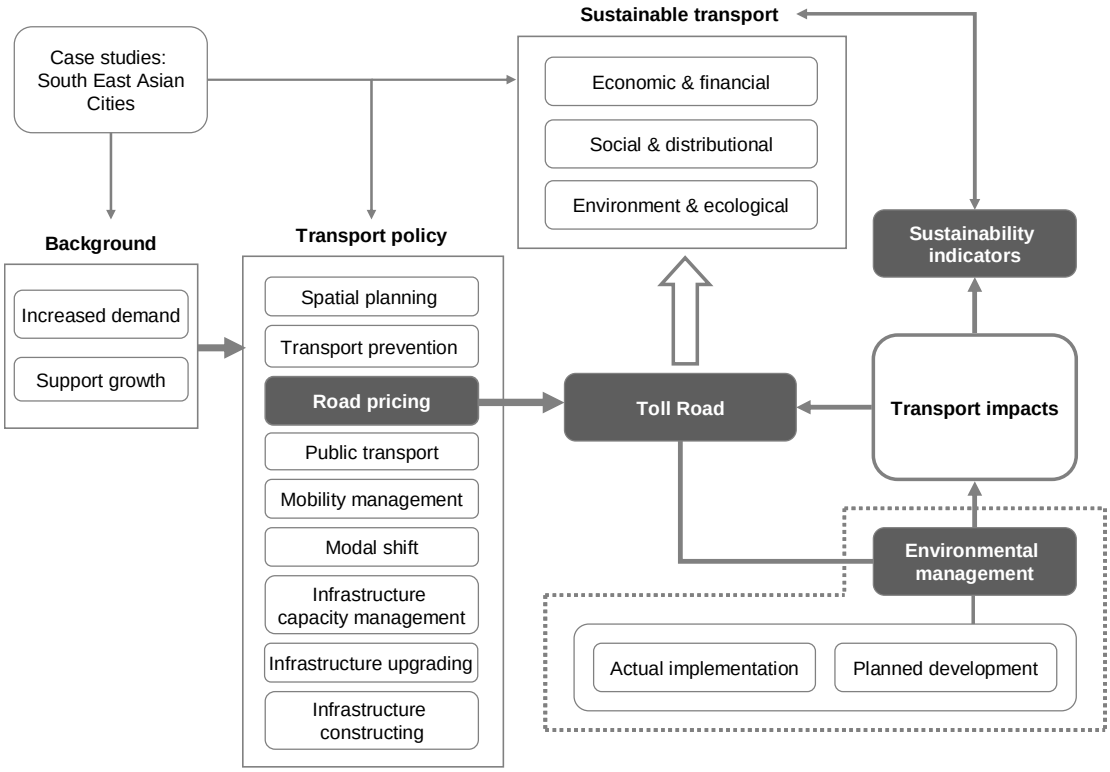

Figure 1. Conceptual framework

1.5 Research Objective and Questions

Road pricing has been practiced in different parts of the world as an effective transport management tool. In Indonesia, road pricing implementation comes into practice with toll road development. There are not many studies focused on the environmental aspects of toll road in Indonesia or the environmental impacts of its implementation. The study was aimed at exploring the two aspect of development (toll road and environment management). **Research objective** was formulated as follows;

To study the performance of toll road, as a road pricing mechanism, towards an environmentally sustainable transport.

To achieve such objective, **research question** was formulated as follows;

How is the environmental management organized and implemented in toll road sector and how does it contribute to sustainable urban transport?

The focus of this research is to analyze the existing system within which toll road is being implemented, focusing on the environmental management aspect. To answer the main research question, three **sub questions** were formulated as follows:

- *How is the environmental management organized in toll road sector?*

  First part of the study is to analyze the policy environment in which toll road is implemented. Emphasis of this part is to determine the relevance of toll road development in term of environment aspect and how it is managed and organized ("***in theory***"). Emphasis is on the following; (i) is there any environmentally sound regulatory framework for toll road development?, and (ii) who are the actors involved and their roles in the development?

- *How is the actual implementation of the environmental management in accordance to the planned development?*

Having studied the policy environment, the next part is to analyze implementation of toll road environmental management in the real world ("***in practice***"). The interaction between actors and currently existing political and institutional setting may resulted to a distortion between theory and practice. It is also important to determine what factors and aspects influence the implementation and to what extent it is being conducted according to the planned development. The findings and its analysis are relevant in order to identify the strength and weaknesses of the system and how it can be improved in the future. It is the core focus the study and is the empirical part which employs primary data gathering with in depth interview.

- *How does toll road influence the environmental qualities and the urban transport sustainability?*

  The next part of this study is to analyze the impact of toll road to the environment. Three indicators are used to describe to what extent sustainability has been achieved with toll road implementation and its environmental management. Nature of analysis is qualitative rather than quantitative and due to limitation in time and resources, secondary data is employed for this purpose.

1.6 Operational Definitions

Table 1. Operational definitions

Variables	Operational definition
Sustainable transport	Sustainable (transport) development as interpreted from the Brundtland report is "*a process of change in which the exploitation of resources, the direction of investments, the orientation of technical development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations*" (Geerlings and Lohuis, 2008)
Transport demand management	*"Also called Mobility Management, refers to various strategies that change travel behaviour in order to increase transport system efficiency and achieve specific planning objectives"* (VTPI, 2007)
Road pricing	*Road Pricing means that motorists pay directly for driving on a particular roadway or in a particular area* (VTPI, 2007)
Toll road	Roadway facilities financed by tolls (also "toll lane") (VTPI, 2007)
Road toll	A fixed fee for driving on a particular road (VTPI, 2007)
Public Private Partnership (PPP)	Although there is a broad definition of PPP, for this thesis the following definition (Lewis, 2001) is retained as: *"agreements where public sector bodies enter into long-term contractual agreements with private sector entities for the construction or management of infrastructure facilities by private sector, or the provision of services by the private sector entity to the community on behalf of a public sector entity*"
Environmental impact	Direct and indirect impacts of transportation on environment include local, global and other life related aspects

1.7 Variables and Indicators

Table 2. Variables and indicators

Sub Questions	Variables	Indicators	
How is the environmental management organized in toll road sector?	Policy and planning	Objectives of development	Environmental objective? Yes/no
		Actors in policy formulation	Environmental institutions involved? Yes/no
		Participatory development	Community participation in policy & planning? Yes/no
		Investment tender	Decision based on environmental aspect? Yes/no
			Environmental certification for investment application? Yes/no
		Environmental management tools	What tools are applied?
			Stakeholders involved?
			Roles of the stakeholders?
			Control mechanism?
			Indicators for success?
	Construction	Supervision and monitoring	Stakeholders involved?
			Roles of the stakeholders?
			Rewards and punishment?
			Community participation?
	Operation	Supervision and monitoring	Stakeholders involved?
			Roles of the stakeholders?
			Rewards and punishment?
			Community participation?
	Post-operation	Monitoring	Indicators for success?
How is the actual implementation of the environmental management in accordance to the planned development?	*Theory and Practice Analysis (empirical part)*	*Development plan*	
		Implementation	How policy and plan being implemented? Causes and impact of the implementation? Measure to success? Supervision report? Implementation documents? Reward and punishment?
How is the toll road influence the environmental qualities and the urban transport sustainability?	Transport impacts	Level of congestion	Travel speed on toll road?
			Travel speed on non toll road?
		Level of air pollution	Level of air pollution? Decreased/increased
		Level of traffic risk	Traffic accidents on toll road?
			Traffic accidents on non toll road?

1.8 Methods and Strategy

The study is a ***qualitative*** research with combined ***descriptive*** and ***exploratory*** methods. ***Case study*** was used as main research strategy since it focuses on the study of contemporary phenomenon of practical situation in the study area. Instruments of the study include; (i) compilation of primary data with in depth interview with key respondents are those who directly involved in the development of toll road and environmental management ***(purposive sampling)***, (ii) literature review and (iii) secondary data gathering includes policy documents, reports and archival data).

1.9 Units of Analysis

Environmental management and *transportation impacts* are units of analysis of this study. Analysis was done qualitatively and emphasized in the implementation of environmental management of toll road as the empirical part of the study. Furthermore, the transportation impacts of the road are also analyzed and how it impacted the urban transport system in Jakarta.

1.10 Population and Sample

Transport network in Jakarta includes extensive system of roadway, railway, public transport, mass rapid transit and many other transportation activities both formal and informal. The study focuses on Jakarta Intra Urban Toll Road located within the inner city with an average traffic volume of approximately 739,427 vehicle/day (December 2006). Population of the research is stakeholders involved in toll road development comprising government institutions, private operator and the road users (community). Purposive (non probability) sampling technique was implemented to identify the competent and highly experienced key respondents with deep understanding and knowledge within the infrastructure, toll road development and the environment including the planning, policy making and implementing agencies.

1.11 Data Collection

1. Primary Data

   Primary data collection is the empirical part of the study used to answer the second research sub question which is to analyze the actual implementation of environmental management in toll road sector in accordance to the planned development. Purposive sampling was used to identify the key respondents

   In depth interview with open-ended questions and semi structured format was conducted during fieldwork period in 30 June – 1 August 2008. Organizations of key respondents for interview are shown in Table 3.

   Total number of key respondents is 12 people. List of key respondents and their organization is described further in Annex 1.

Table 3. List of respondents organization

No.	Organization		Remarks
Government			
1.	DG Highways, Ministry of Public Works	Sub Directorate of Toll Road and Freeways Development	Division deals with policy and planning in toll road and freeways
		Sub Directorate of General Planning	Division deals with general planning in road development, including toll roads
		Sub Directorate of Environmental Engineering	Division deals with environmental management in road sector
		Field project	Field unit for toll road construction by government
2.	BPJT, Ministry of Public Works	Division of Studies	Toll road regulatory body under Ministry of Public Works
3.	Ministry of Environment	Section of AMDAL	Division deals with AMDAL management
Private			
4	PT Jasa Marga		Private operator for JIUT (Cawang-Tomang-Cengkareng toll road)
Practitioners/NGO			
5.	Consultants		Consultancy experts in the filed of toll road and environment
6.	NGO		Nongovernmental organization with special concern to transportation sector

2. Secondary Data

   Relevant secondary data are collected, including policy documents in toll road provision and environment management, environmental documents and the monitoring reports and data on environment parameter. Data on environmental qualities and parameter are also employed.

3. Literature review

   Literature review is conducted to prepare theoretical framework of key concepts for sustainable transport and pricing mechanism and for case studies on three relevant cities in regards to the transport management which add up for foundation to the framework.

1.12 Data Quality

Validity: validity is controlled with triangulation technique such as the use of secondary data analysis, literature review and primary data collection with interview. Validity was insured by employing purposive sampling techniques focused on competent and qualified respondents with first hand experiences and direct involvement in the subject area.

Reliability: reliability is enhanced by unambiguous, clear and non leading question. Data collections derived from cross sectoral respondents with purposively sampling methods to ensure the right key respondents to provide reliable data and answers in the interview. Records/interview notes are kept for analysis and further results. Reliability was also enhanced by piloting the interview questions to fellow students and a staff in one of the institutions involved.

1.13 Data Analysis

Data analysis is conducted qualitatively through an institutional and regulatory analysis including types of stakeholders, their roles and the mechanism between them. Part of literature review to identify the development plan is crucial and will be used as the basis to analyze the findings from the empirical study. Stakeholders' roles, their responsibility and the actual implementation are validated through an interview and by studying the planning, monitoring and supervision documents. Empirical part of the study is analyzing the system in actual practice and how it complies or distorts from the planned development. Furthermore it is used to validate the previous part (regulatory and policy environment) in term of the workability of the system and/or the implementability of the system.

Next part of the analysis is assessing the transportation impacts, include (i) level of congestion (on toll road and on non toll road), (iii) level of air pollution (ambient air quality), (iv) level of traffic risk (crash deaths and injuries on toll road and on non toll road), all of which are indicators for sustainable transport. These indicators determine the sustainability level of a transport system.

Phases of analysis and relationship between research questions and indicators are as shown in Figure 2.

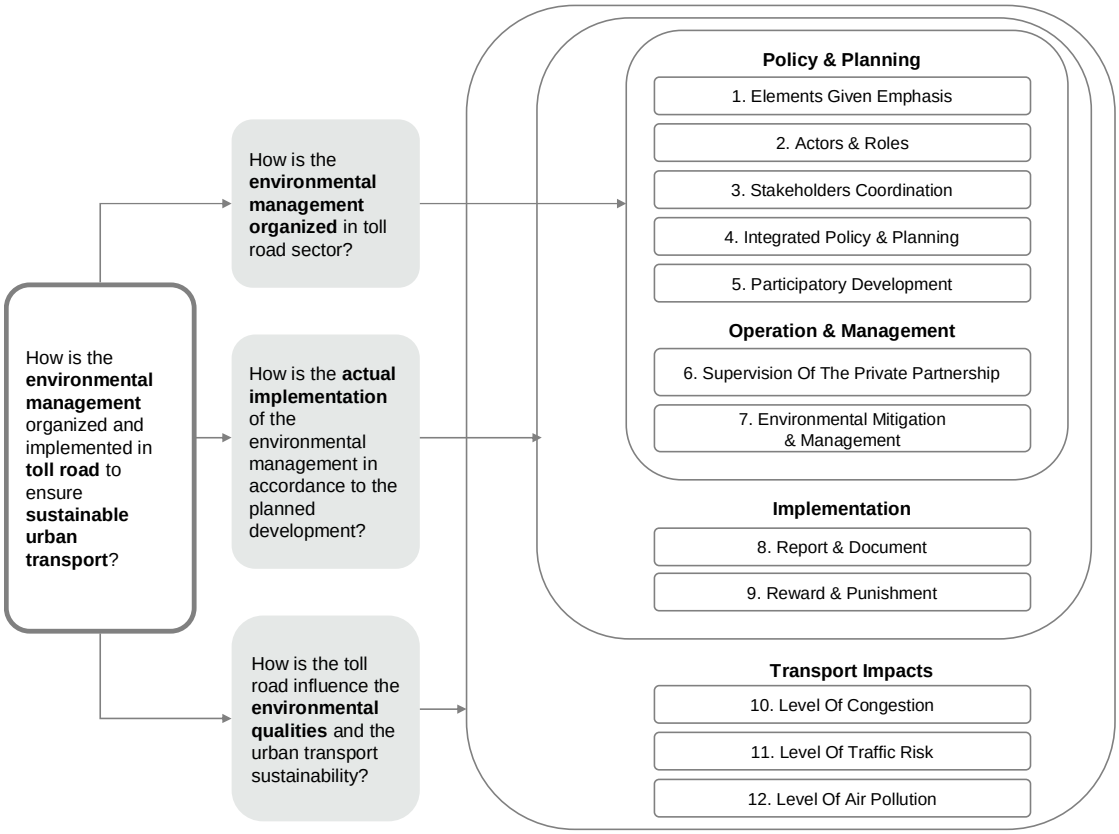

Figure 2. Relationship between questions and indicators

1.14 Scope and Limitation of the Study

The scope of the study is the environmental management in toll road sector with Jakarta Intra Urban Toll Road as a case study. It includes analyzing the framework within which toll road is carried out, the implementation of the operation by the private operator and the environmental impacts of the toll road.

There are limitations on this study related to time and resources constraint and other practical factors during fieldwork. Limitation is associated with the condition that fieldwork was conducted by long distance interview with helps from research assistant. The difficulties to acquire accurate and actual answers are also another challenge to be overcome since the respondents from governmental institutions, particularly high ranked officers, tends to give politically right answers. However, this bias issue was minimized by cross checking answers of the same questions to different respondents and, if necessary, by repeating the same question in different approaches to the same respondent.

Another limitation is the limited availability of data for measuring the transport impacts. It is due to some institutional changes that have taken place within certain agencies thus the filing and data base system are still under construction and limited to access.

1.15 Research Design

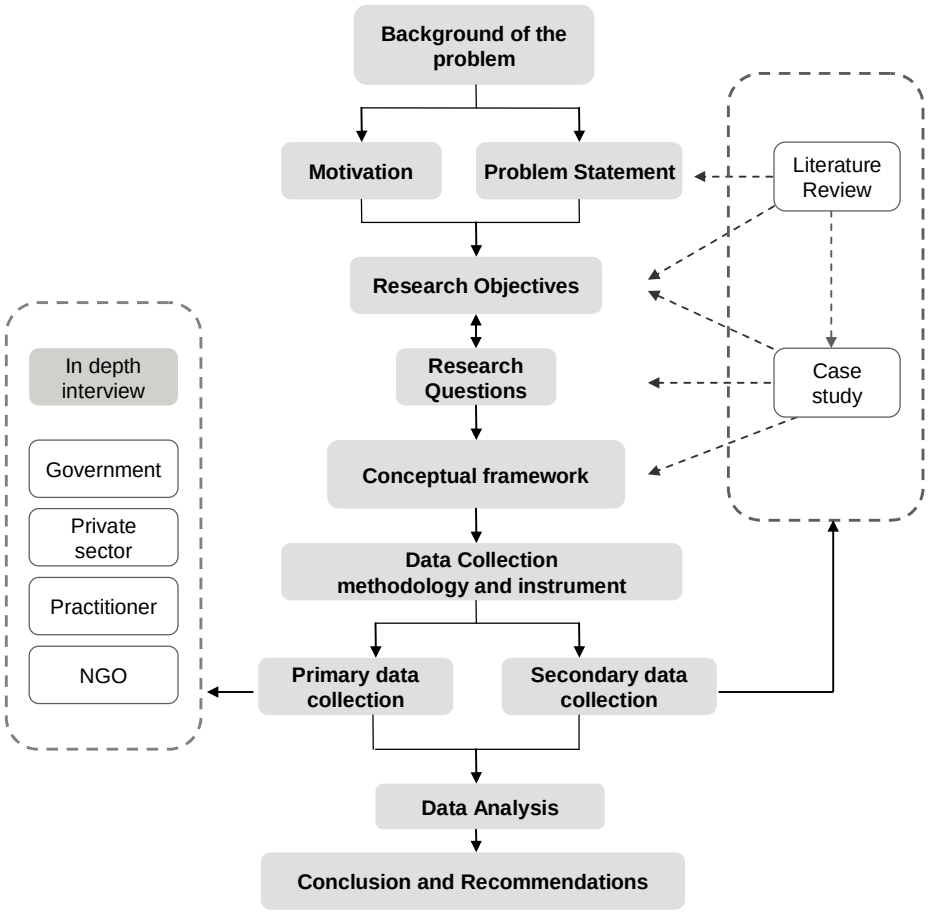

Figure 3. Research design

1.16 Thesis Structure

Chapter 1 is the introduction part includes the research's background, statement of problem, objectives, questions and conceptual framework. The methodology is also included in this chapter.

Chapter 2 includes a literature review on the main topic of this study, which is sustainable transport. The chapter presents review on theories relevant to sustainable transport and road pricing with regards to the research questions and scope of the study.

Chapter 3 presents an illustration of how cities deal with urban transport issues including policy measures and the environmental impacts. Three cities are selected in South East Asian region, namely Singapore, Bangkok and Ho Chi Minh City, which have geographical closeness and comparable condition with Jakarta.

Chapter 4 presents general information of study area (including economic, environmental performance and transportation profile) and information of toll road development (policy and regulatory framework) in the study area. Regarding research questions, this chapter relates to the first sub question which explores and explain the policy environmental within which toll road is implemented.

Chapter 5 presents analysis about environmental impact of Jakarta Urban Toll Road employed three indicators of sustainable transport; traffic risk level, air pollution and level of congestion. Regarding research question, this chapter relates to the last sub question about measuring the toll road contribution to sustainable transport.

Chapter 6 is the empirical part of the study presents findings and analysis within environmental management context from primary data collection conducted during fieldwork period. Regarding research question, this chapter relates to the second sub question about the actual implementation in accordance to the planned development.

Chapter 7 presents the conclusions, recommendations and direction for further research.

Chapter 2. Literature Review on Sustainable Transport

Main topic of this study spins around in two themes; transportation and the environment. Unprecedented growth in transportation is marked in both developing and developed countries. While almost all of the developing countries are still experiencing urban transport related problems, most of developed countries have introduced and applied new approaches to manage their urban transport. In those countries, emerging concept of sustainable transport has come into practice and implemented in planning and policy making. In order to be effective, transport policies should be based on three pillars of sustainable development, namely economic, social and environmental sustainability. Properly designed urban transport with balance proportion of the three objectives should be able to derive optimum positive side of transport while minimizing the negative side.

This chapter provide literature review on the concepts of sustainable development, sustainable transport, and road pricing as one of transportation management tools. It focuses on road pricing concept as it is the background and basis of toll road development in Indonesia.

2.1 Transportation: Development Generator and Environmental Consequences

2.1.1 Positive Impacts of Transportation

Transportation has been a central part of our daily lives as it becomes crucial to development and the economy. The World Bank (1996) stated that *"transport generates growth by facilitating trade, both nationally and internationally, and by increasing access to health and education facilities as well as local national amenities."*

Transportation, as one of the main infrastructures, brings broad multiplier impacts on economic development by acting through both supply and demand. Transportation improvements can affect economic growth and development in at least four ways:

> *"(i) by enabling new forms of trade among industries and locations, (ii) by reducing cargo loss and enhancing reliability of existing trade movements, (iii) by expanding the size of markets and enabling "economies of scale" in production and distribution, and (iii) by increasing productivity through access to more diverse and specialized labour, supply and buyer markets"* (California High-speed Rail Authority, 2008).

At the microeconomic level, the transport effect is seen through (i) reduced cost of production thereby affects profitability, levels of output, income, and employment and (ii) structural impact in demand and supply that it contributes to diversification of the economy. Transportation also contributes to raise the quality of life. Button (1993) stated that *"a comprehensive transport provision is an important input into the efficient functioning of modern industry and commerce as it is also affords individuals and households the benefits of mobility and access"*.

2.1.2 Negative Impacts of Transportation

Positive side of transport is undeniable. However, despite the wide range of benefits, transportation activities bring variety of adverse impacts to the degradation on environment qualities and human health. The impacts associated to transport is widely diversified, however the following are widely accepted as important transport-based sources of environmental degradation (Button, 1993): (i) noise, (ii) vibration, (iii) accident risk, (iv) atmospheric pollution, (v) excess depletion of natural resources, (vi) community severance, (vii) water pollution, (viii) congestion, and (ix) visual intrusion and aesthetics.

Inappropriately designed transport system can threat and cause damage to the environment and to human health and safety. Road accidents cause about a million people's death each year while the air quality in major cities of developing countries is getting worse. Road traffic in large city centre may not be the main contributor of air pollution but it is a primary source of some important of pollutants, for instance lead and carbon monoxide (90-95%), nitrogen oxides and hydro carbons (60-70%) and a major share of particulate matter (Newman & Kenworthy, 2007). In 1993, an estimated 12,500 deaths a year was recorded in Mexico City due to the high particulate level (World Bank, 1996).

To address the diversified transport impacts, Gwilliam and Geerlings (1992) mentioned four major categories covering local pollution, global pollution, land, water, air space and materials use and other quality of life effects.

(1) *Local pollution* is defined to include all of the physical emissions other than those considered under the global pollutions category (those causing global warming and ozone layer depletion). Impacts comes from many sources and result in air, water and soil pollution including gaseous emissions entering the water cycle and enter the soil as deposited particulates; (i) *air pollution* which relates to human health (including reduction of human oxygen level, respiratory problem and eye irritation), damage of plants and buildings, including carbon monoxide (CO), oxides of nitrogen (NOx), particulate matter, sulphur oxide (SO2), organic compounds, benzene, PAH's, photochemical precursors (VOC's) and trace metals (Pb and PAN), secondary pollutants formed by the atmospheric photochemical reaction such as ozone (O3) and PAN, (ii) *water pollution* includes toxic compounds release by suspended solids, over demand for biochemical oxygen and changes in local drainage systems which in turn leads to damage to aquatic ecosystems and contamination of potable water supply, (iii) *soil pollution* which contaminate the soil in the similar manner with water pollution and effect the environment including on crops and vegetation, health and safety issues associated with disturbance and handling of contaminated soil and chemical attack in structures.

(2) *Global pollution* includes those which are of significance to global warming (the greenhouse effect) and stratospheric ozone layer depletion; (i) *the greenhouse gasses* including carbon dioxide (CO2), methane (CH4) and ozone precursors such as hydrocarbon (HC's) and nitrous oxide (N2O), other relevant gases are chlorofluorcarbons (CFC's), tropospheric ozone (O3) and water vapor from high altitude, (ii) *ozone depletion*, known to cause skin cancer and cataracts in animals and reduce crops yield, which principally caused by reaction of chlorine from CFC's in the atmosphere.

(3) *Quality of life effects* includes the direct effects of transport on urban life which mainly associated with high traffic volume and the congestion that results, (i) *noise* which may generates stress, impedes verbal communication and social activity, and impairs job performance, (ii) *vibration* transmitted both through air (at high frequencies) and structures (at low frequencies) which at lower frequencies may cause damage to buildings structures, (iii) *visual impact* of traffic caused by the vehicle, infrastructure, interaction of transport network structure and the land use or the air pollution generated by the transport particularly smoke emissions, (iv) *community severance* is the perceived or objectively measurable loss of local accessibility caused both by the traffic itself and the infrastructure designed for the traffic, (v) *perceived safety and security*, the associated high levels of traffic accidents to high motorization levels which causes loss of income an puts economic pressures on hospital and the services.

(4) *Land, water, air space and materials use* for transport vehicle and environmental impacts imposed during manufacturing, operation and operation also those impacts associated with the construction of infrastructure and land space occupation. Resources used are either limited in supply or environmentally sensitive, including iron and steel, aluminium, lead, metals and polymers/plastics.

2.2 Sustainability for Transport Policy Basis

2.2.1 Sustainable Development

Sustainable Development according to the Brundtland Report is;

> *"one that meets the needs of the present without compromising the ability of future generations to meet their own needs"*. It interpreted by Geerlings and Lohuis (2008) as *"a process of change in which the exploitation of resources, the direction of investment, the orientation of technical development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations"*.

Three interrelated systems within sustainable development include the ecological system ("planet"), the economic system ("profit") and the socio-cultural system ("people"). Sustainability is increasingly gaining a wider definition including a broad dimension of issues, as shown in Table 4 below.

Table 4. Sustainability issues

Economic (profit)	Environmental (planet)	Social (people)
- Affordability	- Pollution prevention	- Equity
- Resource efficiency	- Climate protection	- Human health
- Cost internalization	- Biodiversity	- Education
- Trade and business activity	- Precautionary action	- Community
- Employment	- Avoidance of irreversibility	- Quality of life
- Productivity	- Habitat preservation	- Public participation
- Tax burden	- Aesthetics	

Source: Geerlings and Lohuis, 2008

2.2.2 Sustainable Transportation

Litman and Burwell (2003) stated that transport sustainability is defined dispersedly from narrow definition incorporating individual technologies to a wider concept involving more comprehensive approaches; improved travel choices, economics incentives, institutional reforms, land use changes as well as technological innovation.

Some definitions of sustainable transport are recorded such as *"transportation that does not endanger public health or ecosystems and meets mobility needs consistent with use of renewable resources at below their rates of regeneration and use of non-renewable resources at below the rates of development of renewable substitutes"* (OECD, 2001) or *"a sustainable transport system is one in which fuel consumption, vehicle emissions, safety, congestion, and social and economic access are of such levels that they can be sustained into the indefinite future without causing great or irreparable harm to future generation of people throughout the world"* (Richardson, 1999).

Table 5. Sustainable transportation issues

Economic (profit)	Environmental (planet)	Social (people)
- Accessibility quality - Traffic congestion - Infrastructure costs - Consumer costs - Mobility barriers - Accident damages - DNRR	- Air pollution - Climate change - Noise pollution - Water pollution - Hidrologic impacts - Habitat and ecological degradation - DNRR	- Equity / fairness - Impacts on mobility disadvantaged - Affordability - Human health impacts - Community cohesion - Community livability - Aesthetics

This table lists various impacts which should be reflected, as much as feasible, in sustainable transportation indicator sets. (DNRR=Depletion of Non-Renewable Resources)

Source: Litman and Burwell, 2003

A sustainable development definition by Daly (1991) can be translated to cover environmental aspects of sustainable transport. It would have the transport system that;

> *"(i) use renewable resources at a rate that did not exceed their natural rate of reproduction; (ii) the rate at which the system uses non-renewable resources may not exceed the rate at which alternative substitutes are developed; and, (iii) the rate at which the system emits pollutants can not exceed the environment's ability to assimilate these".*

The environmental nature of this definition is apparent. Sustainable transport as recommended by the Transportation Research Board (TRB, 2008) is a transport system which; (i) allows the basic access and development needs of the people to be met safely and consistent with human and ecosystem health, and promotes equity within and between successive generations, (ii) is affordable, operates fairly and efficiently, offers a choice of transport mode and supports a competitive economy, as well as balanced regional development, and (iii) limits emissions and waste, uses resources at the level of generation or development, while minimizing the impact on the use of land and the generation of noise.

Overall, sustainable transportation should consider all three angles (World Bank, 1996);

> *"(i) to ensure continuous capability to support an improved standard of living corresponding to economic and financial sustainability, (ii) to generate optimum possible improvement in the general quality of life that relates to the concept of environmental and ecological sustainability, and (iii) to produce equitably benefits shared by all sections of the community which term social sustainability".*

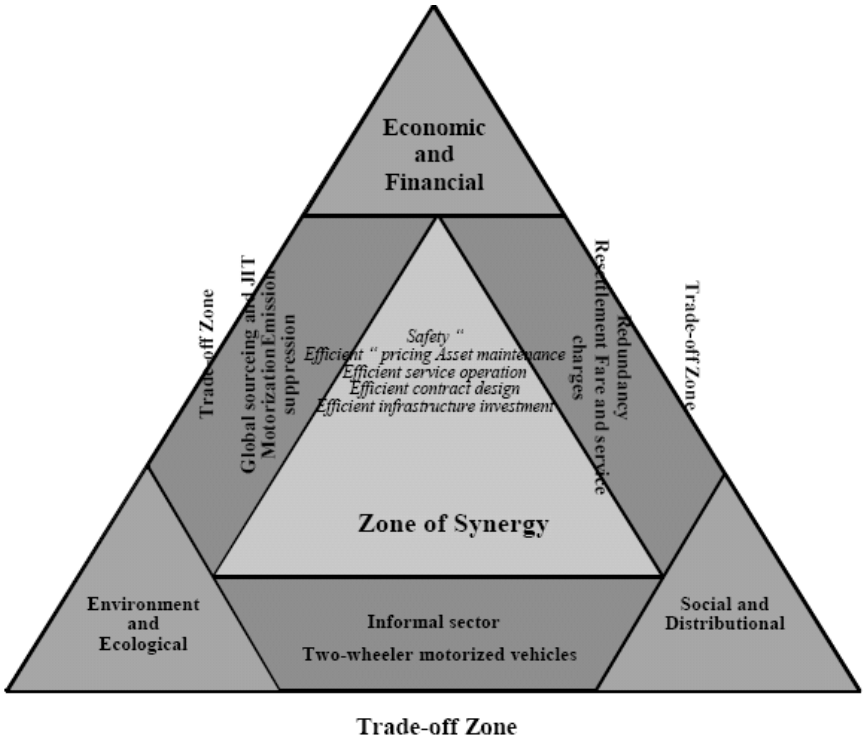

Figure 4. Three dimensions of sustainability

Source: The World Bank, 2006

2.2.2.1 Economic Sustainability (Economic Efficiency)

Transport activities must be cost effective and continuously responsive to changing demands in order to be sustainable in term of economic and financial. Facilitating regulatory reform to enable private firms to enter and exit the market more freely thus promote competition enabling the continuous transport activities. Transport becomes more competitive that the suppliers will response to users' needs at lower costs.

Increase private financing of infrastructure has been notably in the last two decades with the high rise financing of assets for which (i) access can be limited (airports, tunnel and bridges compared to urban and rural local roads), (ii) high traffic volume (primary roads, container ports), (iii) reliable cash generation, (iv) possible foreign exchange earnings (ports, seaports) (World Bank, 1996). The main objectives of private participation are to increase efficiency in service provision, to avoid political interference in operations and as an alternative solution for public sector budget constraints.

2.2.2.2 Social Sustainability (Distributional/Social Equity)

Social and distributional needs are met by ensuring a fair distribution of resources, poverty reduction, stable human development, public participation, and democratic policy formation. (Schwaab and Thielmann, 2001). Through its effects on economic growth, transport improvement should be capable of acting as an instrument of poverty reduction. Transport strategies and program can be designed to provide the poor with better physical access to employment, education and health services. Mitigating the unwanted social effects of transport policies including physical resettlement, occupational redundancy and reduced transport affordability are the most critical (World Bank, 1996).

2.2.2.3 Environmental Sustainability (Ecological Stability)

Most improvements on transportation system are aimed at reducing the cost thus improving the quality of services, all of which in turn may have a beneficial impact on the environment for example by reducing fuel consumption and air pollution (World Bank, 2007).

In big cities and conurbations, mostly in developing countries, where there is no adequate network development planning, the inadequate capacity may cause long term economic and environment costs. Therefore countries must be able to provide comprehensive strategy to combine the efficiency, equity and environmental objectives of transport development. Such strategy must be based on a full cost benefit analysis incorporating both transport and environmental objectives. In cities with wide variety of adverse environmental impact of transport, such those of developing countries, the key to medium term environmental sustainability is the integration of environmental concerns within economic incentive structures which include the price internalization of environmental effects (World Bank, 1996).

2.2.3 Objectives of Sustainable Transport

To cover overall aspects of sustainable transport, principles and approach have to be further broken and adapted to the specific needs of the area. Table 6 summarizes a number of possible policy objectives for road transport as found in practice and in literature.

> *"A sustainable transport strategy requires a comprehensive and well-balanced set of measures to address the wide range of goals; furthermore, sustainability must incorporate a long-term view"* (Schwaab and Thielmann, 2001 with sources from UN ESCAP, 2000; Cracknell, 2000).

Table 6. Objectives of sustainable transport

Economic Goals	Environmental Goals	Social Goals
- Provide infrastructure for sound economic development and employment - Allow for cheap, fast and high volume transport - Reduce congestion - Strengthen rural urban inter linkages - Create sound financial basis for public transport - Raise revenue for infrastructure and transport facilities set-up, operation and maintenance	- Improve health and safety in transport - Reduce pollution on local, regional and global level; contribute to climate stabilization - Reduce land take - Integrate environmental and economic dimensions in transport planning and development - Develop an environmentally sensitive strategic framework	- Guarantee transport services and access for all social groups - Focus on transport for the (urban) poor - Improve methods of addressing transport problems of the poor - Protect poor against adverse changes in transport policies - Ensure democratic participation in transport policy decision making

Source: Schwaab and Thielmann, 2001

2.2.4 Emerging Trends in Sustainable Transport Policy

New approaches and principles have been introduced to transport policy making which facilitate the set of sustainability criteria (Profit/Economic, Planet/Environment, People/Social as shown in Figure 5.

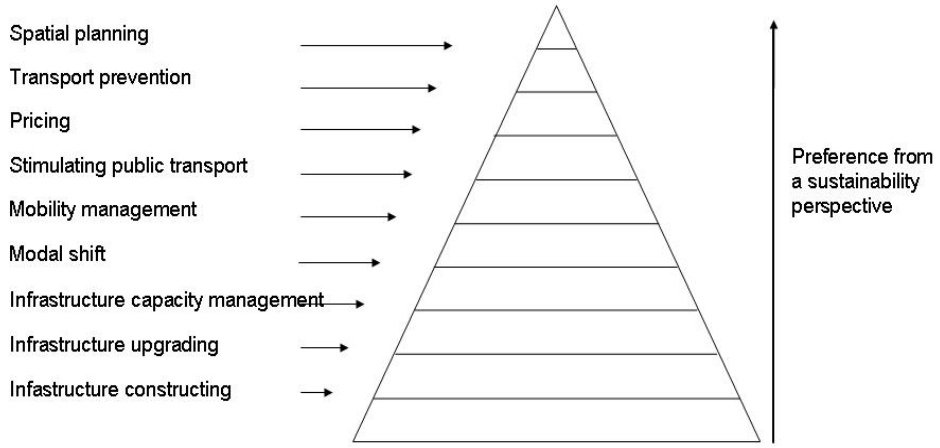

Figure 5. Priority pyramid

Source: Geerlings and Lohuis, 2008

The pyramid illustrates options and types of transport policies to improve transportation problems with priority setting of prevention, modal shift, optimism and facilitation. The fact that transport growth can not be followed with the same speed by the expansion of the required infrastructure shows that coping the increased demand of transport by infrastructure constructing (bottom of the pyramid) does not comply to the sustainability perspectives. It often leads to more congestion. In the other hand, integrating transport and spatial planning may resulted in a more sustainable outcome with, for example, reduced travel demand and increased non motorized transport.

The effective measure is to find the right combination of policies to be implemented with regards to specific area characteristics and situation. Spatial planning may works best if it is supported by the implementation of public transport improvement and transport prevention. Road pricing is another approach to be implemented to mutually support each of the available policy option.

2.2.5 Sustainability Indicators

Indicators are variables selected and defined to measure progress towards an objective. A variety of indicators have been used and should include the following aspects; (i) transportation efficiency, (ii) land use efficiency, (iii) environmental impact, (iv) human liveability, and (iv) economic efficiency. There is currently no standard set of sustainable transportation indicators. A list of indicators recommended by Transport Research Board (VTPI, 2008 from CST, 2003; Marsden, et al., 2005; Litman, 2007) is shown in Table 7. Potential Sustainability Indicators includes 3 subsets of indicators indicating rating of priorities from *A = should be collected in virtually every situation; B = should generally be collected if feasible; C = should be collected when needed to address specific community needs.*

Table 7. Potential sustainability indicators

Category	Subcategory	Indicator	Rating
Travel Activity	Vehicles	Motor vehicle ownership	A
	Mobility	Motor vehicle travel	A
	Mode split	Portion of trips by auto, public transit, and non-motorized modes	A
Air pollution emissions	Emissions	Total vehicle emissions	B
	Air pollution exposure	Ambient air quality	A
	Climate change	Climate change emission (CO2, CH4)	A
	Embodied emissions	Emissions from vehicle and facility construction	B
Noise pollution	Traffic noise	People exposed to traffic noise above 55 LAeq, T	B
	Aircraft noise	People exposed to aircraft noise above 57 LAeq, T	B
Traffic risk	Rash casualties	Crash deaths and injuries	A
	Crashes	Police reported crashes	A
	Crash costs	Traffic crash economic costs	B
Economic productivity	Transport costs	Consumer expenditures on transport	A
	Commute costs (time and money)	Access to employment	A
	Transport reliability	Per capita congestion costs	A
	Infrastructure costs	Expenditures on roads, public transit, parking, ports, etc.	A
	Shipping costs	Freight transport efficiency	B
Overall accessibility	Mobility options	Quality of walking, cycling, public transit, driving, taxi, etc.	A
	Land use accessibility	Quality of land use accessibility	B
	Mobility substitutes	Internet access and delivery service quality	B
Land use capacity	Sprawl	Per capita impervious surface area	B
	Transport land consumption	Land devoted to transport facilities	B
	Ecological and cultural degradation	Habitat and cultural sites degraded by transportation facilities	B
Equity	Affordability – Transport	Portion of household budgets needed to provide adequate transport.	A
	Affordability – housing	Affordable housing accessibility	C
	Accessibility	Quality of accessibility for people with disabilities	B
Transport policy and planning	Pricing efficiency	Cost based pricing	B
	Strategic planning	Degree to which individual planning decisions support strategic goals	B
	Planning efficiency	Comprehensive and neutral planning	C
	User satisfaction	User survey results	B

Source: VTPI, 2008

A set of indicators may be selected to measure progress toward an objective as well as reflecting various levels of analysis, as illustrated in Table 8 (VTPI, 2008). The following principles can help select sustainable transportation indicators:

> *"(i) comprehensive and balance, set of indicators must be collected from each of the major categories of issues, (ii) data should be feasible to collect and of adequate quality, (iii) understandable to the general public and useful to decision-makers, (iv) desegregation may be needed to support specific types of analysis, (v) reference units (also called ratio indicators are measurement units normalized to facilitate comparisons, such as per-year, per-capita) can affect how problems are defined and solutions prioritized, (vi) level of analysis is important to reflect ultimate impacts of concern rather than intermediary effects, (vii) performance targets are measurable objectives to be achieved by a stated deadline"*. (VTPI, 2008).

Table 8. Levels of analysis and selected indicators

Level	Examples indicators
External trends ↓	Changes in population, income, economic activity, political pressures, etc.
Decision-making process ↓	Planning process, pricing policies, stakeholder involvement, etc.
Policies ↓	Facility design and operations, transport services, prices, user information, etc.
Response ↓	Travel activity, pollution emissions, crashes, land development status, etc.
Cumulative impacts ↓	Changes in ambient pollution, traffic risk level, overall accessibility, transportation costs, etc.
Human and environmental effects ↓	Changes in pollution exposure, health, traffic injuries and fatalities, ecological productivity, etc.
Economic impacts ↓	Poverty damages, medical expenses, productivity losses, mitigation and compensation costs.
Performance evaluation	Ability to achieve specified targets.

Source: VTPI, 2008

2.3 Transportation Costs

To pursue sustainable development, costs play a central role in determining transport policy. Basically, two major categories of costs in transport activities have to be distinguished (Schwaab and Thielmann, 2001):

1. Internal costs from the provision (construction, maintenance) and use of transport infrastructure which have to be recovered from infrastructure users or from the public. Internal costs are the basis for decision making on the transport market and largely determine both individual mobility demand, and transport supply.
2. External costs are not part of supply or demand decisions on the transport market thus are external to these decisions. They stem from (mostly negative) side-effects of transportation, such as congestion, accidents, emissions and pollution, noise, and aesthetic factors.

In systems where only internal costs are implemented, road transport is too cheap and its use is inefficient. These in turn lead to negative environmental and social effects. To cope with it, it is important to make internal costs internal and make external costs internal. Firstly, when transport investment is offered free of charges and paid for from the general budget while the state revenues from the transport sector are lower than investment in the sector, it means that the transport sector is subsidized. It is important to keep the internal cost internal. Later on, when internal cost is determined with proper accounting in place then it is also important to put attention to the external costs. However, external costs are extremely difficult to measure which makes it difficult to make road users pay exactly for the costs they incur. External costs of transport are significant, nonetheless, based on various studies and experiences, even with high charges on vehicles, fuel, road use etc., external costs are still far from internalized. Selected policy options to deal with transportation costs are as shown in Table 9 (Schwaab and Thielmann, 2001).

Table 9. Road transport cost and selected policy options

Cost Component	Policy options (selection)
Internal cost	
- Infrastructure construction and management (variable and fixed costs) - Transport equipment construction and maintenance	User charges Fixed charges Public procurement
External costs	
- Congestion	- Congestion charges - Parking fees - Traffic management
- Accidents	- Road safety policy (standards, traffic management, education) - Risk related insurance, premiums (specific user charges)
- Emission/pollution (air, water, soil, climate change, acid rain, etc.	- Environmental standards (vehicles, fuels) - Traffic management (e.g. speed limit) - User charges - Specific urban measures (e.g. parking policy, restricted access)
- Noise nuisance	- Standards - User charges - Planning policy
- Visual intrusion - Ecosystem fragmentation, etc.	Landscape and planning

Source: Schwaab and Thielmann, 2001

2.4 Road Pricing

Experience shows that supply side management alone is not able to meet the constantly increase travel demand therefore the alternative solution, as proven to be effective in some cases, is to control such demand. Different options for travel demand management are available include improving the existing network efficiency, promoting the use of public transport and reducing vehicle use or often referred to as traffic constraint measures (include physical, regulatory and fiscal control). Road use pricing, congestion pricing or road user charging has been advocated as a potential traffic restraint method.

2.4.1 Road Pricing Categories

Road Pricing has long been advocated by economists as an efficient and equitable way to pay roadway costs and encourage more efficient transportation. *Road pricing* is normally used for a designed system aimed at reducing congestion by diverting traffic to other less congested alternative routes and hours. *Urban road pricing* is the term used to emphasize such system in urban areas, c*ongestion pricing* is designed particularly to reduce congestion, and *environmental pricing* is emphasizing the manner to reduce the environmental impact from road traffic which is as congestion pricing it is designed to reduce congestion with addition the differentiation of environmental damaging factor of vehicle or of environmentally sensitive areas. The term *road tolls* and *road (user) charges* refer to a charge for entering a certain area or a passing a certain point of a road. Table 10 shows different categories of road pricing found in many systems (VTPI, 2007).

Table 10. Road pricing categories

Name	Description	Objectives
Road toll (fixed rates)	A fixed fee for driving on a particular road	To raise revenues
Congestion pricing (time-variable)	A fee that is higher under congested conditions than uncongested conditions, intended to shift some vehicle traffic to other routes, times and modes	To raise revenues and reduce traffic congestion
Cordon fees	Fees charged for driving in a particular area	To reduce congestion in major urban centers
HOT lanes	A high-occupant-vehicle lane that accommodates a limited number of lower-occupant vehicles for a fee	To favor HOVs compared with a general-purpose lane, and to raise revenues compared with an HOV lane
Distance-based fees	A vehicle use fee based on how many miles a vehicle is driven	To raise revenues and reduce various traffic problems
Pay-As-You-Drive insurance	Prorates premiums by mileage so vehicle insurance becomes a variable cost	To reduce various traffic problems, particularly accidents
Road space rationing	Revenue-neutral credits used to ration peak-period roadway capacity	To reduce congestion on major roadways or urban centers

Source: VTPI, 2007

Road pricing refers to different schemes such as, for instance, toll rings or zone-based systems, in which either all car users are charged a flat fee or charges are differentiated based on, for instance, time of day, period of use, or distance traveled (Jakobssona, et al, 1997). Different kinds of road pricing mechanism as implemented in many countries may take many forms as the following (Schwaab and Thielmann, 2001):

- A general road pricing scheme for the complete road network (often considered as too expensive to implement);
- Tolls (often used to recover investment and maintenance costs of motorways or bridges);
- Urban road pricing; (i) congestion pricing which restricts the use of congested urban roads and reduce the need for network extensions; (ii) area licensing imposes a charge on the actual road use in cities; and (iii) cordon pricing is equivalent to an entrance fee into a city.

- Vignettes schemes (can be seen as a fee for temporarily accessing certain road networks);
- An electronic mileage-tax for Heavy Goods Vehicles as introduced in order to effectively tax transit cargo transport.

2.4.2 Road Pricing Objectives

Different system design and how the scheme performs basically determined by the differences in objectives of the implementation. May (1992) mention objectives of road pricing as follows;

- Increasing efficiency of the road network. As demand of the road network increases, speeds fall and the cost to the individual user rise.
- Revenue generation as finance for transport infrastructure has become more limited.
- Reducing environmental impacts. Continued growth of travel demand will undermine the effort of such improved design of vehicles unless the demand was restrained.
- Contribute to the improvement of accessibility, urban area revitalization and redressing inequities in the transport system.

In general, two major objectives of road pricing have been marked, namely revenue generation and congestion management (VTPI, 2007). These goals are not in conflict, and most systems are designed to fulfill the two functions to some extent. Fees with managing purposes can then in turn have the purpose to improve the environment or accessibility. No matter the design of the system, it will have both a financing function (with returns of revenue) and a controlling function (as the revenue will affect the traffic), however, usually one is superior which will determine the system that finally will be chosen (T&E, 2002).

Regarding the objectives of road pricing and how the two main purposes must play a synergetic part and not in conflict, many international experiences shows successful approach and implementation while other do not. The Singapore Area Licensing Scheme and Hong Kong Electronic Road Pricing system were designed specifically to reduce congestion although during the implementation the environmental benefits were also realized. Other scheme such as The Dutch Rekening Rijden have primary focused on environmental improvement with some emphasis also on congestion relief and revenue raising for transport infrastructure. The Norwegian toll rings in Bergen, Oslo and Trondheim have been specifically designed to raise revenue for new road projects and public transport investment (May, 1992). Furthermore, as one of travel demand management tools, road pricing must be considered within the context of an integrated strategy to reinforce the effects of other policy instruments such as railway infrastructure, bus service improvements and environmental traffic management.

2.4.3 Toll Road as a Pricing Mechanism

Toll road is the term to use on a certain section of roadway to which road users must pay to enter. Tolls are a common way to fund highway and bridge infrastructures. The tolls are fee-for-service with revenue dedicated to the project operator. Basic characteristic that differentiates toll road with congestion pricing is that its main objective to raise revenue. It involves a user-pay toll facility operator to set rates and generate revenues to raise capital, construct, operate and maintain the facility, repay debt, and generate surplus funds to support other toll facilities, regional transportation services and governmental needs, as well as to provide shareholder returns.

One or more of the following objectives are typically the reason for introducing toll road;

- ***Alternative source of finance.*** This has been the major objective in many countries. Toll provides revenue source that can be dedicated to support construction and maintenance for a particular road.
- ***User pays and internalizing of externalities.*** Tolls have been introduced in some countries to increase the extent of "use related payment" or with the goal of reducing road use and internalizing the negative effects of road usage (for example, congestion related prices). This is central to a sustainable transport policy.
- ***Regional equity issues.*** Some countries have introduced tolls on one road in order to support the development of infrastructure networks in less developed regions, these in turn can support transfer of wealth from one region of a country to another.
- ***Private sector development.*** Some countries have sought private sector participation in roads where they wanted to develop the road network, and to develop the private sector within their economy at the same time.

Toll road is often implemented in conjunction with privatization scheme. In all parts of the world, governments are facing high growth in highway demand, both for new construction as well as for maintenance and rehabilitation. One of the major reasons for toll road development mainly comes from budgetary constraints on the public sector.

In developing countries, this demand is particularly strong due to the rapid growth of urbanization and the increasing vehicle ownerships level. These countries adopt private sector concessions as the main approach for toll road provision (designing, building, operating and financing).

Developing countries became interested in toll financing during the 1980s, when economic and population growth led to increasing demand for infrastructure. Private tolling is now being pursued in a wide variety of countries, including Argentina, Chile, China, Colombia, Ecuador, Hong Kong, Hungary, India, Indonesia, Malaysia, Mexico, the Philippines, and Thailand.

While congestion pricing imposes higher toll during peak hours to decrease congestion, toll road imposes rather flat toll and not vary by time of the day. Toll roads are often structured to maximize revenue and its success measured in term of project cost recovery and hardly represents congestion pricing.

An example of this is the Scandinavian ring roads. The Scandinavian toll rings do not represent congestion pricing. They are designed primarily to generate revenue to finance desired transportation infrastructure improvements. In Stockholm, revenue generation was the dominant motive for the proposed toll ring, although the reduction in vehicle air pollution was a secondary objective. Congestion management was only a third objective, so tolls were not planned to vary by time of day.

Chapter 3. Urban Transportation and the Environment: South East Asian Cities Experiences

Almost all the Asian mega cities have experienced rapid motorization and have not been able to catch up with increased demand for traffic. Cities like Tokyo, Manila, Bangkok and Jakarta experience the shortage of road infrastructure supply to keep pace with growth in vehicle ownership. Road length decreases as car ownership increases which resulted in severe traffic congestion and low air quality. Cities reacted on this issue differently. Some pursue supply side management by constructing more road and highway to facilitate growth in motorization while others apply demand side management such as by improving public transportation and road pricing implementation.

Case studies analysis of three cities in South East Asia was conducted to enrich the literature review on sustainable transport and gain more insight on how cities manage their urban transport and how it impacted to the environment. Selection of Bangkok, Vietnam and Singapore was made due to geographical closeness with the study area with comparable background in political and cultural aspects. Furthermore the three cities represent different stages of development whereas Bangkok and Ho Chi Minh City are still struggling to improve their urban transport and Singapore has managed to achieve enhanced transportation management with effective results.

3.1 Bangkok, Thailand

Bangkok is the most populous city in Thailand the 22nd in the world with a registered population approximately 6 million people (10% of the national population)[1]. Bangkok Metropolitan Region, covers Bangkok and five surrounding provinces in the central region of Thailand, registers approximately 10 million people (16% of the national population)[2]. Regarding the great flux of immigrants who are not properly registered, the population is around 15-20 million.

Bangkok is the center of Thailand's economic activities. In 2005, Bangkok's GDP is about USD 220 billion (44% of Thailand's GDP) while GDP per capita is over USD 20,000 (one of the highest in Southeast Asia) with tourism sector as the major contributor (providing about 5% of GDP) (World Bank, 2007). During late 1980s-early 1990s, Thailand's high interest rate and cheap labor has made it attractive for international investment and Bangkok has grown into a highly mobilized city.

Figure 6. Map of Thailand[3]

[1] *United Nations Population Division, 2005*

[2] *United Nations Population Division, 2005*

[3] *http://www.un.org/Depts/Cartographic/map/profile/thailand.pdf*

3.1.1 Bangkok Transportation Profile

Road transport plays an essential role in supporting the growth of economy, trade, and investment in Bangkok as well as in Thailand and accounts for 90% of transportation in Thailand (Asian Development Bank, 2005). In summary, daily travel demand in Bangkok has the following features (World Bank, 2007):

- 19.4 million linked person trips per day estimated in 2005;
- 46% of all person trips including walk trips are made by private modes (eg car, pick-up, motorcycle) with 3% by rail MRT, 37% by bus, and 14% by walking and non motorized transport modes;
- 25% of all households had no private vehicle in 2005 down from 45% in 1995;

In 2003, Bangkok's in use national motor vehicle fleet was about 2.94 million with a growth rate of 5.5% per year during 1994 to 2003 (Asian Development Bank, 2005). The number of cars grew at a similar rate. Large numbers of new motorcycles were sold in the 1990s, before the onset of the Asian financial crisis in 1997, which resulted in rapid motorcycle fleet growth (Asian Development Bank, 2005).

Being already a highly urbanized metropolitan city, Bangkok is still experiencing more growth. Growing demand of transportation in the future in Bangkok is illustrated in Table 11. MRT role will become more important while bus and other public transport are also as important. The key topics are to maximizing benefit of MRT and modernizing bus and strengthening its role.

Table 11. Bangkok transport task

Description	2005	2015
Population (M)	10.8	13.0
Travel Demand		
Person trips/day (M)	19.4	23.4
Mode of travel (%)		
Private modes	46	40
MRT	**3**	**15**
Bus & other public transport	**37**	**31**
Walk	**14**	**14**
Total	100	100
Motor Vehicles		
Number of in-use vehicles (M)	3.1	n.a.
% household with no vehicle	25	n.a.

Source: World Bank, 2007

3.1.2 Environmental Aspect

Accompanying boost in economic activity and high rate or urbanization, traffic congestion in Bangkok has been one of the most severe cases in the world coupled with a high growth in vehicle fleet. It is a daily occurrence involves many hours of wasted time on the road, considerable waste of fuel resources and a deterioration of the environment through air and noise pollution. UNEP (United Nations Environment Program) reported in 1992 that Bangkok was one of the most air-polluted cities in the world (Kunchornrat et al., 2007).

Having been phased out of leaded gasoline in January 1996 (Asian Development Bank, 2005) resulting in a decrease of ambient lead levels in 1998 to almost 20 times lower than 1991 levels, air pollution is still an important issue related to Bangkok transportation.

Transport contributes a large part of CO2 emission in Thailand, with about 30% of the total emission of CO2 generated by cars and light trucks. The emission is projected to grow at a rate of 1.8% per annum (Kunchornrat et al., 2007). Contribution of motor vehicle to urban air pollution in Bangkok was reported as follows; (i) 39% of SO2 total air emission, (ii) 22% of TSP total air emission, and (iii) 76% of NOx total air emission (Kunchornrat et al., 2007).

Bangkok Metropolitan Area is the worst among urban areas in Thailand in practically all pollutant category particularly that of air pollution. Public exposure to poor air quality has caused significant health problem that in early 1990s, the cost associated with pollution related problems in Bangkok were estimated as 8-10% of the annual urban income (Kunchornrat et al., 2007).

3.1.3 Policy Responses

Environmental issues in Thailand were given more emphasis during the 7th (1992-1996) and 8th (1997-2001) National Economic and Social Development Plan and with development of a 20-year plan and priorities encapsulated in the Thailand Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality (the 20-year Policy and Prospective Plan) (Kunchornrat et al., 2007). Being declared as the Asia's prototype city in air pollution management in February 2000, Bangkok has initiated a number of programs aimed at curbing the traffic emissions.

In a further effort to reduce the level of traffic and air pollution, improvement of public transportation improvement has deemed necessary and initiated in the late 1990s. Air quality management in Bangkok is in line with the national policy on protection of public health according to the 8th National Economic and Social development Plan (1997-2001). The policy includes management measures such the increase in the number of roads, traffic improvement, development of public transport system, reduction of lead in gasoline and improvement of air quality.

The government has engaged and encouraged the private sector participation particularly to support the Government policy on public transportation. Public private partnerships to improve public transportation management in Bangkok are development of mass rapid transit (MRT) at the end of 1990s. Bangkok Transit System was operational in December 1999 and is the first MRT system in Bangkok and is wholly privately financed. Second MRT system (operational in August 2004) was constructed using national government funds with private consortium. Bangkok Metro (MRT) was designed by a concession concept of which after construction, Mass Rapid Transit Authority of Thailand handed over a 25-year concession agreement to a private Bangkok Metro Company Limited.

Growing demand for public transport is marked with the steady increase in the transport modal patronage. BTS patronage has grown steadily from around 140,000 passengers per day in April 2001, a growth rate of just under 20% pa (World Bank, 2007).

Toll road in Bangkok

Road pricing mechanism is implemented to alleviate the heavy congestion in Bangkok in the form of toll road development. First Stage Expressway, an urban expressway (toll road) was developed by Expressway and Rapid Transit Authority **(**ETA) and opened in 1981. Toll road in Thailand have been developed by government for many years, but only recently with private concessions. Two agencies have jurisdiction over toll roads, the Department of Highways (under Ministry of Transport and Communication) ad the Expressway and Rapid Transit Authority (under Ministry of Interior). In the case of ETA first stage expressway, in Bangkok, the government built the road while ETA handled operations, maintenance and toll collection. ETA's second stage expressway project was the first to offer private sector concession.

3.1.4 Lessons Learned

Public transport quality in Bangkok is lagging behind other cities in the region including Shanghai, Beijing, Kuala Lumpur and Seoul in term of lack integrated system and poor quality of service (World Bank, 2007).

Congestion is a major reason of the decline of transportation efficiency. Development of highways has not proven to successfully reduce traffic congestion. The need for better linkages within the transport system and between transport and activity centers and residential areas to maximize the level of potential accessibility is become more and more evident.

In term of environmental aspect, improved control measures for fuel quality and new vehicle emission standards, as well as the Asian financial crisis of 1997, contributed to decline reported by the air quality monitor over 1996–2001 (as shown in Table 12) however, notable transgressions of the air quality standards were evident for PM, ozone, and most of the other pollutants (ADB, 2005).

Table 12. Air quality parameter in Bangkok

Parameter	Period/Year	Level	Standard
PM10	1996–2001	<50 μg/m3	120 μg/m3
	May 2005	<50 μg/m3	
Nitrogen dioxide (NO2)	1996–2001	20 μg/m3	170 μg/m3
CO (8 hours)	May 2005	1 μg/m3	9 μg/m3

Source: ADB, 2005

Continued rapid economic growth, increased vehicle growth and industrial activity, might increase ambient pollution levels. Increases in average ambient concentrations and roadside concentrations are likely, as well as an increased incidence of standards being exceeded (ADB, 2005). Some measures to improve air quality are still less effective due to the lack of harmonization, independence and sufficient coordination especially those under responsibilities of several agencies.

3.2 Ho Chi Minh City, Vietnam

Vietnam for a long time has been one of the poorest countries in the world however with introduction of political and economic changes since the end of the 1980s, the country is now initiating to become a new growth in South East Asia region (Bolay, et al. 1997).

Ho Chi Minh City is the largest city in Vietnam. The metropolitan area has more than 9 million population (7.4% of national population)[4]. Ho Chi Minh City population is increasing rapidly and within 1999-2004 the population has increased by about 200,000 people per year. It is the most important economic center in Vietnam and accounts for 30% of foreign investment (Bolay, et al. 1997). In 2007, the city's Gross Domestic Product (GDP) was estimated at USD 14.3 billion, or about USD 2,180 per capita, (up 12.6% on 2006) and accounting for 20% GDP of the country. The average growth rate of GDP was 9.5% per year since 1995[5] .

Figure 7. Map of Vietnam[6]

3.2.1 Ho Chi Minh City Transportation Profile

Ho Chi Minh City has an estimated 8.7 million people participating in daily traffic and traffic demand is continuously growing. Average traveling ratio is 1.7-2.5 times/day/person (ADB, 2002). Number of registered automobiles increased from 137,000 in 2001 to about 245,000 in 2004 (World Bank, 2006). On average, over 1,000 newly registered vehicles per day or approximately 20,000 units per month (ADB, 2002). Figure 8 illustrates the growth in Ho Chi Minh City's vehicle fleet during 1997-2001 (ADB, 2002).

Motorcycle is the primary mode of transport accounts for 60-65% of vehicular trips, with bicycles accounting for another 25%. Automobiles account for less than 5%. In the coming years, motorcycles will remain the dominant transportation means with growth of around 14-15% per year in period 2001-2005. This translates into 3.6 million units by the year 2005 (ADB, 2002).

[4] *http://www.pso.hochiminhcity.gov.vn/an_pham/thanh_pho_ho_chi_minh_25_nam/B01.htm*

[5] *Ho Chi Minh City's positon in Vietnam'economy, Ho Chi Minh City Official Website Accessed 19-11-2007*

[6] *http://www.studyabroad.com/content/portals/maps/vietnam_map.gif*

Public transportation in Ho Chi Minh City is offered by bus services of which the majority owned by small private cooperatives. Organization of public transportation is not integrated and suffers from weak infrastructure. Only small share of the total bus fleet is still within permitted service life (over 25 years). Beside the low quality, the density of public bus routes is still low, around 0.67 km/km2 (much lower than in urban areas in some other countries, including developed countries where the rate is 2-4 km/km2) (ADB, 2002).

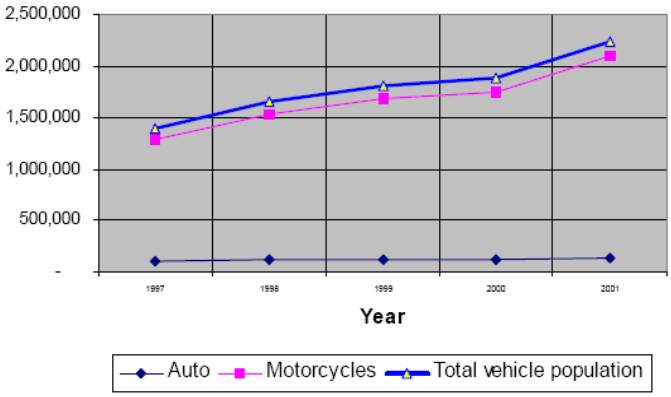

Figure 8. Ho Chi Minh City's vehicle fleet by type

3.2.2 Environmental Aspect

The failure of public transport to attract passengers encourages the booming of personal transport demand for motorcycles, thus contributing to traffic jams and urban environmental pollution. Air quality is becoming a serious problem. With 60 traffic jam locations, air pollution problem in Ho Chi Minh City is greatly due to transport vehicular emissions[7]. Transport sector consumes 19% of total fuel, but emits 61% NOx, 84% CO and 94% HC, motorcycle response for 70% CO, 93% HC and 92% VOC emission[8].

3.2.3 Policy Responses

The need to promote and develop better urban transport system has been recognized that by 2002, Prime Ministerial Decision No. 162/2002 has put main concern to promote and develop public transport, to develop road infrastructure to alleviate congestion and open up new areas for urbanization (World Bank, 2006).

To facilitate growth, Government of Vietnam has been pursuing the acceleration on infrastructure development to cope with the growing need of demand. In Vietnam's 7th five-year national development plan (2001- 2005), the infrastructure development, especially transportation and electric power sectors, is assigned one of the top priorities.

Toll road in Ho Chi Minh City

Major infrastructure projects have been initiated with the foreign loan. Japan Official Development Assistance (ODA) to Vietnam financed for various project areas including infrastructure development. Projects included in this financing are National Highway No. 5 Improvement Project, National Highway No.1 (Hanoi-Ho Chi Minh City) and East-West Highway in Ho Chi Minh City.

Other than foreign financing, infrastructure development is pursued by promoting private investment. Infrastructure investment is made with 40% of Official Development Assistance (ODA) and about 20% of private investment (Huong, 2007). PPP in infrastructure development in Vietnam is important in regards to the limited public funding, including ODA.

[7] *RegionalWorkshop: Fighting Urban Air Pollution, 2001*

[8] *Regional Workshop on Transport Planning, 2002*

3.2.4 Lessons Learned

Though Vietnam has successfully phased out lead from gasoline, Ho Chi Minh City still has air quality problems. Some policies to inspect and control emissions from four-wheeled vehicles are in place but motorcycle emissions are still uncontrolled. Efforts to control congestion by limiting motorcycle ownership in the urban have not proven to be effective as the rules have been easily circumvented by registering vehicles outside the restricted districts (World Bank, 2006).

To control pollution, the city needs to develop a better understanding of transport's contribution to pollution and as appropriate develop control strategies including promotion of non-motorized modes for short trips and the development of inspection and maintenance programs (World Bank, 2006).

Policies to limit congestion have not borne much fruit. There is a need to develop a comprehensive policy on managing congestion that includes consideration of restrictions on ownership and use of both motorcycles and cars, a parking policy, promotion of non-motorized modes for short trips and more effective traffic management.

Traffic management culture in Vietnam is poor and lacking of proper implementation. It is inhibited by excessive fragmentation of responsibilities between different elements of authorities including those responsible in planning, designing, implementation (Public Works Department) and operation and enforcement (traffic police) of transportation.

Challenges for Vietnam in adapting its infrastructure policies and institutions still remain including accessing new sources of finance, refining planning processes, preparing for rapid urbanization, improving the efficiency of infrastructure service providers, developing stronger institutions to encourage private finance of infrastructure or direct private provision of infrastructure, and developing more targeted approaches to poverty alleviation (World Bank, 2006).

Hindrance in the accelerating process is the insufficient laws on PPP thus it is a big challenge for the Vietnamese Government to design a long-term strategy for the participation of private firms in infrastructure with a sound legal framework. The current legal basis for PPP infrastructure development in Vietnam, are construction, investments and enterprise laws and regulations on investment in the forms of BOT, BT and BTO contracts issued by the government between 1977 and 1999.

3.3 Singapore

Singapore is located at the southern tip of the Malay Peninsula about 137 kilometers north of the equator, south of the Malaysian state of Johor and north of Indonesia's Riau Islands. It is about 704.0 km² and is the smallest country in Southeast Asia. The population is approximately 4.68 million with an annual population growth rate of 2.8% in 2000[9].

In term of GDP per capita, it is the 17th wealthiest country in the world[10]. Singapore has a highly developed market-based economy and is one of the Four Asian Tiger along with Hong Kong, South Korea and Taiwan which largely depends on exports refining imported goods, especially in manufacturing. Manufacturing constituted 26% of Singapore's GDP in 2005[11].

Figure 9. Map of Singapore

3.3.1 Singapore Transportation Profile

In 1971 the Government of Singapore has recognized the need for improvement in their transportation system. State and City Planning (SCP) Project estimated that by 1992 transportation would be environmentally unacceptable and that it would be impossible to build new roads to meet travel demand.

Following recommendations of SCP, Singapore implemented a number of measures which in general have made it the world's best practice of transportation management. Strong transportation network with reliable infrastructure makes it one of the most competitive cities in the world.

In 1995, the level of motorization was slightly over 100 cars per 100 people, the average level of cities with an income level one third that of Singapore. Public transportation is efficient and reliable. Singapore has an integrated system consisting of city buses, suburban-city center express buses and the Mass Rapid Transit railway. Commuters can travel between trains, subways and buses using one pass. Buses carry half of all road passenger traffic and 65% of commuter trips are by public transit (Leitmann, 2000). The first MRT system is operated and maintained by a private company SMRT Corporation Ltd since 1987 and serves the major high density travel corridors.

3.3.2 Environmental Aspect

Singapore has maintained it's environmental and transportation systems under acceptable limits with major air pollutant concentrations are well within the limits the WHO and USEPA have laid out.

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[9] *Singapore Department of Statistics, 2007, www.singstat.gov.sg*

[10] *List of GDP per capita by country, 2006, www.imf.org*

[11] *Singapore Department of Statistics, 2007, www.singstat.gov.sg*

Table 13. Singapore ambient air quality

Pollutant type	Average time	1982	1988	1994	1999	Standard
Carbon Monoxide	8 h (roadside), ppm	1-3	1-3	1-3	1-3	9
Lead: road side	3 months, $\mu g/m^3$	1.5	0.4	0.2	0.1	1.5
Lead: ambient	3 months, $\mu g/m^3$	0.6	0.2	0.1	0.1	1.5
Sulphur dioxide	Annual mean, $\mu g/m^3$	29	20	19	22	80
Nitrogen oxide	Annual mean, $\mu g/m^3$	18	16	29	36	100
Ozone	Max 1 h, $\mu g/m^3$	450	176	237	181	235
Ozone*	1 h concentration >235 $\mu g/m^3$, days	30	0	1	0	-
PM10	$\mu g/m^3$	-	-	48	34	50
TSP	$\mu g/m^3$	70	47	55	-	75

Source: www.iges.or.jp

3.3.3 Policy Measures

Transportation planning in Singapore is designed to provide an efficient and reliable system for the mobility of people and goods through the following strategies: (i) integrated and co-ordinated land use and transportation planning; (ii) increasing the capacity of Singapore's roads; (iii) improving the public transport system; (iv) effective travel demand management; and (v) improving traffic management (Leitmann, 2000).

To implement these strategies, innovative approaches are employed to help minimize the environmental side-effects of traffic congestion transport. Singapore has relied high taxes and fees to curb car ownership. Fiscal measures include an import duty, a good and services tax, registration fees, including an Additional Registration Fee (ARF) imposed when imported vehicles and registered, and road and fuel taxes. These measures generated a large amount of revenue, which, in turn was invested in land transportation infrastructure.

Despite the heavy financial burdens of owning a car, Singapore saw a 73% rise (an average of 13,000 cars a year) in the number of cars from 1977 to 1984. Although this increase was much less than in other similar nations, the Singapore Government imposed a new fiscal measure to control the number of vehicles: the Vehicle Quota System (VQS) maintains a 3% annual growth rate. VQS was intended to cap the number of newly registered vehicles. With the VQS the government fixed the number of allowable vehicles which price remains determined by the market.

Measures such as the week-end cars scheme is also implemented which provided rebates in ARF, import duties, quota premiums and road taxes but allowed WEC use only during off peak hours. In essence, WEC was a manual road pricing scheme, although in a very primitive form.

Road pricing system

Area Licensing System (ALS) is a road pricing mechanism in which each car is charged for its contribution to congestion in central business districts (CBD). Import duties, ARF and other measures such as road and fuel taxes cannot influence the use of cars once they are on the street, but ALS can. Introduced in 1975, ALS was highly successful in curbing traffic congestion during morning peak hours. The average speed of vehicular traffic increased from 18 to 35 kph and traffic was reduced by 45.3% substantially more than the targeted 25-30%[12].

[12] *Source: www.iges.or.jp*

Electronic Road Pricing (ELS) replaced ALS in September 1998. Its basic idea is similar to ALS, but since it is ERP technologically sound, it can vary charges over time and space and reflect the true cost of vehicle use in CBDs. The successful implementation of ERP has facilitated the reduction of taxes and other charges and increased the allowable vehicle quota.

Toll road in Singapore

Singpore has a extensive network of highways consists of total of eight expressways namely; Pan Island Expressway (PIE), Ayer Rajah Expressway (AYE), East Coast Parkway (ECP), Central Expressway (CTE), Tampines Expressway (TPE), Seletar Expressway (SLE), Bukit Timah Expressway (BKE) and Kranji Expressway (KJE). Total length of the expressways is of 148km providing uninterrupted high-speed travel for motorists[13].

Singapore's Land Transport Authority (LTA) recognizes the importance of getting road user to the destination fast using the shortest route possible. To provide a comprehensive and efficient land transport system, the LTA continues to expand the road network and expressways will form the backbone of the road network in Singapore.

Commencing in 1999, toll road policy has been implemented in Singapore's highways.

Table 14. Key dates in Singapore transportation [14]

Year	Activity
1968	Ministry of Communication established, 30% import duty on cars imposed
1970	Bus service reform begins
1972	Import duty and ARF (additional registration fees) increases
1973	Singapore bus service is unified
1974	ARF raised to 55%
1975	ALS (area licensing system) scheme initiated
1980	ARF raised to 150%
1987	MRT begins
1989	ALS extended to other vehicles
1990	VQS (vehicle quota systems) begins
1994	ALS implemented whole day
1995	Road pricing system on motorways
1998	ERP (electronic road pricing) begins
1999	ERP extended to highways

3.3.4 Lessons Learned

Success of urban transport management in Singapore is the result of sound and integrated policy and good implementation of Travel Demand Management (TMD). TMD has had only limited success in many parts of the world, most of which actively pursue supply side measures (such as building road infrastructure, etc.). Supply side measures, however, are never sufficient and, in fact, place a greater burden on the environment.

Keys of success of TMD implementation in Singapore are as follows;

- Integrated city planning as the key word in Singapore's success of which measures as part of a comprehensive and coordinated strategy to produce a comprehensive solution.
- As a city-state, Singapore has only a single tier of government which allows the flexibility in planning and eliminate mismatch between local and national priorities.

[13] *http://www.aas.com.sg/features/archive/otr07013.htm*

[14] *Source: www.iges.or.jp*

- A strong government, stable and strong regulations and institutional frameworks for enforcement.
- Transparency in policy formulation which allows periodic adjustment using feedback from the public.
- Infrastructure investment in which demand side management was supplemented by constructing additional road infrastructure, maintaining roads well, coordinating traffic light systems, and building expressways and MRT.
- Technological factors also played important roles in Singapore for example in ERP implementation.

Chapter 4. Toll Road Development in Indonesia

During the ten years preceding economic crisis in the late 1990s, the Indonesian Government has allocated about 40% of its development budget for infrastructure development includes road sector. However, the expenditure level still struggle to keep pace with the growing demand. Development of toll road has been initiated since the mid eighties and the government has encouraged private sector financing to meet the demand-supply backlog for road infrastructure.

This chapter presents the policy framework within which toll road has been implemented, includes general information about study area, transportation profile and challenges, toll road development scheme, role of toll road in Jakarta, actors involved and their roles in the development and AMDAL as an environmental management tool in toll road development. Regarding the research question, it provides answers and explanation for one of the sub question; *how is the environmental management organized in toll road sector*.

4.1 Introduction to Study Area

4.1.1 Indonesia

Figure 10. Map of Indonesia

Indonesia is a developing country in South East Asia with a population of 222 million in 2006 and is the world's fourth most populous country (3.47% of total world population)[15]. Indonesia shares land borders with Papua New Guinea, East Timor and Malaysia and other neighbouring countries include Singapore, the Philippines and Australia.

Before the East Asian crisis in 1997, Indonesia's economy had been growing at an annual average of 6.5% for 30 years (1966 to 1996), more than double the world's average of 3% (Sadasivan, 2002). Accompanying growth over this period were relatively low inflation and improvements in social indicators: rise in life expectancy and fall in poverty level.

Being one of the countries hardest hit by 1997 East Asian crisis, Indonesia has made a significant economic recovery; GDP growth exceeded 5% in both 2004 and 2005[16]. Indonesia's GDP for 2007 is estimated of US$408 billion (US$1,038 bn PPP)[17]. The services sector is the economy's largest and accounts for 45.3% of GDP (2005), followed by industry

[15] *Indonesian Central Statistics Bureau (www.bps.go.id, 1 September 2006)*

[16] *Indonesia: Forecast. Country Briefings. The Economist (3 October 2006)*

[17] *Indonesia: Forecast. Country Briefings. The Economist (3 October 2006)*

(40.7%) and agriculture (14.0%)[18]. Both development spending and poverty have returned to pre-crisis levels. However, governance issues remain an impediment to progress on some fronts, increasing investment, particularly in infrastructure, is critical to Indonesia's longer term growth prospects.

4.1.2 Jakarta; the National Capital

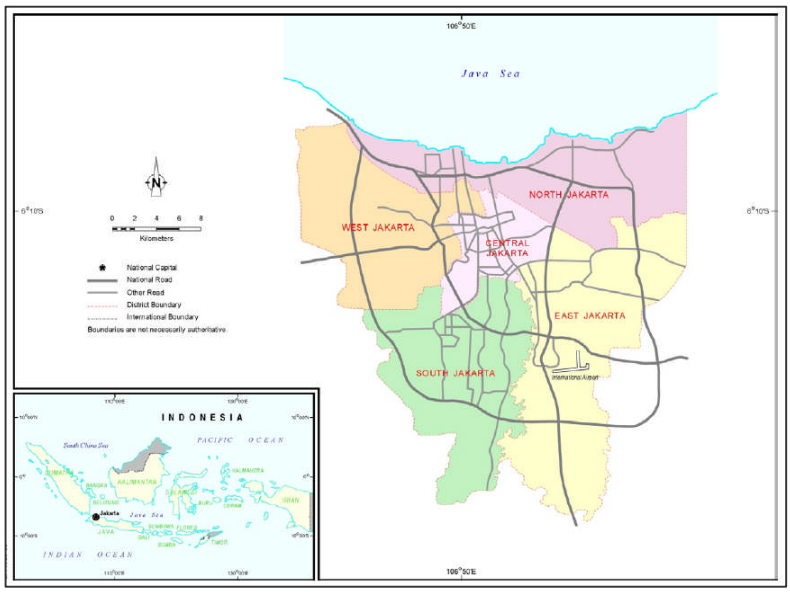


Figure 11. Map of Jakarta

Source: Syahril et. al., 2002

This study was conducted in Jakarta, the national capital and largest city of Indonesia. It is located on the northwest coast of the Java Island near the mouth of the Ciliwung River. It covers 661.52 km² land area and 6,977.5 km² sea area and includes more than 110 islands in the Thousand Islands Archipelago.

Jakarta is divided administratively into five municipalities (kotamadya), namely North Jakarta, East Jakarta, South Jakarta, West Jakarta, and Central Jakarta. The total population of Jakarta from 1995 to 2015 is depicted in Figure 12 (Syahril et. al., 2002). Annual population growth is varied by district. Several districts experience decline in population, particularly those in the city center, while others experience a relatively fast population increase. Overall average annual population growth for Jakarta from 2000 until 2015 is approximately 1%.

[18] *Official Statistics and its Development in Indonesia (PDF). Sub Committee on Statistics: First Session 18–20 February, 2004. Economic and Social Commission for Asia & the Pacific*

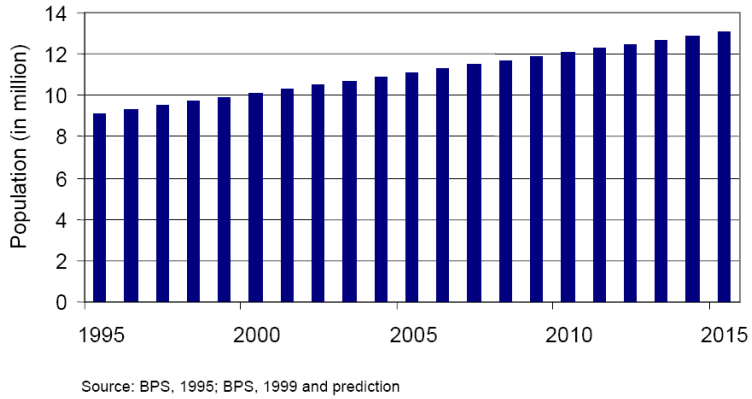


Figure 12. Population of Jakarta from 1995 to 2015

Source: Syahril et. al., 2002

The Metropolitan area is called Jabodetabek (Jakarta-Bogor-Depok-Tangerang-Bekasi) with more than 21 million inhabitants. Jabodetabek (Greater Jakarta) is a large-scale metropolitan consists of DKI Jakarta and 7 local governments (Kabupaten and Kota Bogor, Kabupaten and Kota Tangerang, Kota Depok and Kabupaten and Kota Bekasi). Jabodetabek's gross regional domestic product was estimated of 22% of the national gross domestic product (in 2002), showing it strategically as the most important region of the nation (Syahril et. al., 2002).

Development of the metropolitan area was initiated in 1977 with rapid development of Botabek region (Bogor, Tangerang and Bekasi) as buffer regions for Jakarta. During 1980-1990, spatial deconcentration is marked with annual growth rate in Jakarta that was lower (3.08%) than that of Bogor (11.67%), Tangerang (20.89%) and Bekasi (19.84%). Demographic trend in Jakarta metropolitan area is shown in Table 15 (Kusbiantoro, 1998).

Table 15. Demographic trends in Jakarta metropolitan area (population in millions)

	Area (sq. Km.)	1971	1995	% increase (1971-1995)
Jakarta	661	4.6	9.1	98%
Botabek	5978	3.7	11.0	197%
Jabotabek	6639	8.3	20.1	142%

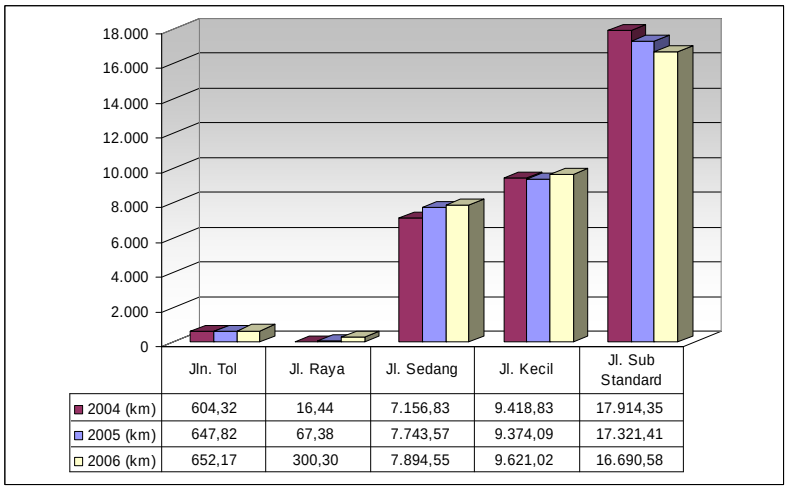
Source: Kusbiantoro, 1998

Several major activitiy systems (new towns and industrial estates) have been developed in Botabek, mostly by private developers. These activity systems combined with increasing level of income and education, increase trip rates, especially during peak hours.

4.2 Transportation Profile

4.2.1 Predominant Road Transportation

Indonesia's transport system has been shaped over time to support the economy, national stability and inter-regional equality to realize the Indonesian archipelagic outlook. All transport modes play a role in the country's transport system and are generally complementary rather than competitive. Road transport is predominant, with a total system length as indicated in the Figure 13 below.



	Jln. Tol	Jl. Raya	Jl. Sedang	Jl. Kecil	Jl. Sub Standard
2004 (km)	604,32	16,44	7.156,83	9.418,83	17.914,35
2005 (km)	647,82	67,38	7.743,57	9.374,09	17.321,41
2006 (km)	652,17	300,30	7.894,55	9.621,02	16.690,58

Jln Tol (toll road) : 2x2 lanes, width of >=14 m and full controlled median
Jl. Raya (major road) : 2x2 lanes, width of >=14 m and partially controlled median
Jl. Sedang (medium road) : 2x1 lanes, width of >=7m
Jl Kecil (small road) : 2x1 lanes, width of >=5.5m, <7 m
Jl Sub standard (sub standard road) : 2x1 lanes, width of <=5.5m

Figure 13. National road length (capacity condition)

Source: Ministry of Public Works

Special attention has been put to undeveloped areas, mainly in eastern Indonesia. In more developed areas, mainly in western Indonesia with the concentration on Java Island, improvement of strategic and arterial roads was to support the development of fast growing regions and industrial development centers.

4.2.2 Jakarta Urban Transportation

In the last decade, public transport gains more attention in Jakarta's policies. Transportation master plan (2010) has been developed through Jakarta Macro Transportation Scheme (JMaTS) included the following (i) 15 corridors of busway, (ii) Jakarta Monorail (LRT) Blue Line and Green Line, (iii) MRT Subway and (iv) WaterBus on Banjir Kanal Timur and Banjir Kanal Barat. It is recorded that since the operation of busway corridor 1 in 2004, a shift from private cars usage has been recorded up to 20-30%.

While the public transportation improvement initiative is taking place, currently there is still high increase in car ownerships. Vehicle growth rate of 11% per year exceeds the capacity of road area extension of only 1 %. Private vehicle and public transport ratio is around 40% to 60%. Traffic congestion is partly attributed to rapidly increasing number of cars and motorcycles. Compared with the year 1994 before the crisis, the number of cars has increased rapidly and has been almost doubled in 8 years. High commuter trips also attributable to Jakarta. Commuter trips from Bogor, Depok, Tangerang and Bekasi are 600.000 unit vehicle per day carrying about 1.2 million people in 2003.

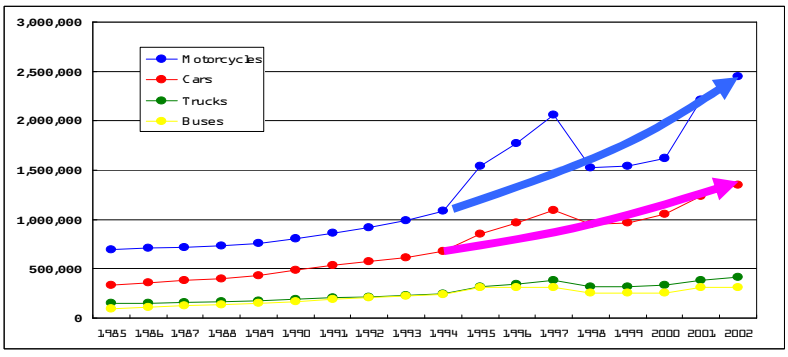


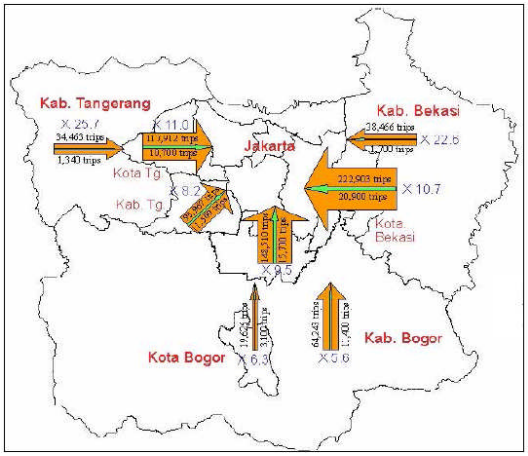
Figure 14. Vehicle growth in Jakarta

Source: SITRAMP, 2004

4.2.3 Jakarta Transportation Challenges

Traffic congestion is daily occurrence in Jabodetabek. Due to the economic crises stroke the country in late 1990s, rapid growth of car and motorcycle registration has been hampered. However the number of cars and motorcycles has again been increasing in recent years. Traffic congestion and rapid motorization can also be attributable to deterioration of the service level of public transportation.

4.2.3.1 Expansion of Urbanized Area

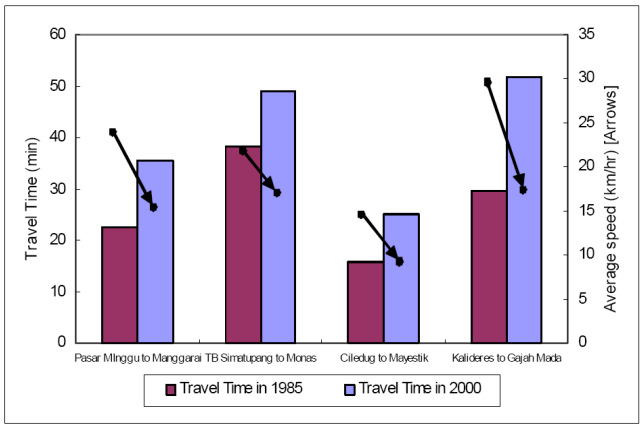


Commuting trips from the surrounding areas to DKI Jakarta has increased about 10 times between 1985 and 2002. These trips are concentrated in the CBD of Jakarta.

Figure 15. Increase of commuting trips to Jakarta (1985-2002)

Source: SITRAMP, 2004

4.2.3.2 Economic Loss Due To Transportation



Severe traffic congestion is often seen in the central area of Jakarta and the radial highways every morning and afternoon. The increasing traffic demand has brought about traffic congestion resulting in longer travel times on roads. This implies that mobility in the region has gone down so as efficiency in the performance of economic activities.

Figure 16. Longer travel time (1985-2000)

Source: SITRAMP, 2004

4.2.3.3 Low Accessibility of Poor Households

High income households indicate strong preference to private modes of transportation. In contrast, people belonging to the low income group heavily depend on public transportation. Among motorized modes of transportation, the bus is a major transportation mode for the low income.

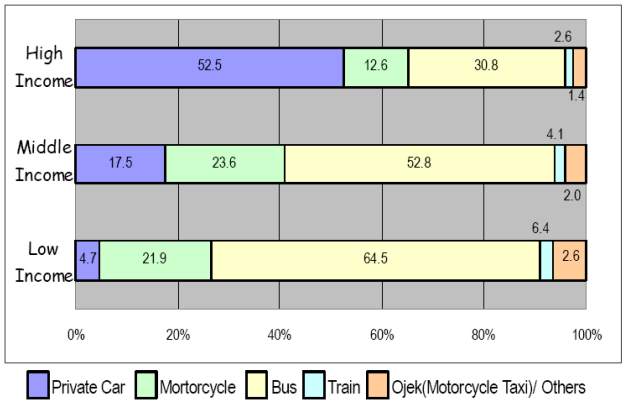


Figure 17. Modal composition by income level

Source: SITRAMP, 2004

4.2.3.4 Increasing Motorcycle Use

Recently the number of motorcycles has been increasing rapidly. Motorcycle registrations has increased by 60% from 1,528 thousand in 1998 to 2,446 thousand in 2002 (SITRAMP, 2004). This increase can be attributed partly to deterioration of public transportation services and reduced motorcycle price. At present 22% of motorized trips are made by motorcycles, in particular, this is a popular mode of transportation for the middle-income class. Motorcycles are however often involved in traffic accidents: motorcycles are involved in as much as 34% of all the traffic accidents (SITRAMP, 2004).

4.3 Toll Road Development Scheme

Toll road development in Indonesia was initiated in 1978 and ever since, toll road has been an effective contribution to the array of techniques used to enhance transport provision which struggle with the growing demand despite limitation of public funding. The toll road network expanded to approximately 659.72 km currently in operation of which approximately 600 km is in Java Island (more than 90% of national total).

Toll road development has been based on four distinct generations of implementation that are based on previous experience and additional institutional and financial capacity gained. Those phases are briefly described as follows: (i) 1st Generation (1978-1983), fully financed by government funds, (ii) 2nd Generation (1983-1990), funded by foreign development loans supplemented by bonds issued by Jasa Marga, (iii) 3rd Generation (1987-1993), financing in cooperation with the private sector (BOT system), and (iv) 4th Generation (1994 - present), introduction of a competitive BOT system to attract international investors.

Since the late 1980s the Government has chosen not to adopt a policy of subsidizing toll roads, so development has been limited to those projects that could be considered financially viable. Many toll road developments are located in urban areas such as those in Jabodetabek metropolitan. In these areas, the high traffic volume due to high demand travel is expected to generate high revenue thus the private sector is more attracted to invest. Accordingly, in less developed areas, government support is still required to keep the project financially viable for the private sector. The scheme is shown in Figure 18.

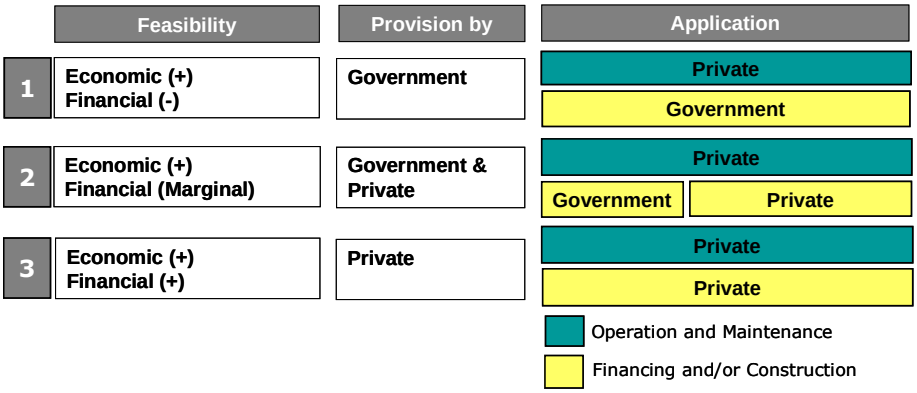


Figure 18. Toll road development scheme

Most toll road development is implemented in Jakarta Metropolitan Area or connecting links from Jakarta to surrounding region. This is due to the fact that private sector are more interested to invest in the sections which has highest demand for traffic and highest benefit potential like those in Jakarta (Table of all operational toll road in Indonesia is shown in Annex 4) .

In developed areas like Jakarta, toll road development is important to release congestion, to support the economic growth and to improve urban and regional connection. Private financing enables the public budget for road infrastructure to be allocated to other sector as well as for infrastructure development in less developed regions. Overall toll road development brings multiplier effect to the economy by creating more employment opportunities in formal and informal sector, stimulate industrial and tourism sector, increase social integration and regional interaction and serves as an investment option offering benefits for the private sector.

4.4 Toll Road in Jakarta: to Cope With the Rapid Growth

Along with the rapid growth of Jakarta as a metropolitan city, the need to develop road network has becoming increasingly urgent. Jakarta as almost all the Asian mega-cities, except Singapore, has not been able to develop the road networks to catch up with increasing traffic demand caused by rapid motorization.

JIUT was recommended by JMAT Study (Jakarta Masterplan for Anticipated Transportation System) and Jakarta-West Java Toll Road System Feasibility Study. JIUT was part of an extensive Jabodetabek toll road network. In Jakarta, toll road network consists of three ring roads, namely Jakarta Intra Urban Toll Road (JIUT, inner ring road), Jakarta Outer Ring Road (JORR), and Jakarta Outer Outer Ring Road (JORR 2). These are already in operation (all sections of JIUT and some parts of JORR) and others are still under construction (some parts of JORR and JORR 2) and under investment tender process (some parts of JORR 2). Other toll road sections are those connecting Jakarta and other regions such as Jagorawi (connecting Jakarta, Bogor and Ciawi), Jakarta-Padalarang-Cileunyi (connecting Jakarta and Bandung), Jakarta-Cikampek, Jakarta-Tangerang and Jakarta-Merak. Figure 19 illustrates the complete network.

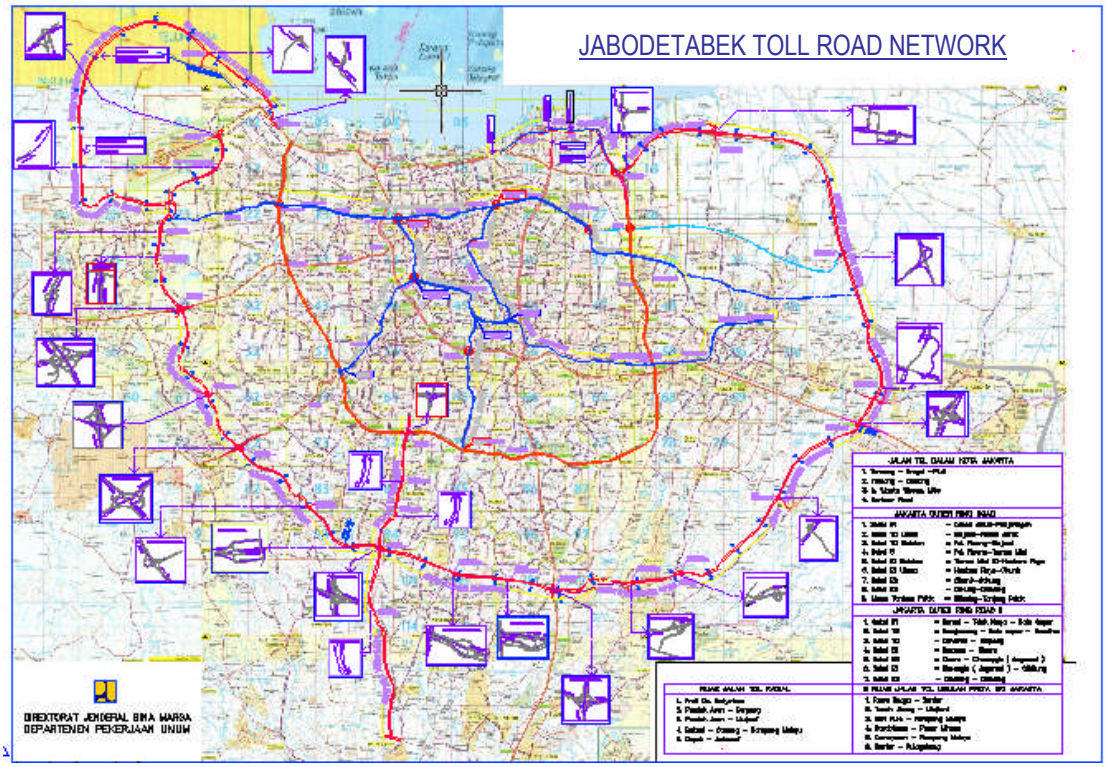


Figure 19. Jabodetabek toll road network

Source: Ministry of Public Works

Almost two decades of its development, Jakarta has gone through rapid growth in many development indicators. In some extent these objectives have been well achieved however there are some backlog remains.

1. To alleviate traffic congestion especially on important links within the city center.

   It is already witnessed that JIUT provides vital service for urban transportation in Jakarta to connect activities centers in every part of the city. Daily high traffic volume in Jakarta is nearly impossible to be accommodated by the arterial road network due to its limited capacity. JIUT serves the population by providing "extra" transportation capacity which can be used in daily activities with affordable cost

2. To increase regional coordination and strengthen interaction in Jabodetabek area.

   JIUT forms an important part of the entire urban road network in Jakarta which is very important to facilitate regional coordination and interaction of major areas in the city. In this sense, the importance of JIUT can be manifested both for the public service activities managed by the government and economic-trade activities of the private sector. By JIUT presence, it is possible to create strong links between major important economic activity centers which is needed in particular business activities and, in turn, will result in more employment opportunities for the resident.

3. As a part of Cawang-Tanjung Priok Toll Road; to improve logistic transportation thus enhancing harbor capacity effectively.

   The Tanjung Priok Port is an international gateway for import and export commodities not merely from the region but also from neighboring provinces. The timely arrival of goods is of great importance for manufacturers for their production. The delays result in reducing product competitiveness in the international market and contribute to the deterioration of economic growth of the region. At present access to the port still suffers

from traffic congestion due to the increasing industrial growth not keep pace with improvement in road length or capacity. Regarding the important role of the harbor, the government is preparing development of Jakarta Outer Ring Road II which will form outer layer of ring road to optimize JIUT and JORR network that are currently operational.

4. To serve as the main distribution node of services for adjacent cities.

   Jakarta has been growing fast into a great metropolitan area which includes several adjacent cities such as Bogor, Depok, Tangerang, and Bekasi (Jabodetabek). This wide area is already integrated into a single spatial entity with enormous inter-linked activities across its administrative border. As a consequence, there are tremendous flows of goods and services from Jakarta to other cities and the other way around as well. Accordingly, JIUT plays an important role in providing transportation services for that purpose. Recently, due to the existence of Cipularang toll road section connecting Jakarta and Bandung, the importance of JIUT is also increasing as a gateway to further away cities such as Bandung.

5. To improve land use in Jakarta.

   By the presence of JIUT, and also overall urban road network, provincial government of Jakarta has the instrument in encouraging and enforcing the implementation of spatial planning whereby the land use is being planned. Road is the major infrastructure that plays the role to structuring the space in a particular area. Therefore the existence of JIUT, if being planned and managed carefully, will also serve for this objective.

6. To minimize migration rate into Jakarta by supporting development and growth in adjacent areas.

   The development and economic activities of Jakarta is considerably higher than most other regions in Indonesia. As the consequence, annually Jakarta attracts population of other region to come and stay in Jakarta to make a living. This urbanization process has been creating many problems in the development of Jakarta with its already high density and limited capacity in infrastructure services. By connecting major activity centers in Jakarta to adjacent cities, it is possible and financially feasible for the workers to stay in adjacent cities while remain working in Jakarta. This, in turn, will benefit the municipal government of Jakarta by, at least, minimizing the rate of migration into Jakarta.

4.5 Actors in the Development

Toll road development is regulated in Indonesia under the Law No. 38/2004 concerning Road and Government Regulation No. 15/2005 concerning Toll Road. The responsibility to manage toll road development lies within the Ministry of Public Works authorization. The Minister of Public Works Decree No. 369/KPTS/M/2005 jo. No. 280/KPTS/M/2006 on National Road Network Master Plan which states the toll road master plan for 2005-2009 by which the Minister determines the government priorities on toll road development in Indonesia.

The unit within the Ministry mainly deals with road infrastructure is the Directorate General of Highways. It formulates the policy and establishes regulations concerning the development of road infrastructure and, as an institution under Ministry of Public Works authority, reports to the Minister. Its area of responsibility includes the provision of national roads and bridges infrastructure. Toll road as a part of national road network is fully a national government responsibility and its management is not in the regional or local authorities. Role of Directorate General of Highways in general is to formulate and implement the policies and technical standardization in road and bridges infrastructure of which includes national roads, freeways (toll road) and urban (metropolitan) roads.

Within the Ministry is a regulatory body for toll road development which deals with the private provision of toll road called Badan Pengatur Jalan Tol (BPJT, Indonesia Toll Road Authority). On behalf of the government signs a concession agreement with the private investor. In previous regulations, the role was held by PT Jasa Marga (Persero). Dual role of PT Jasa Marga (Persero) as regulator and also operator was ended with the establishment of BPJT under Minister of Public Works and the enactment of Minister of Public Works Decree No. 295/PRT/M/2005 on Indonesian Toll Road Regulatory Body (Badan Pengatur Jalan Tol-BPJT).

Roles of BPJT according to Government Regulation No. 15 Year 2005 on Toll Road are as follows:

- Recommend initial tariff and its adjustment to the Minister.
- Take over toll road provision after concession period and recommend further provision of the toll road to the Minister.
- Temporarily take over toll road provision for those which concession has failed and conduct re-tender.
- Conduct preparation for toll road provision includes financial feasibility analysis, feasibility study and Environmental Impact Assessment Study.
- Conduct an open and transparent investment tender for toll road provision.
- Support land acquisition process by ensuring the availability of land acquisition fund from the private and managing the spending mechanism.
- Monitor the progress of design and construction processes also operation and maintenance conducted by the private.
- Supervise the private in implementing the toll road provision in accordance to toll road concession agreement and report regularly to the Minister.

According to Law No. 38 Year 2004 on Road and Government Regulation No. 15 Year 2005 on Toll Road, non public sector is invited in the provision of toll road which includes: private enterprise, state owned and regional owned enterprises, as well as domestic and foreign investors. PT Jasa Marga is an example of a state owned enterprise which has some concession rights for some toll road sections.

The determination of concession rights for the private sector is done through an open and transparent investment tender held by BPJT (on behalf of the Government). Under concession arrangement, private investors have the right to operate and maintain a particular toll road section and collect toll revenue for their investment recovery. Tariff issue is then a crucial factor which must be set fairly: affordable for the road users and also beneficial for the investor. Initial tariff and its periodical adjustment is the responsibility of the Minister. After the concession period, generally between 30-40 years, the right of private provision is handed over to BPJT (on behalf of the Government).

4.6 Environmental Management in Toll Road Development

4.6.1 AMDAL (Environmental Impact Assessment)

In Indonesia, sustainable development is implemented in a set of environmental policy stating the obligatory of Environmental Impact Assessment (EIA) as an environmental management tool. EIA is a policy and management tool for both planning and decision making. EIA is aimed at assisting the identification, prediction and evaluation of foreseeable environmental consequences of proposed development projects, plans and policies.

The EIA process in Indonesia known as AMDAL (Analisis Mengenai Dampak Lingkungan) was originally included in law through Government Regulation No. 29 of 1986 (PP 29/1986), promulgated under Law No. 4 of 1982, Indonesia's fundamental Environmental Law, which establishes the principle of sustainable development. Since then it has been revoked several times and currently the existing regulation is Law No. 23 of 1997 and Government Regulation

No. 27 of 1999 (PP 27/1999). The subsequent guidelines issued by the Minister of State for the Environment are Decree No.11/2006 who specifies the screening requirement if AMDAL obligatory.

By the law, AMDAL is compulsory for every proposed project with potential significant and important consequences to the environment. It includes assessment of the following aspects of physics-chemistry, social-cultural, and public health impacts and also stand as a part of feasibility study of a particular project. To measure the level and magnitude of impact, the following criterions are used:

- Number of people potential for impact exposure;
- Area covered or within influence of impact;
- Period (time length) and intensity of impact;
- Number of potential environment component will be influenced;
- Cumulative impact;
- Characteristics of reversible or irreversible of the impact.

Biswas & Modak (1999) stated that promulgations of law and regulation are not sufficient to put EIA at its best purposes towards environmentally sustainable development. To ensure effectiveness of EIA some condition to be fulfilled as summarized in the following;

- Comprehensive legal regulations leaving no misunderstanding about the interpretation of EIA obligation.
- Rational and open decision making which allows EIA to perform best by giving enough room to consider alternatives and absorb new information.
- Application of strategic EIA to sustain project EIA.
- Enough room for public participation since the public may possess useful information leads to the formulation of new alternatives.
- Independent body to prepare draft guideline for the preparation of EIA report and the review in order to strengthen the process.
- Good scoping as a crucial part in effective EIA process.
- Quality if EIA report which enabling proper use by all stakeholders.

4.6.2 Stakeholders in AMDAL

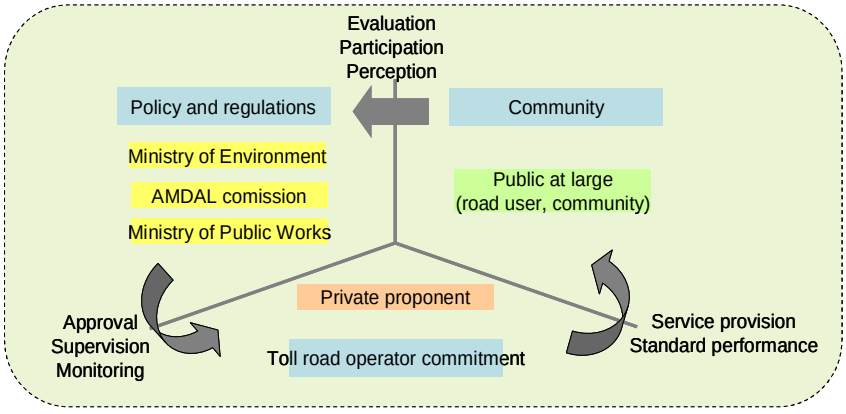


Figure 20. Actors and processes of AMDAL

The most important actors involved in AMDAL implementation are:

(1) Proponents of business and development activities, both public and private sector.

Proponent of development activities are those responsible for the project initiatives and management. The proponents prepare the AMDAL documents by assistance from consultants and their technical staff. The AMDAL documents are then should pass the evaluation of AMDAL committee before the project can be implemented. Within the

implementation period, the proponent must report regularly to the Ministry of Environment and comply to the previous evaluation. The evaluation includes a binding agreement on the environmental impacts management and mitigation measures stated in *Rencana Pengelolaan Lingkungan* (RKL, Environment Management Plans) and *Rencana Pemantauan Lingkungan* (RPL, Environmental Monitoring Plans).

(2) The government, through the responsible sectoral agencies and provincial governments.

Ministry of Environment is responsible for national wide projects, while other projects are under provincial and municipal governments. With the vision to realize environmental quality improvement towards sustainable development, the Ministry is responsible for policy and regulation formulation including AMDAL.

(3) The AMDAL committee who reviews and evaluates the AMDAL documents.

AMDAL commission consists of the representatives of community, NGOs, relevant experts, and related government agencies in concerned sector. It determines the formulation of AMDAL's scope and its evaluation.

(4) The public in general, including community representatives and NGOs.

Public participation in AMDAL process is made possible from the initial phase (screening and scoping phase) to the decision on final AMDAL statements.

Chapter 5. Sustainable Transport Indicators: Measuring the Environmental Impacts

Sustainability of transport can be measured by the use of a set of indicators. Indicators are tools of selected variables to measure progress towards certain goals or to evaluate condition within a certain system. Many literatures mention about this indicators set. One of which is a potential sustainability indicators for transportation developed by VTPI as explained in Chapter 2 Literature Review on Sustainable Transport.

In this study, researcher used three indicators, namely (i) traffic risk level, (ii) air pollution level and (iii) level of congestion. Reasons for this indicator selection are also based on VTPI recommendation. VTPI recommend principles of indicators selection and its use in different types of analysis level from the planning process to travel behaviour, impacts on people and the environment, and economic effects. This recommendation from VTPI is explained in details in Chapter 2 Literature Review on Sustainable Transport.

It is rather difficult to scientifically measure the environmental impacts of Jakarta Intra Urban Toll Road (JIUT) and its contribution to sustainable transport. JIUT is a part of an extensive transportation network and to measure its actual impact to the environment, for example air pollution, is required a qualitative impact research with an experiment and intensive survey. Figure 21 illustrates the existence of JIUT and non toll road (arterial road) in Jakarta. As a complete network, JIUT and the arterial road form an open system and thus difficult to isolate the environment impact of each component.

Figure 21. JIUT and arterial road (non toll road)

For the purpose of this study, qualitative assessment is used with an explanatory and descriptive approach. Secondary data from previous studies, documents and report as well as primary data from interview during fieldwork are used for this qualitative analysis.

5.1 General Description of Jakarta Intra Urban Toll Road

Cawang-Tomang-Cengkareng Toll Road (JIUT) is operated by PT Jasa Marga consists of 2 sections namely Cawang-Tomang-Pluit and Prof. Dr. Ir. Sedyatmo (Soekarno Hatta international airport toll road). Cawang-Tomang-Pluit section was open to traffic in April, 20 1988 and Prof.Dr.Ir. Sedyatmo section was in June, 20 1996.

Number of lanes is 2 x 3 for Cawang-Tomang section and 2 x 2 for Tomang-Cengkareng section. Number of operational toll gates is 19 with open system toll collection. The toll collection system can be an open system (road user pays in entrance gate or exit gate) or a closed system (road user takes the ticket in the entrance gate and pays the toll in the exit gate). Capacity of toll gate is of 707 vehicles/gate (Standard Minimum Service for open system is $\leq$ 450 vehicle/gate). Type of pavement construction is rigid pavement which in average is in

good condition. Traffic sign and road marks are generally in good condition and well functioning.

Cawang-Tomang-Cengkareng Toll Road connect 5 important areas in Jakarta including Cawang, Tomang, Grogol, Pluit and Cengkareng with total length of 31.4 km. Southern part of the toll road, in Cawang interchange, a meeting point of 3 important toll road sections in Jabodetabek . These are Jagorawi Toll Road as the main gate of Jakarta towards West Java, Jakarta – Cikampek Toll Road as the main gate to east and north west towards North Jakarta which then connected to Soekarno-Hatta airport. The toll road increase accessibility from all directions towards Jakarta and as an alternative route to divert traffic from arterial road networks within the city.

5.2 Traffic Risk Level

Traffic accidents results from a combination of factors related to the components of the system comprising roads, the environment, vehicles and road users, and the way they interact. Some factors contribute to a collision occurrence thus are part of crash causation while some others aggravate the effects of the collision and thus contribute of its severity.

Traffic accidents in Jakarta are mainly caused by vehicle and road users factor. It is evident by a high level of accidents accompanied by high number of traffic violation. Data from Polda Metro Jaya DKI Raya, within a week (18-24 July 2008) recorded 25 of traffic casualties, 51 victims of severely injured and 52 victims of milder injuries. Number of traffic violation was 11,855 cases for that period comprising 6,074 involving motorcycles and 5,781 of four wheel drive. Traffic violation incorporating traffic sign and helmet use violation, and over loaded vehicle (Sindo, 30 July 2008). Bad driving attitude of road users evidently correspondence the high traffic accident level in Jakarta.

Growing traffic volume in Jakarta also derives another cause for this issue. Increased number of vehicle means more risks imposed on traffic accidents level.

Table 16. Number of registered vehicle

Year	Vehicle Type				Total
	Motorcycle	Passenger car	Heavy Load Vehicle	Bus	
2001	1,813,136	1,130,496	347,443	253,648	3,544,723
2002	2,257,194	1,195,871	366,221	254,849	4,074,135
2003	3,316,900	1,529,824	464,748	315,652	5,627,124
2004	3,940,700	1,645,306	488,517	316,396	6,390,919
2005	4,647,435	1,766,801	499,581	316,502	7,230,319
2006	5,310,068	1,835,653	504,727	317,050	7,967,498

Source : www.bps.jakarta.go.id from Ditlantas Polda Metro Jaya

One way of measuring whether JIUT operation has impacted on level of traffic risk in Jakarta is by comparing number of traffic accidents in arterial roads before and after its operation. However, difficulties arise during data collection since data from previous years are not available. Nevertheless, in general we can say that toll road traffic induces less level of traffic risk based on some argument. As discussed earlier, main factor of traffic accidents in Jakarta is vehicle and road users. We can argue that on toll road the risk is lessen because smoother traffic flow (with less congestion), better road signs and physical condition of toll road shall lessen the bad driving attitude of road users. The more vehicles entering toll road means the less risk incurred. In line with increase vehicle ownership, traffic volume on toll road also increases each year.

Another argument is the restriction of toll road for motorcycles. As discussed earlier significant number of traffic accident and violation involved motorcycle. More than 50% of the traffic violation involved motorcycle.

Having said so, traffic accident level in Jabodetabek is still high compared to developed countries. Fatality rate Jabodetabek on toll roads is of 2.98 fatality per million vehicle km, compared to developed countries of 0.5 fatality per million vehicle km (SITRAMP, 2004). The number of lives lost in traffic accidents on ordinary streets has not decreased while the fatality rate on toll roads is high. Accidents report on toll road is shown in Table 17. according to it, the most common reason for traffic accident on toll road is drivers and vehicles factors.

Table 17. Accident report on toll road

Tool road section	Total accident		Accident level		Casualties		Fatality level	
	2005	2004	2005	2004	2005	2004	2005	2004
Cawang-Tomang-Cengkareng Jakarta Intra Urban Toll Road	319	366	17.13	19.72	n.a.	n.a.	0.70	1.13

Indicators	Number
Number of accidents	280
Number of victims (person)	206
Causal factor	
a. Drivers	206
b. Vehicles	69
c. Environment	5

Source: PT Jasa Marga

5.3 Air Pollution

Air quality monitoring is conducted by BMG (Badan Meerorologi dan Geofisika) which has 41 air quality monitoring stations throughout Indonesia. Six stations are located in DKI Jakarta including at BMG central office conducts measurement of SPM, chemical composition of the atmosphere, SO2, NO2, aerosol and ozone concentration.

Parallel with the urban development and urbanization, Jakarta has experienced serious air pollution problem associated with the use of energy in transportation sector and industries. Jakarta is one of the most polluted cities in the world and among the worst in Asian cities as illustrated in Figure 22.

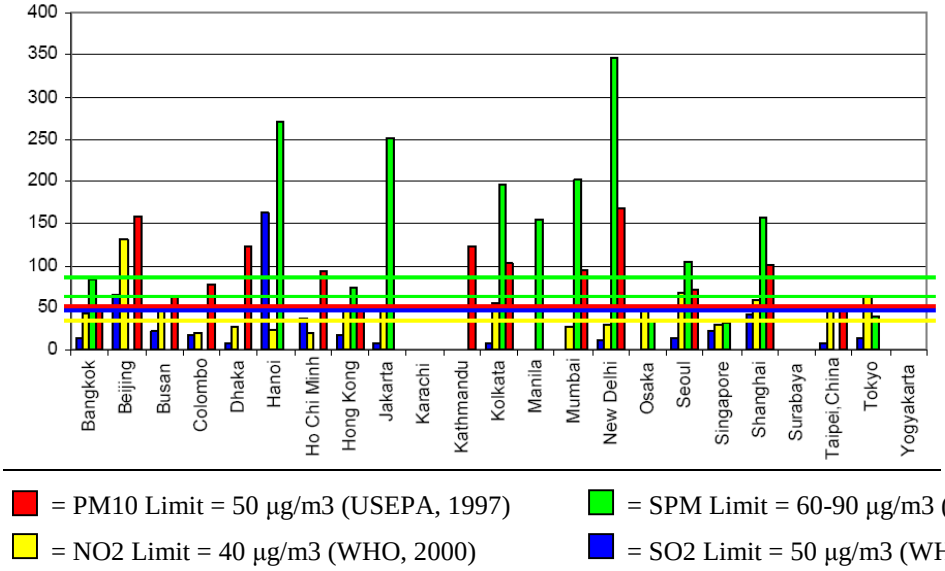
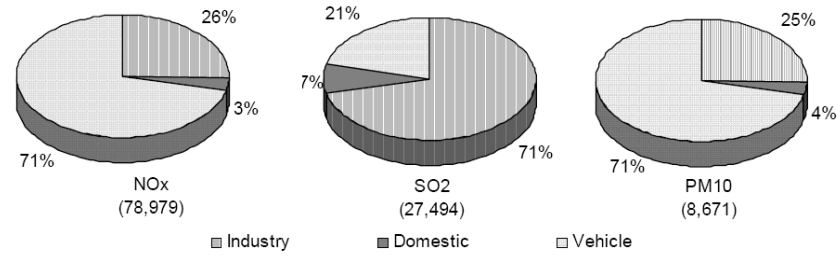


Figure 22. Average annual air quality levels (2000- 2003) in Asian cities

Source: Air Quality Management Capability in Asian Cities, Clean Air Initiative for Asian Cities, Asian Development Bank

To measure JIUT impacts and contributes to air pollution level in Jakarta is somewhat difficult. Main problem is the limitation in availability of emission inventory data. Measuring the impact can be done by comparing pollution level before and after JIUT operation. Although such approach is also not absolute since the vehicle ownerships are continuously increasing each year thus unless some highly effective pollution control measure have been done, the emission as well as pollution level will also accordingly increase.

Another impediment for impact measurement is the complexity of the urban life and its dynamics. Data from Syahril et al (2002) indicates the emission shares in Jakarta in 1998 as shown in Figure 24. Transport contributes 71% of total NOx emission, 21% of total SO2 emission and 71% of total PM10 emission. Other emission source types are from industrial and domestic sector which contribute significant share.



Note: The figures in the brackets are estimated total emission load in tons/year.
All CO and THC only emitted from vehicle as much as 942,840 and 187,545 tons/year, respectively.

Figure 23. Emission shares by source type in Jakarta in 1998

Source: Syahril et al, 2002

However, one can argue good road standard is also good for the environment and is regarded as positive contribution to a sustainable environment; a bad road standard results in high emissions from the car traffic while bad road standard results in high emissions from the car traffic. Study from SINTEF Technology and Society and Norwegian Road Federation (2007) proved that better roads with better road design and smoother traffic flow resulted in less emission of various pollutants. Lack of sufficient capacity results in very low traffic speed

(stop-and-go conditions) with high level of emissions and do not contribute to a sustainable environment.

Other source of air pollution is badly maintained old vehicles largely occupying roads in Jakarta. Like in many cities of developing countries, a large number of low maintained vehicles register a high percentage of vehicle population as they are passed down the economic chain. People prefer to drive their private cars instead of taking the public transport, no matter how old the vehicles are and how little they can afford for the maintenance. An older poor maintained vehicle can emit 100 times the pollutant of a properly maintained modern vehicle (Brilhante & Frank, 2003). As a result, efforts to control air pollution without giving attention to vehicle maintenance are consequently flawed.

5.4 Level of Congestion

Transportation in Jakarta is characterized by severe traffic congestion. Figure 24 from SITRAMP (2004) shows the level of congestion in Jakarta urban roads. Most road sections have reached over capacity and high traffic volume resulted in very low travel speed. On some sections, travel speed reaches 0-10 km/hour during morning (AM) peak. It is very much impacted on low productivity, high economic losses and decreased comfortability of road users. Figure 25 shows locations and causes of congestion in Jakarta.

With JIUT operation, some of the traffic is converted to the toll road which provides better travel speed. As required in Minister of Public Works Decree No. 392/2005 on Minimum Service Standards for Toll Road, standard speed for urban toll road is 60 km/hour or at least 1.6 times non toll road speed.

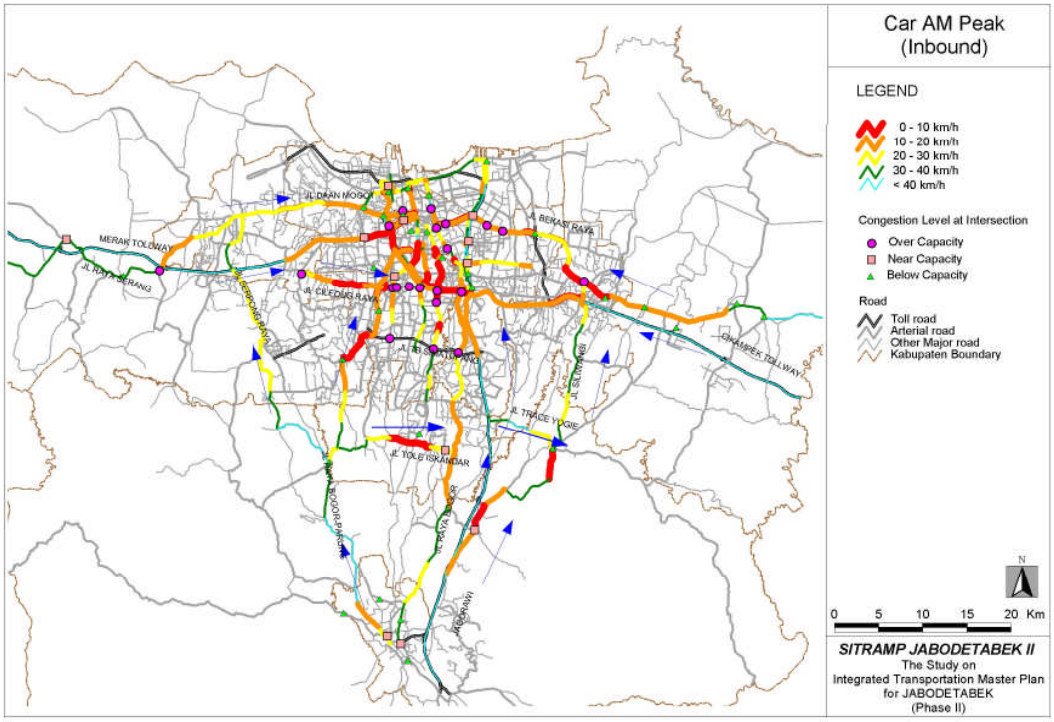


Figure 24. Traffic congestion in Jakarta

Source: SITRAMP, 2004

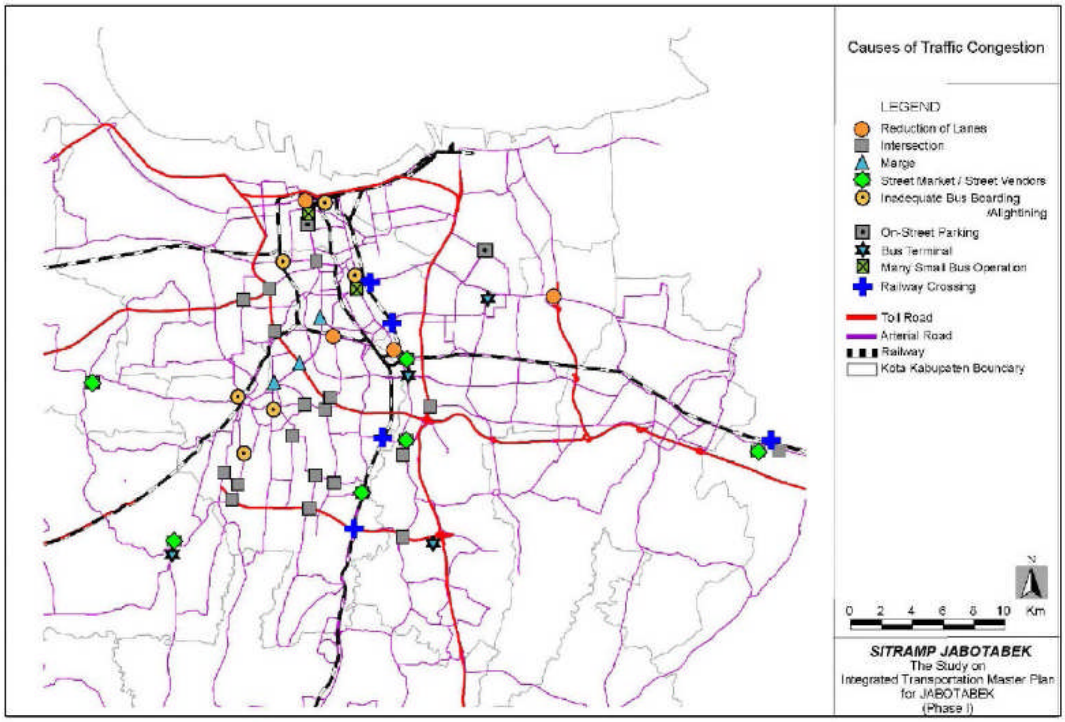


Figure 25. Causes of traffic congestion in Jakarta

Source: SITRAMP, 2004

Even so, congestion on toll road still occur from time to time particularly long queue at toll gates during AM or PM hours. Efforts have been made to improve this including operation of open system for toll collection. The collection system in a tollway can be an open or a closed system. In the open toll collection system, the road user usually pays in entrance gate or exit gate, while in the closed toll collection system, the road user takes the ticket in the entrance gate and pays the toll in the exit gate. Open system minimizes the time required for toll transaction and reduced vehicle queue at toll gates. Presently, application of electronic toll collection is being prepared by the government and its implementation is expected to improve toll collection system in the future.

Congestion on toll road also occurs on some sections for example on those towards the harbor caused by heavy loaded vehicles that move very slowly on the road. Other cause is flood which happens from time to time on toll road towards the airport. These issues must be taken into consideration by the government and toll road operator.

Figure 26. Congestion on toll road

Chapter 6. Environmental Management in Practice

Empirical part of the study explores the implementation of environmental management in toll road development. Primary data collection was conducted by in depth interview with stakeholders involved in toll road development and environmental management. Having studied the environmental policy of the development, findings results show some remaining impediments in the environmental management practices. The main challenge is to overcome lack of enforcement caused by interrelated aspects form poor institutional coordination to limited manpower and financing. This chapter presents findings and analysis which structured into four main themes; (i) role of environment in the development, (ii) crucial role of AMDAL, (iii) participatory development, (iv) supervision and monitoring and (v) toll road in sustainability perspectives.

6.1 Role of Environment in the Development

6.1.1 Rationales and Background of Toll Road Development

Toll road development in Indonesia was initiated by operational of Jagorawi Toll Road in 1978 connecting Jakarta, Bogor city and Ciawi. Initiative for toll road development was very much based to fulfilling high demand for traffic. This is stated by one of the key respondents as quoted below;

"…Background for toll road provision in Indonesia is mainly to release congestion. That is why toll road generally located in urban area which factually has sufficient demand in this term high traffic volume. The other is to support regional development and economic growth…"

Key respondents agreed on two main objectives of toll road development. Firstly, toll road was developed to increase comfortability of road users. Toll road in developed urban areas, such as in Jakarta, is designed as an alternative route of non toll roads with low level of service; heavy congestion, high level of side frictions due to misuse of roadway by other activities (e.g informal sector) and poor maintenance.

Secondly, toll road was developed to support economic growth which in turn leads to regional development. In less developed areas, toll road was developed although it is not financially viable but being very important to support regional development (thus it is economically viable).

Later, respondents also commented on the environmental interest in toll road development. As quoted from one of the key respondents, "*..(At the beginning of its development) toll road had no environmental goal, however we can associated less congestion (as a result from toll road development) with fewer vehicle emission and reduced air pollution. As road pricing implementation, JIUT in Jakarta has strong characteristic for revenue generation…"*

Moreover, the respondents also agreed that toll road as road pricing implementation in Jakarta is not a travel demand management measures and has not yet succeeded to encourage road users to convert to public transport.

6.1.2 Emphasis on the Environment

Toll road development phases in Indonesia and institutions involved, according to Law No. 38 Year 2004 on Road and PP No. 15 Year 2005 on Toll Road, are as shown in Figure 27. It is initiated by policy formulation by Ministry of Public Works (by Directorate General of Highways, DGH). DGH provides guide in the development by establishing laws, regulation and decrees in road infrastructure sector (to include toll road). The Ministry also produces a

toll road master plan, every 5 years, in which stating the national toll road network (existing network and the future plan) through a ministerial decree. Current master plan for toll road is Minister of Public Works Decree No. 369 Year 2005 on National Road Network Master Plan. The master plan is established through a comprehensive studies and close coordination with regional planning agencies in areas where the toll road is programmed.

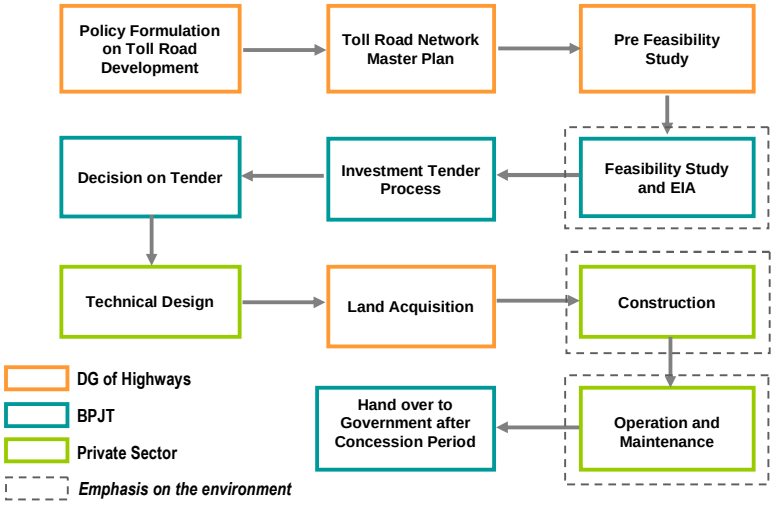


Figure 27. Phases of toll road development

The next phase is pre-feasibility study conducted by DGH followed by feasibility study and AMDAL (Environmental Impact Assessment). AMDAL is obligatory and implemented according to a screening (national criteria for AMDAL requirement). Toll road construction and operation is obligated with AMDAL comprising all unit length. The AMDAL approval approval process takes place according to the location of the project, from municipality (BPLHD Kota), regional government (BPLHD) or central government (Ministry of Environment).

The next phase is investment tender, conducted by BPJT, in which local and foreign investors are encouraged to participate. Evaluation in toll road investment tender is based on the following aspects (Minister of Public Works Decree No. 27/PRT/M/2006):

- Administrative requirements
- Company's financial status and performance
- Company's background and experience, including type of business and project location
- Concession proposal includes capital and organizational structure
- Technical proposal includes designs of technical, construction, toll collection, traffic management, maintenance and devices renewal.
- Provision schedule
- Financial proposal (business plan)

Key respondent from BPJT further explained about the basis for decision on toll road tender evaluation as follows;

- Proposed tariff by the private enterprise. In limited tender, whereas method of provision (design, construction and land acquisition cost) and concession period are already stated by the Minister, evaluation is based on the lowest tariff.
- Support/compensation from government or risk assumed by government. In limited tender, evaluation is based on the lowest government's support/compensation and risk.
- Proposed investment value, concession period and initial tariff in case of tender by investment parameter basis. Provision framework (design, construction, and land

acquisition cost) is determined by the government. Evaluation is based on the lowest cost, construction plan, tariff and concession period.

The respondent also stated that *"..environment aspect is not explicitly stated as the requirements in tender investment winner. However environmental management (AMDAL) is a part of tender document which must be referred to by the bidder (potential operator)..."*

Proceeding tender process is technical design which must also comply to AMDAL recommendations and guidelines. The next phase is land acquisition which is also an aspect included in AMDAL. In Indonesia, LARAP (Land Acquisition and Resettlement Action Plan) is applicable for donor funded projects, otherwise land acquisition matters is included in AMDAL.

During construction and operation, environmental management implementation is conducted according to RKL (environmental management plan) and RPL (environmental monitoring plan) as part of AMDAL document. During operation, the operator regularly reports to the government upon RKL and RPL implementation every 6 months.

6.2 Crucial Role of AMDAL

6.2.1 AMDAL in Planning Process

EIA in planning process should be managed so it provides decision makers information at every stage of the project planning cycle (Modak and Biswas, 1999). In the planning process, it can be done sequentially (EIA conducted after engineering/economic planning), concurrently to emerge with engineering/economic planning, and integrated as a management tool on a par with engineering/economic planning.

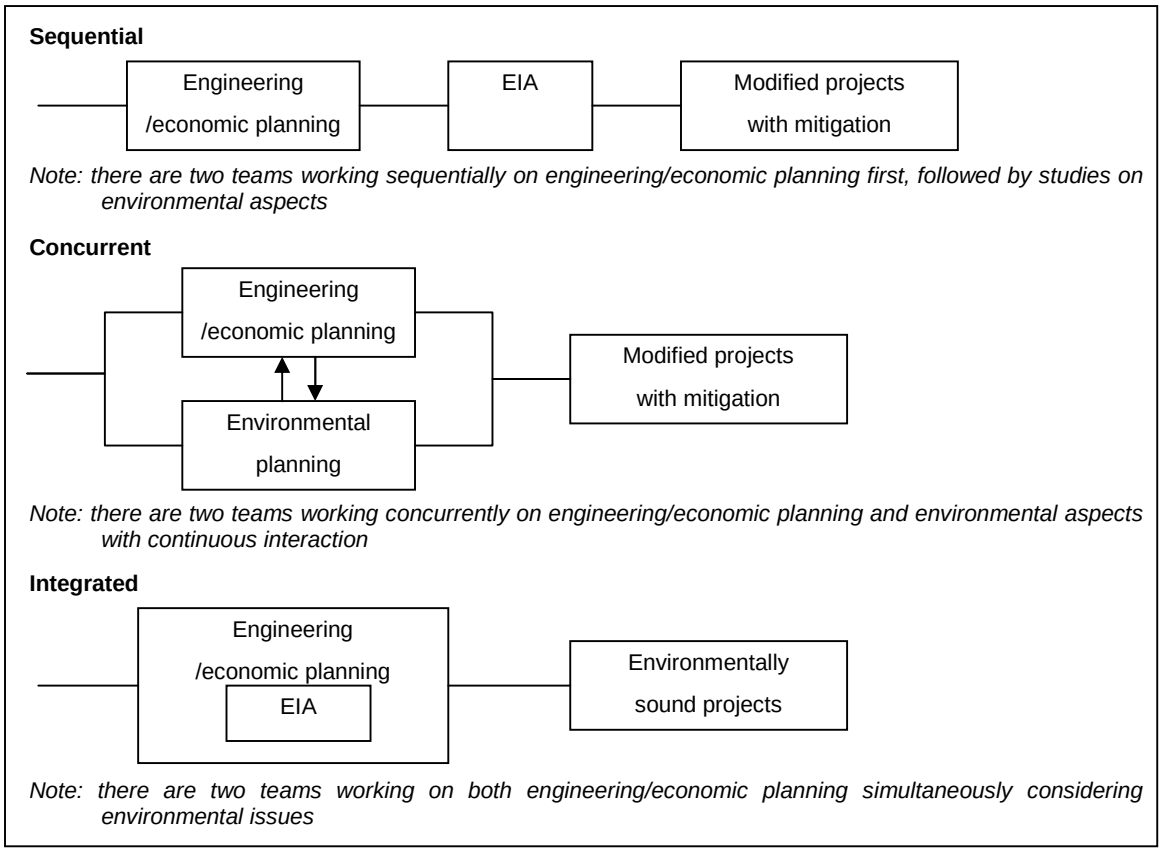


Figure 28. EIA in planning process

Source: Modak and Biswas, 1999

AMDAL in Indonesia is a part of feasibility study meaning that it assists the decision maker to determine whether a project should be implemented and in what form. Based on the regulations, AMDAL is implemented concurrently integrated within the planning process. However in practice, the implementation in many cases is sequential where it is conducted after the engineering/economic planning stage in the project cycle. In some cases, EIA even commenced after the project is already operational.

Jakarta Intra Urban Toll Road (Cawang-Tomang section) was operational in 1988 but the environment documents were prepared later during its operation in 1994. Key respondents commented on this that there are a lot of project, not limited to toll road sector, which does not have environmental documents after many years of operation. It indicates lack of control from the institutions in charge for environment management. This is caused by many factors. Firstly, the regulatory framework and institutional reforms since the establishment of AMDAL in the early 80s. AMDAL was originally included in law in 1986 through enactment of PP 29/1986. It has been revoked several times and the current regulation is PP 27/1999. Some major changes including the role of AMDAL authority that has been passed on to KLH form Bapedal.

Another background for this situation is that in some cases, as in JIUT case, the project is of high priority due to its major role for development and economic growth so immediate implementation is required.

6.2.2 Quality of AMDAL

Concerning its major role in toll road development, quality of AMDAL documents is crucial. Good quality means that AMDAL should be at least contains; (i) information on the environmental impacts and its alternatives, including environmentally sound alternatives, (ii) comparison of all (relevant) alternatives, and (iii) comparison of impacts with environmental objectives and standards and evaluation of the standards (Modak and Biswas, 1999).

An example of this is the frequent occurrence of flooding on toll road section towards Cengkareng airport. The section is particularly one of the most important and busiest links. This toll road flooding causes traffic congestion on toll road and long delay of travel to and from the airport. It is an example of the failure of AMDAL as an environmental study previously prepared aimed at predicting and minimizing the negative impacts. AMDAL should be able to recognize environmental conditions, including physical, chemical and biological characteristics, of the study area and identify the consequences of the project brings upon the area. It includes identifying the possibility of flooding occurrence during the rainy season and its impact on the traffic. Furthermore it should be able to providing mitigation and management measures to deal with the impacts.

Lack of AMDAL quality can be associated with scoping phase as an important stage during AMDAL. Effective scoping enables the proper impact predictions and the mitigation measures. Community participation during scoping of AMDAL helps shape the AMDAL to its best quality. More over, it is also caused by the manpower behind AMDAL formulation both in the government and project proponent.

One of the key respondent commented on this issue as follows; *"…the institution (Ministry of Environment) is lacking human resources with good knowledge on AMDAL. In the regional agencies (BPLHD, Regional Environmental Agencies) the condition is worse. High level of employee mutation is happening, and sometimes staff with very little knowledge on the environment was given tasks to manage AMDAL. There should be more training and capacity building on this issue.."* Later on, the key respondent also highlighted the need for better highly qualified environmental consultants with AMDAL certification on every project. Highly qualified consultants are expensive therefore private proponents often choose consultants with less qualification.

6.3 Participatory Development

6.3.1 Public Participation and Access to Information in AMDAL

Public involvement in the AMDAL process is defined in the Government Regulation (PP) No. 27, 1999 on AMDAL, and is further elaborated in the Decree of the Head of BAPEDAL No 08, 2000 on Public Involvement and Information Disclosure in the AMDAL Process (Kepka 08/2000).

The Government Regulation on AMDAL, PP 27, 1999 (article 34) states that: "Concerned public must be involved in the preparation of the terms of reference, evaluation of terms of reference, environmental impact analysis, environmental management plan and environmental monitoring plan". In the subsequent guidelines issued in the Head of BAPEDAL Decree (Kepka) 08/2000, the objective of public involvement in AMDAL is provided. It is described as follows:

1. To protect the interest of the public
2. To empower the public in decision-making on planned activities that have a potential to cause significant and large environmental impacts;
3. To ensure transparency in the overall AMDAL process; and
4. To create an atmosphere of equal partnership among all concerned parties, ie. by respecting the rights of all parties to obtain information and making mandatory for all parties to provide information that must be known by other parties affected.

According to PP No. 15/1993 there are 3 main elements of public participation:

1. The obligation of project proponent to make public announcement of the project. Announcement may be placed on public media and notice board near project site or proponent's location (Article 22 (1))

   Findings: Ministry of Environment is very strict on this issue. Every proposed projects must comply to this obligation otherwise the subsequent phases of AMDAL will be delayed affecting the whole project approval and construction. Public announcement is made on the Ministry's website, local and national newspaper, radio.

2. Opportunities to involve the affecting people, NGOs, CBOs, and other community representatives in AMDAL commission (central and regional commission)

   Findings: Ministry of Environment establishes AMDAL commission consists of ad hoc members from sectoral agencies, regional representatives and from the community. The commission responsible for AMDAL approval and evaluation.

3. Open access of AMDAL reports for public including RKL and RPL reports as stated in Article 22 (2).

   Findings: Ministry of Environment allows anyone to access, read and make copies of AMDAL documents. However, data and archival bases are still poorly managed caused by lack of coordination between the Ministry, BPLHD, and project proponents. Sometimes we have to come to many offices to find the data/documents we require. It is even more difficult to search for out dated documents or data from previous years.

Although public involvement and information disclosure in AMDAL have been implemented (albeit in varying degrees), the outcome of these efforts have not been significant. Comments from key respondents noted some remaining problems including that it has not yet significantly contributed to a better AMDAL process and decisions based on the AMDAL process.

Reason for limited success from public involvement in AMDAL is attributed to a combination of problems. Firstly, great concern of it comes from the poor understanding of AMDAL objectives, scope and processes. Regarding the importance and crucial role of

AMDAL, quality of the document and how the community has a very strategic role in the process have not supported with adequate knowledge and awareness from the community themselves.

Comment from one of the key respondents on this matter is as follows, " …*Although community have no rights for (directly) approving or disapproving decisions in AMDAL, they have rights to submit their input and advice in the process. Decision on AMDAL approval is the authority of AMDAL commission in which representatives of community are involved. Socialization (public consultation) in general has been implemented sufficiently. The main reasons of involving the public are to inform the community on the proposed project so they can give their input and response regarding it in order to achieve optimum AMDAL quality. In practice, it is sometime responded by the community in a different way. For example, they request for sewer improvement, mosque construction or even request of charity, all of which are not related with the project.."*

Furthermore, the key respondent also mentioned the need to keep community participation in the right track and focused on the project itself rather than as a momentum to gain government attention on other non related project issues. It is important to improve understanding of public involvement in AMDAL and the expected output from it.

Another background for this problem is still evolving democratic process and institution. Indonesian people have long been in a strong governmental regime (during Soeharto hey day) which discourages them to be actively pursue for democracy and tend to be obediently follows the ruler (government).

6.3.2 Public Participation and Access to Information during Operation

There is no formal procedure of monitoring and supervision by the community during operation. However, the community has the right to monitor indirectly and report to the government upon environmental destruction or degradation caused by the project. The community also has the right to access AMDAL documents and RKL and RPL implementation reports as they are public documents. Room for public participation is open by the opportunity of community to review through the reports and submit their input or recommendation to the government. Upon the community recommendations, the government may force the toll road operator to prevent, minimize or mitigate impacts from the projects.

In summary, at least there are two problems with public participation in toll road sector and in AMDAL implementation; social and cultural factors. Low education level of the community and limited access to information greatly influence the level of participation. Sometimes the community has very little knowledge and understanding on AMDAL and the project itself. This in turn makes them difficult to predict potential impacts of the project thus deterring the very core objectives of community participation. In term of cultural aspects, as Koentjaraningrat, a well known anthropologist, mentioned about one of cultural characteristics of Indonesians is the "upline orientation" (Hadi, 2005). Such cultural trait discourages people to create gap with their formal and informal leaders and they tend to follow the leaders opinion and/or instruction.

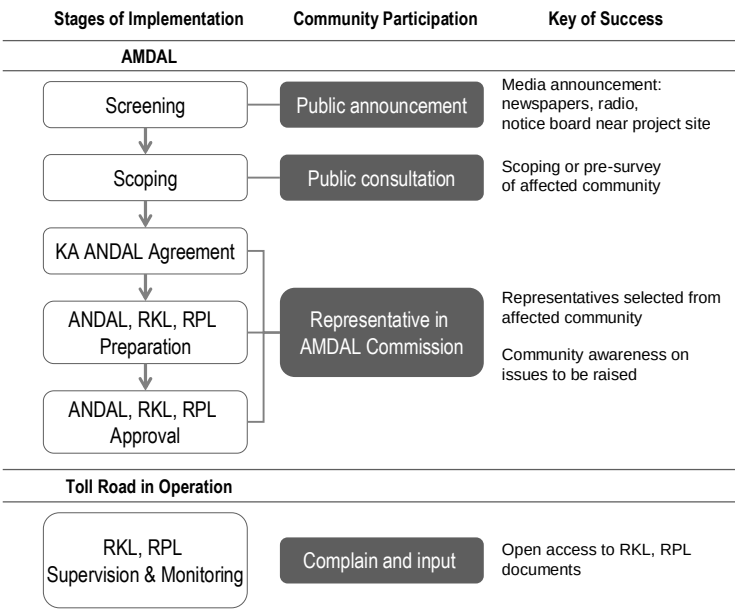


Figure 29. Public participation in toll road development

6.4 Supervision and Monitoring

6.4.1 Lack of Enforcement

Monitoring in EIA context can be defined in accordance to definition by 1972 Stockholm Conference as *"a system of continued observation, measurement and evaluation for defined purposes"* (Brilhante et al, 2002). Another definition is as made by the World Bank (1996); *"technical and institutional activities implemented by a proponent of a project to measure and evaluate environmental (including health and socio-economic) changes induced by a project"*.

In transportation projects, such as toll roads, monitoring is essential in every development phases, including; (i) during construction, (ii) during operation, and (iii) post project monitoring, all of which is to make the environmental management in a much more effective manner, gain optimum benefit of the project while preventing or minimizing degradation in environment.

Figure 30 illustrates actors, their roles and simplified interactions between them in toll road and AMDAL monitoring and supervision. In principal, there are two control mechanisms involved, namely (i) contractual agreement between toll road operator and the government (BPJT), and (ii) AMDAL implementation supervision by designated environmental institutions.

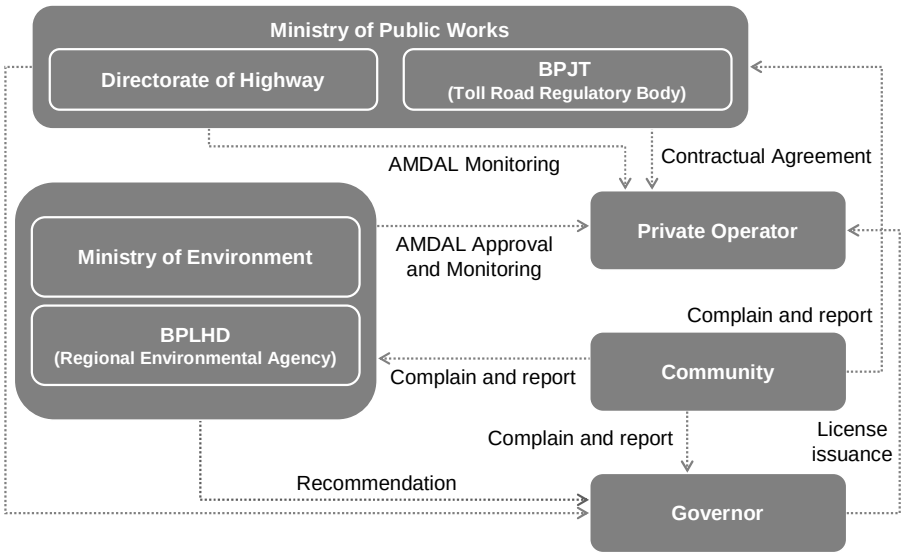


Figure 30. Stakeholders and roles in supervision and monitoring

Contractual agreement between private operator and BPJT includes administrative requirements and fulfilment of standard toll road service. Standard toll road service or called Minimum Service Standard (SPM) is regulated by Minister Decree include the technical and construction of toll road standards according to the principal that it must offer better specification compared to non toll road. The contractual agreement is reported every 6 months. Disobedience in complying the agreement may lead to cancellation of operation right by the operator. However, it is a new policy being implemented so as new establishment of BPJT and there is not much experience in practice on this. Respondents stated that, so far, the reports are not followed by field clarification and direct observation by the institution in charge. For example, the failure to comply to standard time of toll payment at toll gates, one of the requirements of SPM, are still experienced in many toll road section including in JIUT as one of the busiest toll road section in Jakarta (and in Indonesia).

Other control mechanism is the supervision of AMDAL (RKL and RPL) implementation. According to PP 27/1999, toll road operator must comply to the requirements stated in RKL and RPL. The operator must report RKL and RPL implementation to the following; (i) Ministry of Public Works (DGH and BPJT as toll road regulator); (ii) the Governor as the license issuer, (iii) institutions in charge for environmental management supervision (KLH, Bapedalda, BPLHD, and Dinas LH)

Monitoring during construction for toll road is conducted as part of AMDAL and complies to statement previously made in RKL and RPL. The operator and contractor put the technical design and AMDAL as their guideline. An important point of this phase is how the agencies monitor and control the construction while the construction is on going. During construction the project proponent must submit report regularly every 3 months.

During operation, toll road may bring important adverse or beneficial impact to the environment. The key of monitoring is to make sure the impacts are managed in the most sustainable way. During operation the project proponent must submit report regularly every 6 months. These 3 monthly and 6 monthly reports are called implementation reports.

Remaining problems in environmental management of toll road comes when AMDAL documents with RKL and RPL still only perform as (quoted from one of the respondents) “table documents.” Still there are cases where the implementation does not comply according to the regulation. A respondent stated that a lot project proponents do not submit the regular report. For example, a project had AMDAL approval in 2004 and submitted the

implementation report in 2007 (the project should have been reported 6 times according to the regulations). For small scale projects, the designated institutions do not put too much attention on these cases. Only for big projects, Ministry of Environment or BPLHD send notification to the project proponent. Also sometimes the report and notification do not proceeded by direct observation or field clarification by the institution.

Key respondents unanimously agreed that the major blank spot on environmental management in toll road sector, and in AMDAL implementation in particular, is the poor enforcement. One of the key respondents commented on this issue as follows, *"…Main improvement to be done in environmental management is better enforcement since it is currently very poorly implemented. Reward and punishment is one of potential option. Another is the lack of environmentalist in the organization (Ministry of Public Works).."*

Another respondent confirmed this by saying, *"…PP No. 27/1999 on AMDAL states that institution designated for environment management must conduct review and evaluate reports from project proponent every 6 months. In practice, not all of the projects are evaluated and monitored by the institution. It is due to the limited number of personnel as there is lack of capacity of the available personal. This in turn causes weak supervision of AMDAL…"*

At least three important aspects are marked upon the respondents answers as follows;

- Limitation in manpower and financing

  There are numerous numbers of project as the economy expands while capacity of the agency is limited. Therefore not all of the projects gain as much supervision as they have to. For example, Ministry of Environment has to deal with all projects throughout Indonesia comprising all development sectors so as BPLHD DKI Jakarta with numerous projects in Jakarta. As mentioned earlier, the Ministry and BPLHD with limited manpower and financing have to choose from many projects the ones that need priority for supervision and direct observation.

- Poor coordination between stakeholders/agencies

  Better coordination is needed particularly between local and national institutions as well as between planning agencies and environmental sector agencies.

  Better coordination is also required in term of internal relationship of a government institution or agency. An example is the Ministry of Public Works which is the base organization for infrastructure development. Under the Ministry are two main organization deals with road sector, (i) Directorate General of Highways in charge for policy and planning, and (ii) BPJT as toll road regulator in charge for management of toll road private provision. Currently there is still distortion in role sharing between the two and still evolving coordination synergies. In order to best function in term of supervising and monitoring the environment management, the two organizations should establish clear line of the role sharing and better coordination.

  Furthermore, with well managed and close coordination, limitation in manpower and financing can be compensated with more effective and efficient supervision.

- Optimizing community participation on supervision

  According to Law No. 23/1997, institution authorized in punishment (sanction) is Governor (possible to be transferred to Bupati/Walikota). The sanction is based on the recommendation made by Bapedalda, BPLHD/Dinas LH who conduct the supervision and or report and complain from the community. Governor/Walikota/Bupati has the authority to force the operator to stop, prevent or manage the impact of its operation. Some disobedience may be resulted in cancellation of project license.

6.4.2 Absence of Post Operation Monitoring

Monitoring is required to evaluate the following (i) level of success of failure of environmental management measures, (ii) consequent benefit or losses of the implementation, and (iii) subsequently to reorient the management plan. Monitoring in AMDAL for toll road is aimed at supervising whether the environmental implementation complies to the development plan. Here again, the management and its outcome is benchmarked from the RKL and RPL of AMDAL which prepared based on impact prediction. Changes on physical condition of an area and social changes may require adjustment within environmental management and mitigation plans.

One element that is important but little if not any implemented is post project monitoring. In Indonesia, currently there is no regulation or procedure on post project monitoring. Monitoring is regulated only in the two phases while attention on the later part is rather neglected.

Modak and Biswas (1999) stated that EIA procedures should include review or audit for completed projects to evaluate the predictions and recommendations made compared to the actual situation. It is important not only for the projects efficiency itself also as an input for EIA development in general.

Post operation monitoring for AMDAL can also be done by survey and surveillance procedures which will help to gain optimum benefit of the environmental management objectives. Furthermore, description of monitoring assessment procedures as stated by Modak and Biswas (1999) is shown in Table 18.

Table 18. Supervision and monitoring for EIA

Operation	Definitions
Monitoring	Long term, standardized measurement, observation, evaluation, and reporting a part of the environment in order to define status and trends
Survey	A finite duration, intensive program to measure, evaluate, and report the quality of part of the environment for a specific purpose
Surveillance	Continuous, specific measurement, observation, and reporting for the purpose of environmental management and operational activities

Source: Modak and Biswas, 1999

6.5 Toll Road in Sustainability Perspectives

Sustainability is made up of three interrelated system which include broad dimension of ecological, economical and socio-cultural system. Each component is considered in such an equilibrium to produce the maximum benefit for the people, however the very core objective of development is the well being of the people (those of today and the future).

Looking at the three systems and JIUT performance at such, the following is concluded:

In term of economic efficiency, JIUT increases the economic efficiency of transportation. Firstly, it reduces traffic costs of road users by lower vehicle operational cost. Secondly, private entities are free to enter and participate in the development hence increases market competition. Moreover, toll road brings multiplier effect for the economy by improved mobility thus enabling people to travel timely and increase productivity. As stated respondent, *"..in Jakarta experience, we have seen a rapid growth along Jagorawi, Jakarta-Cikampek and JIUT corridor. Areas that previously unfeasible for growth become developed enabled by the available accessibility. An example of JIUT direct impact is the rapid development of Kelapa Gading area.."* Such growth however is derived from the whole urban road network as a system with toll road as a part of it. The road system forms spatial structure by creating demand. New development areas are built as private sector's responsiveness to develop new business opportunities.

In term of environmental stability, improvement on transport system by improving quality of services in turn may have a beneficial impact on the environment for example by reducing fuel consumption and air pollution (World Bank, 2007). However, in Jakarta environment indicators are still poor and falling behind developed countries. Improvement in transportation system by toll road development has not yet resulted in improved environmental parameter towards environmental sustainability. Policy measures have very little concern on environmental aspect as well.

In term of social and distributional sustainability, toll road development contributes by means of improved distribution of resources and accessibility for people to their work place and other activities. It also enables growth other undeveloped areas as marked in adjacent cities outside Jakarta. Development of toll road towards social equity also comes across when the Government saves up the budget for infrastructure, by toll road private financing, and allocates it on other more needed sector, such as education. Problem rise when the toll tariff increase and the public protests particularly from low income households.

A sustainable transport strategy incorporates comprehensive and well balanced measures to address the three objectives (Schwaab and Tillman, 2001); the finding results show that toll road development's emphasis in Jakarta is very much put on the economic goals and less in the social goals while very little on the environmental goals.

Chapter 7. Conclusion and Recommendation

7.1 Conclusion

Road pricing involves charging road users directly for driving on particular road or in a particular area. JIUT as a toll road, by definition, is an implementation of road pricing where road users must pay a certain tariff (toll) to enter a toll road section. The aim of this study is to analyze the environmental management of Jakarta Intra Urban Toll Road, as a form of road pricing mechanism, and its contribution to sustainable transport.

Table 19. Comparing road pricing objectives

Revenue Generation	Congestion Management
- Generate funds - Rates set to maximize revenues or recover specific costs - Revenue often dedicated to roadway projects - Shifts to other routes and modes not desired (because this reduces revenues)	- Reduces peak-period vehicle traffic - Is a travel demand management strategy - Revenue not dedicated to roadway projects - Requires variable rates (higher during congested periods) - Travel shifts to other modes and times considered desirable

Source: VTPI, 2007

There is a strong characteristic of toll road in Jakarta (as well as other toll roads in Indonesia in general); revenue generation as the main objective. Road users pay toll to *buy* "comfortability" and "time" in less congested road with higher travel speed on toll road compared to non toll road. Toll collected by the private operator is a compensation for their investment. In a broader scheme, it is a win-win situation for all; the private gets profit, road users gets better transport service and the government can allocate their limited budget to most needed sectors (such as education). Less congestion on toll road also means less emission and positive contribution to the environment.

However, toll road may also cause traffic to shift routes, increasing traffic congestion on other roads so congestion is not at all reduced but transferred from one roadway to another. During peak hours, many alternative roadways suffer from severe congestion caused by the shifted traffic. Consequently, toll road has not been able to significantly contribute to sustainable transport in Jakarta.

Three indicators are used to measure transport sustainability in Jakarta, namely (i) traffic risk level, (ii) air pollution, and (iii) level of congestion. It is difficult to quantitatively measure JIUT impacts to the environment and how it contributes to sustainability due to the complexity of the interrelated transport system and lack of available data. This is something that is lacking in Jakarta, a good data base system and archival organization to enable environmental impact measurements of toll road and other development projects.

Empirical part of this study was aimed at analyzing the actual implementation of environmental management in toll road in accordance to the planned development. Based on findings the following can be drawn as conclusions:

1. Role of environment in the development; lack of environmental interest within toll road development policy.

   Toll road development in Indonesia was initiated with main objectives as follows; to alleviate congestion, increase travel comfortability and support economic growth. Jakarta

Intra Urban Toll Road was developed with great concern on the severe transportation condition in Jakarta and the rapid growth of Jabodetabek metropolitan area which demanded for more road infrastructure supply. With such background, environmental concern is not the main theme within the development and very little emphasized in the policy of toll road development.

Toll road as road pricing implementation in Jakarta is not part of travel demand management measures and not yet succeeded to encourage road users to convert to public transport.

Having said that, environment is still an important issue and it is addressed in toll road development phases by obligation of AMDAL. However, attention to environment is only limited to AMDAL and is missing during the following phases; (i) network master plan, (ii) investment tender, and (iii) post-operation. Emphasis on the environment is very much centered on AMDAL and there are no further instruments or policy measures to direct the development towards sustainability. Concerning its vital rote, still some issues remain with AMDAL including its quality and the control mechanism.

2. Crucial role of AMDAL is not supported with high quality of AMDAL and its integration with engineering and economic planning.

   AMDAL in planning process should be managed so it provides decision makers information at every stage of the project planning cycle (Modak and Biswas, 1999). In Indonesia AMDAL in planning process is conducted mostly sequential (AMDAL conducted after engineering/economic planning) rather than concurrent (AMDAL conducted concurrently with engineering/economic planning with continuous coordination between the two) or integrated (AMDAL conducted integrated in the project cycle). This in turn resulted in low quality of AMDAL which makes it difficulties to apply in the technical design. Other remaining issue with AMDAL is its poor accuracy in impact prediction and mitigation and management measures. These are associated with some remaining problems as follows; (i) quality of human resources both in the ministry and private proponent, and (ii) participation of the community as effected groups.

   AMDAL for JIUT is completed while it is already on operation which might be caused by; (i) evolution of regulations on AMDAL since before JIUT construction and after its operation, (ii) institutional and organizational reformation, and (iii) government policy to put JIUT construction as priority concerning its benefit and strategic role for development.

3. Participatory development is only practiced during pre-operation of toll road (AMDAL preparation) and is neglected during toll road operation.

   Public involvement and information disclosure has been implemented during AMDAL preparation by means of the following steps; (i) public announcement of proposed project, (ii) public consultation during AMDAL scoping, (iii) community representatives in AMDAL commission for project approval, and (iv) open access of AMDAL reports for public including its RKL and RPL implementation reports as stated in the government regulation. Although community participation has been implemented (albeit in varying degrees), the outcome of these efforts have not been significant.

   Main reasons for this are poor understanding of the community on AMDAL objectives, scope and process and lack of understanding and awareness of the community on environment issues. There is also still evolving democratic process and institution factor which hinders the process of active community by the public. Furthermore, limited accessibility to environmental documents and data bases causes low level of participation during toll road operation which in turn resulted in poor supervision and monitoring mechanism.

4. Supervision and monitoring suffers from lack of enforcement, manpower and financial resources and the absence of post operation monitoring.

   There are two control mechanisms involved in toll road; contractual agreement between toll road operator and the government (BPJT) and AMDAL implementation monitoring by designated environmental agencies. At least three aspects are marked upon the control mechanism. Firstly is limitation in manpower and financing in both the governmental institutions as well as in the private sector. There is not enough staffs in the Ministry to deal with loads of project while from the available staffs, those who has sufficient knowledge and experience with environmental management is also still limited in number. Secondly, the reason for lack of enforcement is poor coordination between stakeholders/agencies. This is due to the still evolving and restructuring institutional in most of the government organizations. Thirdly, is public lack of accessibility for environmental documents and supervision reports. This reduces the opportunity for public to actively involve in the supervision to compensate the lack of this action from the government.

   There is also a growing need for post-operation monitoring to evaluate the overall outcome of the project and the environmental management implementation effectiveness. Post operation monitoring enables the government and the private operator to evaluate accuracy and efficiency of the predictions and recommendations previously made during AMDAL preparation compared to the actual situation. This is in turn will be an important input to improve the project efficiency and AMDAL application in the development.

7.2 Recommendation

This study focuses on the sustainability aspect of toll road development comprising three angles of development namely economic, social and environmental aspect. It shows that toll road development is very much concentrated on the economic aspect and not too much on the environment and social aspects. It is an undeniable fact that toll roads in Jakarta have brought upon positive impact to the economy and regional growth. In term of economic efficiency, JIUT increases the economic efficiency of transportation. However, the positive impacts on the environmental and social are less or very little. Therefore, in order to achieve its optimal benefit, toll roads in Jakarta should be implemented in a more balanced synergy between the three aspects.

Regarding the remaining problems previously discussed, some recommendations can be drawn aimed at a more conducive and environmentally sound implementation in the future.

Policy and planning

More attention should be given to environmental aspect. The present condition of putting all the environment concern on AMDAL has not proven to be optimally contributes to sustainable development. While the quality of AMDAL itself still draws much doubt from practitioners and public at large, its implementation is still lacking of supervision and monitoring.

Attention to environment should be comprehensively included during the whole development process, not only limited to feasibility study, construction and operation. Room for environmental intervention is still available during the pre-construction, particularly in tender decision and evaluation for example by including environmental management certification for private entities which are interested to participate in the tender. This will increase environmental awareness of the private entities.

Implementation

Better AMDAL quality can be achieved by improving human capacity in the government and in the private proponent (e.g. consultants certification) and optimizing public participation during AMDAL scoping.

Community participation is crucial in shaping effective environmental management measures of the project. Enhancing community participation must be initiated by educating the community so they can have a better understanding and knowledge towards the importance of environmental and the awareness on this issue. How to make the community realize their crucial role in the development is also very relevant. Community education can be done by environmental campaign and socialization or through education in primary school.

Crucial part of environmental management is to improve poor enforcement. The existing regulations still need some improvement to ensure the compliance of implementation including setting clarity of authority and responsibility between designated institutions involved in the supervision. The authority should be independent to make sure its objectivity on environmental interest.

It is very important to improve human capacity in government institutions since they have daily interaction and direct responsibility in supervision and monitoring measures. Capacity building and training in AMDAL are relevant for the government staff to improve their in environmental aspects particularly those in the technical departments/ministries.

Better access for information and environment documents are very relevant to improve environment supervision. It is important to gain more insight from the community since they have the right to indirectly monitor environmental performance. Regardingly, improving or establishing better archival and data bases are also very relevant.

Further recommendation on a larger scale is it is already becoming urgent to promote sustainability of urban transport in Jakarta by integrated measures of road pricing (toll road) and other sound environmental policies. Potential contribution of toll road (good road condition, higher travel speed and less emission) has not yet reached optimal benefit and will be much more significant with travel demand management measures and public transportation improvement.

7.3 Direction for Future Research

Poor enforcement has been concluded to be the main pitfall of environment management in toll road sector in Indonesia. Opportunities of research are open to explore how to establish better enforcement system. Researcher would also recommend a future research in opportunities to apply road pricing as travel demand management in Jakarta.

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Institute for Global Environmental Strategy (www.iges.or.jp)

Annex 1 List of Key Respondents

No.	Name	Position	Organizations
Government			
1.	Herry TZ	Head of Sub Directorate: Toll Road and Highways Development	DG Highways
2.	Max Antameng	Head of Sub Directorate: General Planning	DG Highways
3.	Subaiha Kipli	Head of Section: Sub Directorate Environmental Engineering	DG Highways
4.	Nurmala	Head of Section: Sub Directorate Environmental Engineering	DG Highways
5.	Widayani	Environment & Technical Assistant, Field Project	DG Highways
6.	Abram Barus	Head of Study Division	BPJT
7.	Lies Harni	Head of Section AMDAL	Ministry of Environment
Private			
8.	Truly Nawangsasi	Head of Environment Department	PT Jasa Marga
Practitioners/NGO			
9.	Lilik Wachid Budi Susilo	Senior Staff	PUSTRAL (Study and Research Center for Transportation)
10.	Richard Napitupulu	Toll Road Design Consultant	PT Cipta Strada (Engineering Consultant)
11.	Oktaviatun	Environmental Consultant	Freelancer
12.	Wikanti Ristya Dewi	Environmental Consultant	Freelancer

Annex 2 Interview Questions

A. For institutions authorized in toll road development (policy and planning)

Background of the interviewee

Name	:
Phone & address	:
Organization	: DG of Highways (Ministry of Public Works)
Position in the organization	:
Date and time of interview	:

1. What was the background of toll road development (process, rationale, aim and objectives)?
2. Due to changes in politics and institutional matters, has the policy and regulations in toll road sector have been changed or revoked over time? What was the background and objectives of the adjustments?
3. Please indicate and describe about the environment emphasis stated in the regulation in the following steps of toll road development:
   - Programming phase (network development and master plan)
   - Planning phase (pre feasibility & feasibility study, technical design)
   - Project appraisal (tender investment, decision on tender)
   - Operational phase (supervision and monitoring)
   - Post operation (asset valuation)
4. Does the planning of toll road network involve other institution?
5. Is there any coordination between the Ministries authorized in infrastructure, transportation and environment sectors in managing toll road and if yes what kind of coordination?
6. Has toll road development been a part of a travel demand management and if so how is the integration mechanism implemented?
7. In what ways has toll road development contribute to a sustainable urban transport?
8. Has toll road development influence the demand for traffic?
9. Has toll road development influence urban air quality and if so in what way?
10. Has the toll road development influence the traffic risk level?
11. How to measure the sustainability sustainable transportation scheme? Has the toll road development considered so?
12. What are the barriers and remaining problems in the implementation?
13. In what ways has the implementation of toll road development can be improved towards sustainability in term of the following aspects?
    - Regulatory / policy framework
    - Organizational / institutional framework
    - Coordination between stakeholders
    - Human resources
    - Financing
    - Information (public reports and documents)
    - Community participation

B. For institutions authorized in private partnership in toll road (partnership framework and appraisal)

Background of the interviewee

Name :
Phone & address :
Organization : BPJT (Toll Road Regulatory Body)
Position in the organization :
Date and time of interview :

1. What was the background of private participation in toll road development (process, rationale, aim and objectives)?
2. Due to changes in politics and institutional matters, has the policy and regulations have been changed or revoked over time? What was the background and objectives of the adjustments?
3. Regarding environmental sustainability, is there any preference in the decision of tender for toll road provision?
4. How does the government supervise the private sector during the following?
   - Construction phase
   - Operation and maintenance phase
   - Post operation and handing over to government (asset evaluation) phase
5. How to determine the obligation of the private sector in environment mitigation and management?
6. Is there any standard or guideline for environmental mitigation and management in the concession agreement?
7. How does the government supervise the environment management conducted by the private sector?
8. Is there any other institution involved in the monitoring and supervision process?
9. Does the monitoring and supervision of the private sector involve the community participation?
10. What are the roles of the private sector in toll road management to contribute to sustainable transport?
11. What are the barriers and remaining problems in the implementation?
12. In what ways has the implementation of toll road development can be improved towards sustainability in term of the following aspects?
    - Regulatory / policy framework
    - Organizational / institutional framework
    - Coordination between stakeholders
    - Human resources
    - Financing
    - Information (public reports and documents)
    - Community participation

C. For institutions authorized in environment management (regulation and implementation)

Background of the interviewee

Name :
Phone & address :
Organization : Ministry of Environment
Position in the organization :
Date and time of interview :

1. Is there any requirement of environmental standards in the planning & program setting of toll road?
2. How is the environmental requirement implemented in evaluating the feasibility of a project?
3. Is there any other institution involved in evaluating environmental feasibility of a project?
4. How does the government facilitate community involvement in the evaluation?
5. After evaluating and appraising a project, how does the government monitor and supervise the environment management?
6. How does the government facilitate community involvement in the monitoring and supervision?
7. How does the toll road development influence the urban environment qualities?
8. What are the barriers and remaining problems in the implementation?
9. In what ways has the implementation of toll road development can be improved towards sustainability in term of the following aspects?
   - Regulatory / policy framework
   - Organizational / institutional framework
   - Coordination between stakeholders
   - Human resources
   - Financing
   - Information (public reports and documents)
   - Community participation

D. For toll road operator (private sector)

Background of the interviewee

Name	:
Phone & address	:
Organization	: PT Jasa Marga (Persero)
Position in the organization	:
Date and time of interview	:

1. Is there any standard or guideline in environmental management in toll road sector?
2. What are the obligations of the private operator in environmental management during the following phases; (i) construction, (ii) operation and maintenance, and (iii) post operation?
3. How does the government supervise the toll road environmental management during the above phases?
4. How does the private operator facilitate community participation in the supervision?
5. What are the remaining problems in toll road environmental management?
6. Has the Jakarta Intra Urban Toll Road influenced the demand for traffic?
7. Has the Jakarta Intra Urban Toll Road influenced the urban air quality?
8. Has the Jakarta Intra Urban Toll Road influenced the urban traffic risk level?
9. In what ways the environmental management of toll road can be improved in term of the following aspects:
   - Regulatory / policy framework
   - Organizational / institutional framework
   - Coordination between stakeholders
   - Human resources
   - Financing
   - Information (public reports and documents)
   - Community participation

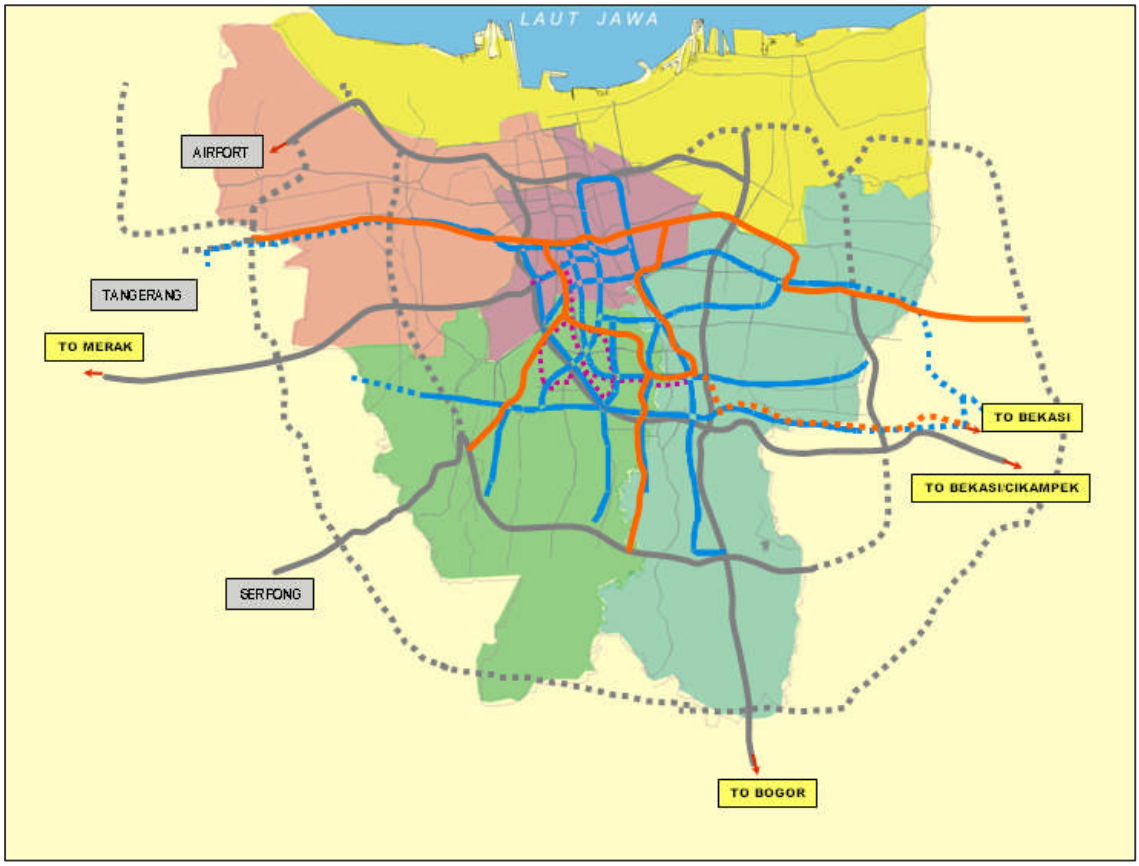
E. For Non Government Organization and practitioners in toll road development

Background of the interviewee

Name :
Phone & address :
Organization :
Position in the organization :
Date and time of interview :

1. In what ways has toll road development contribute to a sustainable urban transport?
2. Has toll road development influence the demand for traffic?
3. Has toll road development influence urban air quality and if so in what way?
4. Has the toll road development influence the traffic risk level?
5. How to measure the sustainability sustainable transportation scheme? Has the toll road development considered so?
6. What are the remaining problems in toll road environmental management supervision during the following phases: (i) construction, (ii) operation and maintenance, and (iii) post operation?
7. In what ways have the community participate in the following phases of toll road development?
   a. Policy and planning (toll road network setting and programming)
   b. Preparation phase (project evaluation)
   c. Construction and operation (supervision and monitoring by the community)
8. In what ways the environmental management of toll road can be improved in term of the following aspects:
   - Regulatory / policy framework
   - Organizational / institutional framework
   - Coordination between stakeholders
   - Human resources
   - Financing
   - Information (public reports and documents)
   - Community participation

Annex 3 Jakarta Transportation Network



NOTE

= OPERATIONAL TOLL ROAD

= TOLL ROAD IN CONSTRUCTION

= PROPOSED TOLL ROAD

= BUSWAY

= PROPOSED MONORAIL

Annex 4 Operational Toll Roads in Indonesia

No	Section	Length (Km)		Operator	Open to traffic
		Main	Access		
1	Jakarta-Bogor-Ciawi	50.00	9.00	PT Jasa Marga	1978
2	Jakarta-Tangerang	27.00	6.00	PT Jasa Marga	1983-1998
3	Surabaya-Gempol	43.00	6.00	PT Jasa Marga	1984
4	Jakarta-Cikampek	72.00	11.00	PT Jasa Marga	1985
5	Padalarang-Cileunyi	35.63	28.77	PT Jasa Marga	1986
6	Prof. Dr. Sedyatmo	14.30		PT Jasa Marga	1986
7	Jakarta Intra Urban Toll Road	23.55		PT Jasa Marga	1988
8	Belmera	33.70	9.00	PT Jasa Marga	1989-1996
9	Semarang Section A, B, C	24.75		PT Jasa Marga	2003
10	Ulujami-Pondok Aren	5.55		PT Jasa Marga	2003
11	Cirebon-Palimanan	26.30		PT Jasa Marga	1990
12	JORR W2 South (Pondok Pinang-Veteran)	16.77		PT Jasa Marga	1991
	JORR E1 South (Taman Mini-Hankam Raya)			PT Jasa Marga	1998
	JORR E2 (Cikunir-Cakung)			PT Jasa Marga	2001-2003
13	Cikampek-Padalarang I	17.50		PT Jasa Marga	2003-2004
14	Tangerang-Merak	73.00		PT Marga Manggalasakti	1983-1996
15	Ir. Wiyoto Wiyono, MSc	15.50		PT Citra Marga Nusaphala Persada	1990
16	Surabaya-Gresik	20.70		PT Margabumi Matraraya	1993-1996
17	JORR South (Pondok Pinang-Taman Mini	14.25		PT Jalan Tol Lingkar Luar Jakarta	1995-1996
18	Harbor Road	11.55		PT Citra Marga Nusaphala Persada	1995-1996
19	Ujung Pandang Section I	6.05		Bosawa Marga Nusantara	1998
20	Serpong-Pondok Aren	7.25		PT Bintaro Serpong Damai	1999
21	Cikampek-Padalarang II	41.00		PT Jasa Marga	2005
22	JORR E1 North Section 3	4.35		PT Jasa Marga	2005
23	JORR W2-S2 (Veteran-Ulujami)	2.50		PT Jasa Marga	2006
24	JORR E3 (Cakung-Cilincing)	3.75		PT Jasa Marga	2006
Total :		**659.72**			

Annex 5 Policy Documents on Toll Road Development and Environmental Management

I. Law

- Law No. 5 Year 1960 on Fundamental regulation on land
- Law No. 5 Year 1990 on Natural resources and ecosystem conservation
- Law No. 4 Year 1992 on Settlement and housing
- Law No. 14 Year 1992 on Road transportation and traffic
- Law No. 23 Year 1992 on Health
- Law No. 23 Year 1997 on Environmental management
- Law No. 38 Year 2004 on Road
- Law No. 7 Year 2004 on Water resources
- Law No. 32 Year 2004 on Regional government
- Law No. 26 Year 2007 on Spatial planning

II. Government Regulation (PP)

- PP No. 41 Year 1993 on Road transportation
- PP No. 43 Year 1993 on Road traffic and infrastructure
- PP No. 27 Year 1997 on AMDAL (Environmental Impact Assessment)
- PP No. 82 Year 2001 on Water quality management and water pollution monitoring
- PP No. 876 Year 2001 on Environmental Impact Assessment on health
- PP No. 15 Year 2005 on Toll road
- Minister of Environment Regulation No. 08 Year 2006 on Guideline for AMDAL preparation
- Minister of Environment Regulation No. 11 Year 2006 on Types of activities with AMDAL obligation

III. Ministerial Decree

- Minister of Transportation Decree No. 63 Year 1993 on Threshold requirement for vehicle
- Minister of Transportation Decree No. 67 Year 1993 on Guideline for monitoring and proper test for vehicle on road
- Minister of Transportation Decree No. 69 Year 1993 on Freight regulation
- Minister of Environment Decree No. KEP-48/MENLH/1/96 on Noise level limit
- Minister of Environment Decree No. KEP-49/MENLH/1/96 on Vibration level limit
- Minister of Environment Decree No. KEP-50/MENLH/1/96 on Odour level limit
- Head of Bapedal Decree No. 056 Year 1994 on Guideline for Impact measurement
- Head of Bapedal Decree No. 229/Bapedal/II/1996 on Guideline for social aspect assessment in AMDAL
- Head of Bapedal Decree No. 124/12/1997 on Guideline for community health assessment in AMDAL
- Minister of Environment Decree No. Kep-02/MENKLH/I/1998 on Guideline for environmental threshold standard
- Head of Bapedal Decree No. 08/2000 on Community participation and information disclosure in AMDAL
- Minister of Environment Decree No. 45 Year 2005 on Guideline for RKL and RPL preparation
- Minister of Transportation Decree No. 14 Year 2006 on Traffic management and engineering

Annex 6 Summary of Case Studies (Urban Transport Management in South East Asian Cities)

Description	Singapore	Bangkok	Ho Chi Minh City
Transportation profile	- Number of motor vehicles: 754,992 (139,434 are motorcycles) (ADB, 2006) - Private car ownership: 11.3 cars per 100 residents) (ADB, 2006) - Integrated & efficient public transportation network includes the Mass Rapid Transit (MRT) system, Light Rapid Transit (LRT) system, buses, and taxis) (ADB, 2006)	- Road transport accounts for 90% of transportation - Increase vehicle ownership, percentage of households 55% (1995) to 75% (2005) - Motor vehicle fleet 2.94 million with a growth rate of 5.5% per year (ADB, 2005) - Increasing role of MRT - Heavy road congestion	- Growing traffic demand: increase in number of vehicles 137,000 (2001) to 245,000 (2004) - Motorcycle as the primary transport mode (60-65% of vehicular trips) - Automobiles account for less than 5% - Growth in motorcycle ownership: 14-15% per year (2001-2005) - Low quality and poor infrastructure for public transportation
Policy on transport management being applied	Travel demand management by means of: - Road pricing (ALS & ERP) - Fiscal measures (vehicle ownership control) - Effective and reliable public transport - Integration between transport and spatial planning	Supply side management focused on: - Improvement public transportation (mass rapid transit) - Infrastructure development (public transport, expressway)	Supply side management focused on: - Infrastructure development (expressway)
Environment aspects	Major air pollutant concentrations within the limits of WHO and USEPA	Air pollution remains problem particularly related to traffic congestion issues	Air pollution remains problem (motorcycle accounts for 70% CO, 93% HC and 92% VOC urban emission)

Public private partnership	Strong privatization	Increase participation of private sector particularly in infrastructure development	Limited private participation (not enough policy and regulation to facilitate PPP)
Implementation of policy	Integrated and well applied policies supported by strong enforcement → success of policy measures	Less integrated transport policies and planning → some fragmentation in policy implementation	Limited sufficiency on policy and regulation, more fragmented implementation → some policies have been set only to experience poor implementation or have not borne much fruit
Remaining problem & challenges	Challenges due to improved welfare and increase economic leads to growing need of transportation.	- Population growth: growing land use and urban sprawl - Increasing travel demand and vehicle ownership - Growing needs for public transportation - Traffic congestion remains a major problem - Poor urban air quality	- Increasing travel demand and vehicle ownership - Lack of traffic management culture: institutional and regulatory issues - Enhancement of private participation in infrastructure development - Poor urban air quality
Lessons learned	Key success: - Comprehensive and integrated policy made possible by single tier of government and strong enforcement - Good governance (trust, legitimacy and transparency) - Technological support - Public investment on infrastructure, public transport	Barriers in implementation - Issue of good governance - The need for integration in policy making - The need to cope with the continuously growing population and demand for transport	Barriers in implementation: - Issue of good governance - The need for integration in policy making - Limited financing both public and private (poor regulatory framework)