ADOPTING ASSET MANAGEMENT SYSTEM FOR MANAGING ROAD ASSET'S IN INDONESIA

THESIS

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DOUBLE MASTER DEGREE PROGRAMME

DEVELOPMENT PLANNING AND INFRASTRUCTURE MANAGEMENT
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ABSTRACT

Adopting Asset Management System for Managing Road Asset's in Indonesia

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Road management in Indonesia has been evolving along with road development. Although road management improved, road condition in Indonesia has not got any better in this last decade. The complexity of problems within road management such as inadequate funds, lack of technologies, human resources constrain, out of date database, complicated decision making process in Indonesia have contributed for road condition deterioration. One of the solutions in other countries to cope with the problems is applying road asset management system into road sector.

Thus, this research was aimed to explore the road management in Indonesia and possibilities in adopting road asset management system for Indonesian road management. Narrative-descriptive analysis is developed to explain the concept of asset management system in road sector, to describe developed and developing countries experiences in applying road asset management system and to describe Indonesian road management condition. Concept of road asset management includes the actors, component and process of road asset management. Australia represents the process of asset management in developed countries, while South Africa represents the developing country. Then, by using evaluative-explanatory analysis this research evaluated those countries experiences and possibilities in Indonesian case to adopt road asset management system for future road management.

This research comprehensively describes the actors, component and process of road asset management either in Australia or South Africa. Moreover, Indonesian road management also explained based on the actors, component and possible existing characteristics of asset management. The result of this research was possibility in adopting road asset management using the window opportunity of new policy development. The end result is the formulation of several actions for pre-developing, implementation and post implementation road asset management system in Indonesia. In developing road asset management, Indonesia has to keep on reforming their legislations including reorganized road agencies. On the implementation stage, road agencies need to improve quality assurance and quality programme for road projects. Besides, IIRMS as a road management tool should be used by preserving database. Road asset management post

implementation will need to focus on the monitoring either internal or external change because the new public management of road asset management will not show direct result but a gradually improvement.

Keywords: road asset management system, road management, actors of road management, process of road asset management, Indonesia

GUIDELINE FOR USING THESIS

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PREFACE

Indonesian road management has been evolving since 1980. Nonetheless, Indonesian road condition is not getting any better. In the late 20010, government of Indonesia tried to use multi-years budgeting process with the medium term expenditure program. Directorate general of highways as the road manager in national roads takes this opportunity to bring road management into next step. Asset management system as a well integrated management for asset could be an answer in road management for Indonesia. Thus, this research tries to understand road management in Indonesian and the possibilities in adopting road asset management system for Indonesia.

I have a special attention in road planning. I have been working in Indonesian Directorate general of highways and experienced myself how the road planning happened in Indonesia. Dealing with road planning annually realizes me that the practice of road planning could be better. It seems to me that there are several "things" should be overcome in pursuing the ideal road management. Those curiosities motivate me to do this research and I find several answers that can be found in this thesis.

I realize that it is impossible to write this thesis without any supports. First of all I would like to express my greatest gratitude to Jesus Christ. Secondly I would like to express my great appreciation of tireless and willingness of S. Lenferink, MSc and Ir. Miming Miharja, MSc.Eng.,Ph.D who always encourage me and kept my thesis on the right track. I would also say my big appreciation to my family in Indonesia, especially my beloved mother, my lovely wife Elida Veronica Ginting and my dear daughter Vany Austin Gultom who always support and believe that I can finish this study. I owe a special debt of gratitude to Bappenas, NESO and Ministry of Public works that have granted me the scholarship and an opportunity to study in ITB-RUG. My great thankfulness also goes to my colleagues of DD ITB 2009 who always be supporting partners and friends. Finally I would like to express my thanks to all the people who have supported me in this study. It is impossible to acknowledge all of them.

Simon Austin Gultom
Groningen
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ABBREVIATIONS

ATC = Australian Transport Council

Austroad = Association of Australian and New Zealand Road Transport and Traffic Authorities

BITRE = Australian Bureau of Infrastructure, Transport and Regional Economics

DGH = Indonesian Directorate General of Highway

DPW = South Africa Department of Public Works

FHWA = Road administration in US/Federal Highway Administration

IIRMS = Integrated Indonesian Road Management System

KPI = Key Performance Indicator

MPW = Indonesian Ministry of Public Works

MTE = Medium term expenditure

MTEF = Medium Term Expenditure Frameworks

MUSRENBANG = Public Dialog for Development Plan

nDoT = South Africa National Department of Transportation

NTC = National Transport Commission

OECD = Organization for Economic Co-operation and Development

PBB = Performance-Based Budgeting

PBC = Performance-Based Contract

PDCA = Plan-Do-Check- Act

PIARC = Permanent International Association of Road Congresses/World Road Association

SANRAL = South African National Roads Agency Limited

SARF = South Africa Road Federation

SCOT = Australian Standing Committee on Transport

TQM = Total Quality Management

VicRoads = Victoria Road Authorities

Chapter I Introduction

I.1 Background

Since the early stage of five years development plan in the late 1960s, Indonesia government has built enormous road networks. More than 250 thousand Km of road has been constructed over the last 40 years (see table I.1). The Indonesian road network is predominately government-owned. Commencing in the early 1980s, road management introduced to assist Indonesian government in the planning, design and implementation of road improvement and maintenance work. The development of road management systems in Indonesia are intended to assist managers which are highway agencies for improving and preserving road infrastructure. Namely Integrated Indonesian road management system, Inter-urban bridge management system, Kabupaten/Regency road management system and Urban road management system have been introduced for road management in Indonesia.

Table I.1 Road Lengths in Indonesia

Roads (Km)	Year	
	1968[a]	2008[b]
National	9,780.00	34,628.80
Province	21,116.00	50,044.00
Regency	48,717.00	245,253.00
City	2,314.00	23,469.00
Toll	-	772.00
Total	**81,927.00**	**354,166.80**

Source: a. Ministry of Public Works, 2003
b. IndII, 2010

Road management in Indonesia also has made a progress by delivering provincial, regency and city roads management to local government. The law 13/1980 (Government of Indonesia, 1980) on road is revised by the law 38/2004 (Government of Indonesia, 2004) which regulates the redistribution of authority and responsibility on road management to local government. Despite the redistribution of authority and responsibility, national road which is tackled by Ministry of Public works still need more attentions. Although there is an improvement of good condition from 81.6% in 2006 to 83.23% in 2008, the

national road conditions has not yet returned to 87% as in 2000 (Ministry of Public works, 2011).

The complexity of problems within road management in road agencies such as inadequate funds, lack of technologies, human resources constrain, ineligible materials and defect equipments, invalid data, complicated decision making process in Indonesia have contributed for deteriorating in road condition. Moreover, society as user expected the improvement of road service. Therefore, the concept of asset management within roads sector is one of the emerging tools to cope with those problems.

Organization for Economic Co-operation and Development (OECD) defined asset management in road sector as (OECD 2001):

> " a systematic process of maintaining, upgrading, and operating assets, combining engineering principles with sound business practice and economic rationale, and providing tools to facilitate a more organized and flexible approach to making the decision necessary to achieve the public's expectations"

One of the important points of asset management is the integration in which all the individual systems could collaborate. Without neglecting existing systems, there is an opportunity to adopt asset management for road maintenance in Indonesia. According to OECD benefits for implementing asset management in road are improved communication (both internal and external organization); up to date asset inventory, a better condition and level of use; increased road network performance; efficiency in budget process; and staff development (OECD, 2001). In practice, we can see performance based contract (one of the asset management process) for road maintenance actually could save significant budget. Pakkala (2005) identified about 10-40% cost savings for Australia under performance based contract rather than conventional contract. Other countries that have enacted performance based also gain minimum 10% cost savings such as England, New Zealand, and USA (Pakkala, 2005).

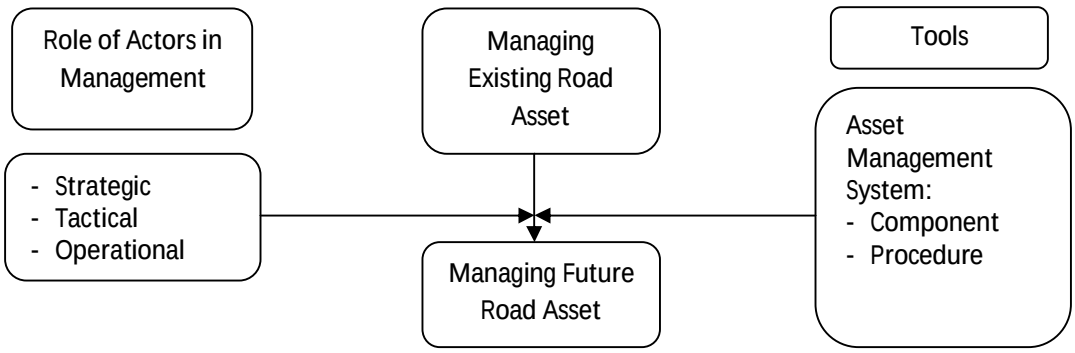
I.2 Problem Statement and Research Objective

It is indicated that inadequate funds, lack of technologies, human resources constrain, ineligible materials and defect equipments, invalid data, and

complicated decision making processes contributed to road deterioration and ineffectiveness of the road management system today in Indonesia. Considering managing road asset as integrating physical and non-physical aspects of a road, this research tries to explore how the road management in Indonesia is practiced and how asset management could be implemented in Indonesian road management.

To secure the best performance of roads as an asset, road management concept appears to be an answered. In overseas Road Note 15 (TRL, 1998), road management is defined as "(the) process of maintaining and improving the existing road network to enable its continued use by traffic efficiently and safely, normally in a manner that is effective and environmentally sensitive; a process that is attempting to optimize the overall of the road network over time". Therefore we can say that road management aims to enable the network to withstand the damage, to prevent and to ensure continuous traffic (TRL, 1998). Road management encompasses management process from planning, programming, preparation and operations.

Figure I.1 Asset management and Actors for future Road Management



This research is aimed to understand the practices of managing roads in Indonesia and the possibilities to adopt asset management system for the future of road asset in Indonesia. More specifically, road management will be drawn in the national level, in which the national road network has a major role in facilitating social needs and economic activities between regions. The research is expected to give feed-back to the government officials, planners and non-government

organizations that concern on the development planning for road management. To reach the objective, the research questions that will be tackled are:

- *What is the development processes in managing road asset historically? What are the components, process and benefits for applying asset management? What is the framework of asset management in road sector?*

  The history of how to manage road assets will be drawn. The description of component and procedure for road management will be delivered properly based on literature. Moreover theoretical review from international literature related to asset management in road development will be described. In global practices, we will see the framework of asset management implemented.

- *What are the current practices of road asset management in developed and developing countries?*

  Road asset management in developed and developing countries will be analyzed and summarized. The context of Australia (Victoria) and South Africa countries will also be included.

- *How is the road management in Indonesia being implemented especially in the national level? Who are the decision makers in the road sectors for Indonesia?*

  To answer this question we will identify the implementation of national road management that already exists in Indonesia. Moreover, we will see the actors in decision making for Indonesian road management. Road management in Indonesia cannot be separated with the context; therefore we will give a brief explanation about Indonesian context related to road management.

- *How could road asset management system implemented in Indonesia? What are the strategies and resistors factors in Indonesian context?*

  Knowing the opportunity and thread of existing road management in Indonesia and lesson learned from countries which have been enacted road asset management will be a benefit for implementing road asset management pattern in Indonesia. Of course, context is very important in adopting a scheme of road asset management for Indonesia.

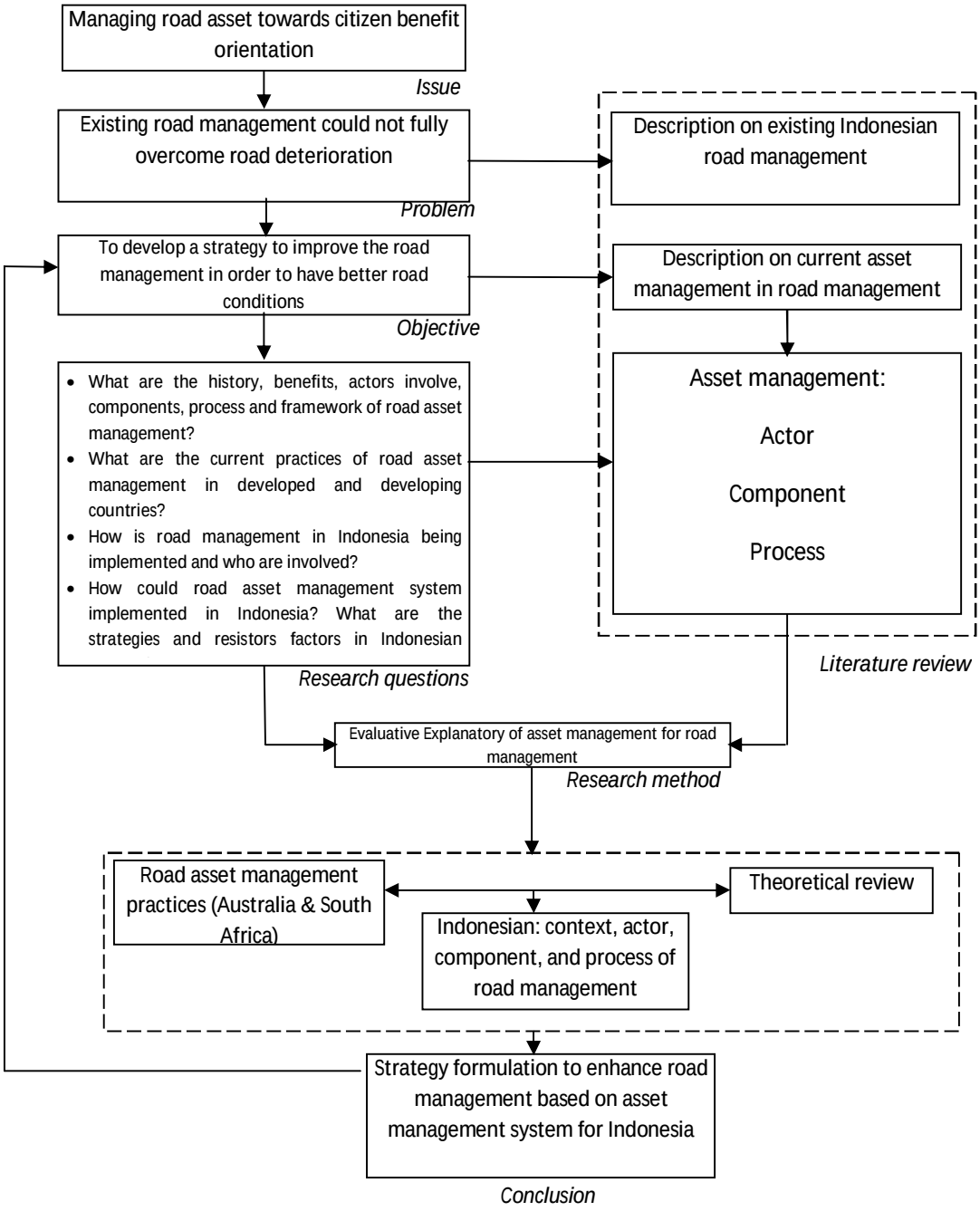
I.3 Research Methodology

This research method will be in narrative-descriptive and evaluative-explanatory method. The method will be applied mainly document analysis and literature review. Documents that describe the road management and decision making process in road management for Indonesia will analyze thoroughly. This research will also draw a lesson in general about asset management practices in developed and developing countries especially in national roads. Developed country (Australia) is chosen because their asset management has been implemented for several years. Australian case will be represented by Victoria State because every state in Australia enacted road asset management based on the Australian road asset management guidelines, by choosing one of the states could represent Australian practice in Australian road asset management case. Therefore, Victoria could represent the road asset management in national roads as national roads are managed by each state authority in Australia.

While developing country (South Africa) is selected for lesson learned in asset management because a quick scan revealed that their road status and funding management is mostly the same with Indonesia. South Africa and Indonesia divide their roads into National roads, Provincial roads, and Regency/City roads. In the budget management, both South Africa and Indonesia use budget grant to the provincial and city authorities'. Availability of literature is also one of the considerations to choose the countries.

Narrative-descriptive method is used to draw the concept of asset management in road, asset management practices and condition of Indonesian road management. Evaluative-explanatory method used to draw the prospect of road asset management in Indonesia and its possibilities to adopt from other countries.

Figure I.2 Research framework



Data

The scope of study can be divided into two aspects. First is the area of study and the second is the substance. This research takes Indonesia as the area of study. It will use secondary data including legislations. Legislation in road management will also be part of the consideration in adopting international practices of road asset management. The substance of this research is directed to possibilities in adopting asset management in road management for Indonesia. Australia and South Africa used in this research for those countries has moved to asset management system in road management. Asset management practice in those countries (Australia and South Africa) will be analyzed along with literature of asset management principles. Possibilities to adopt asset management will be explained in evaluative explanatory.

This research will collect data from road sector institution as well as planning agency. Data will be represented by documents in the road agencies as well as other resources. Document will show how road management has been done and type of management used to gain objective. Evaluative-explanatory analysis employ for opportunities to implement in asset management system of road management.

Table I.2 Data requirement

Objective	To develop strategies to improve the road management in order to have better road conditions
Data	Asset Management system: - Asset Management for road in practices (Australia and South Africa) - Context of Australia, South Africa and Indonesia - Road Management Planning (Plan) - Road Management Implementing (Do) - Road Management Reviewing (Check) - Road Management Improving (Act) - Decision makers

I.4 Structure of Report

This thesis will be delivered in 6 chapters (including this chapter) which are:

Chapter II Asset management principles and framework

The concept of asset management will describe in this chapter based on literature review. We will draw concept of asset management from the components and

process in road management that we can have a comprehensive history of road management. Benefits for applying asset management in road management and the framework of asset management in the road development will be delivered.

Chapter III International practices of road asset management

This chapter will describe the road asset management in the international practices from developed and developing countries. Each of countries has a different context and been applying road asset management to cope with road management problems. Therefore the context will also be described. The discussion is based on the secondary data, legislation and literature.

Chapter IV Current practices in Indonesia: Road management

This chapter explains the current conditions of road management in Indonesia. Decision making process in the road management also explains in this chapter. The discussion is based on the secondary data, legislation and literature.

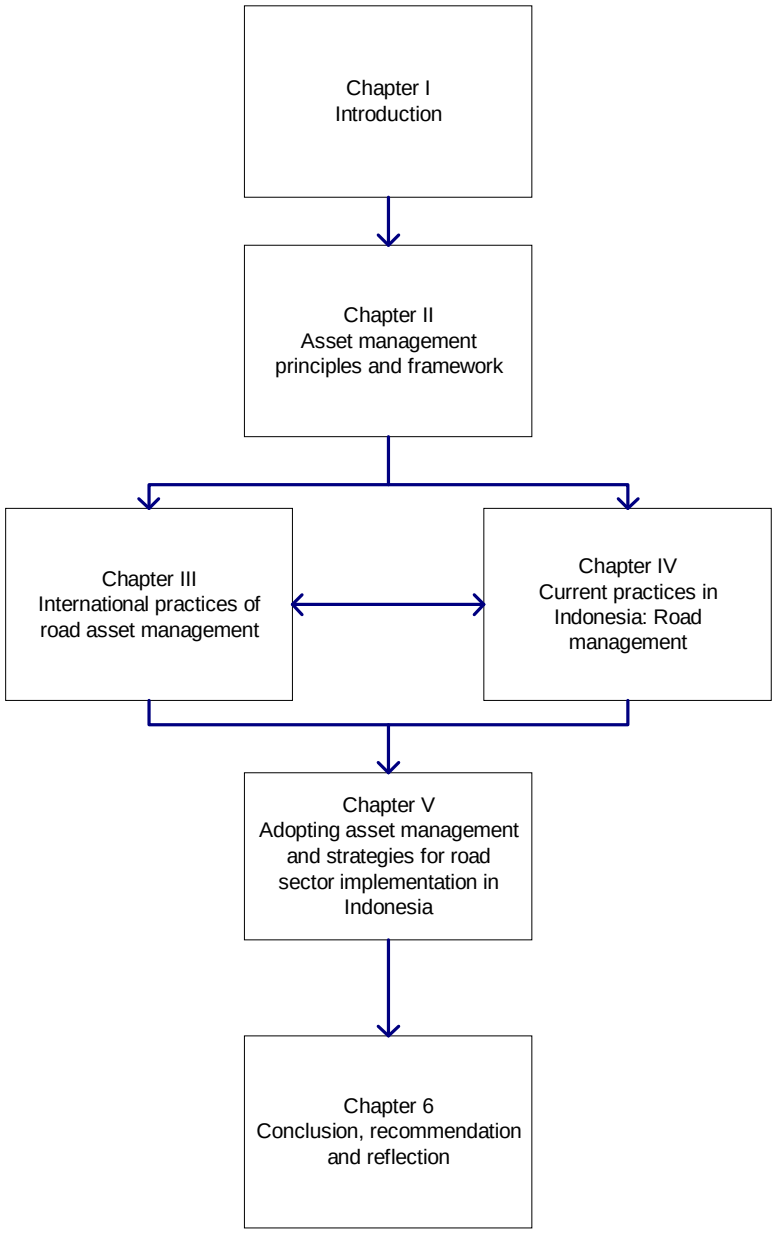
Chapter V Adopting asset management and strategies for road sector implementation in Indonesia

This chapter will evaluate the conditions of road management practices in Indonesia. Based on the evaluation of existing practices and framework of road asset management in the international practices, we will deliver the possibilities in adopting road asset management into Indonesian practices. The possibilities of adopting road asset management are related to the chapter II literature review, lesson learned in the chapter III and Indonesian practice in chapter IV.

Chapter VI Conclusion, recommendation and reflection

This chapter consists of conclusion, recommendation of research and reflection obtained in this research. Conclusion will answer the research questions. Recommendation of research will be a list of practical agendas that could be done in Indonesian case while the reflection will be related into the theoretical perspective of road asset management.

Figure I.3 Structure of Report



Chapter II Asset Management Principles and Framework

In this chapter asset management will be described comprehensively from the history perspective until its framework. Firstly in section II.1 we will discuss the evolution of asset management in road infrastructure and the international practices in asset management. Further, we will draw the benefits of applying asset management in II.2. Asset management as a tool involves stakeholders that should be act to determine decision properly based on the accurate and valid data. Therefore decision makers in asset management will be delivered in section II.3. In order to apply the asset management in transport; we need to know the component and processes of asset management which will be discussed in section II.4 and II.5. Asset management is a process of continual improvement that could be put in a framework of planning process namely plan; do; check and act. The framework of asset management in road can be seen in the section II.6.

II.1 Reflection of Asset Management

Asset management concept has been improved since the beginning. Some of the forefronts for this concept are Organization for Economic Co-operation and Development (OECD), Permanent International Association of Road Congresses/World Road Association (PIARC), Road administration in US/Federal Highway Administration (FHWA), Finland and Australia (PIARC, 2005). In order to understand the beginning of asset management concept, we will draw the international history on asset management and some international practices of asset management.

II.1.1 International History

Pavement management system marks the beginning of asset management for road. The American Association of State Highway and transportation Officials (AASHO) road test embarked the pavement management in 1956 to 1960 (Federal Highway Administration, 2007). Road test used as an evaluation of road condition in pavement management. This management system focuses on the comfortability and safety of people. The concept of pavement management relate

to the concept described by Carey and Irick in "*The Pavement Serviceability-Performance Concepts*" which was published in Highway Research Bulletin no.250 in 1960 (Finn, 1998). According to them, pavement condition can be measured in subjectivity and objectivity. Subjective measurement is determined by people's perception of road condition while objective measurement of road condition is based on the physical condition of pavement in terms of roughness (Finn, 1998). Both measurements of pavement used for the maintenance activities to enhance comfortability and safety of people.

Pavement management system consistently improved from its database, condition index and ranking system to develop a prioritized list of projects till the early 1980s. US Federal Highway Administration defined pavement management system as "a system which involves the identification of optimum strategies at various management levels and maintains pavements at an adequate level of serviceability" (Finn, 1998). Focusing on the project management rather than network management has put pavement management system in jeopardy. Bridges are parts of the roads that should also be considered in the management system; therefore the bridge management system came out to answer the need of network management (see figure II.1).

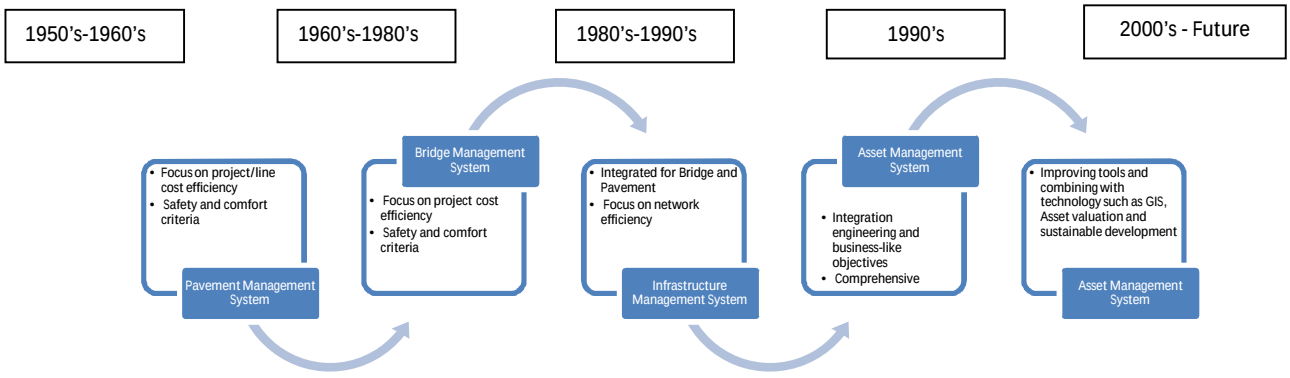
Bridge management system and pavement management system improved along with the computerized and technical measurements. By combining pavement and bridge managements, the network optimum solution will be achieved. Efficiency and effectiveness of project not only determined in based of project management but also related to the network of roads in general.

In US, those two managements enhanced with other system related to road that later called as infrastructure management system (see figure II.1). Combining pavement, bridge and other transportation management happened because there is a change in the expectation of road users. Road users in 1990s expected not only on the comfortability and safety as in the beginning of pavement management system but also by the sustainability paradigm influenced, travel time, accessibility and mobility. Based on the practical experiences, infrastructure management is not good enough to answer all the evolving problems in road management. Then, infrastructure management system was enhanced into asset

management system. Asset management originated in the early 1990s and continued to grow its application to management and administration. It is a comprehensive strategy, aimed at efficiency and effectiveness managing infrastructure assets across their entire life, in order to optimize their aggregate value and provide replacement at the most appropriate time (Abbott, 2006)

The fundamental difference between infrastructure and asset management systems is the emergence of infrastructure management system more rooted in engineering concern while in asset management rooted in public expectations, investment options, greater transparency and accountability of government agencies. As a result, asset management requires a different approach than the traditional systems developed to address technical needs (Mouaket, 2005).

Figure II.1 Asset Management evolution



The characteristics of asset management can be seen in twofold which are management and organizational aspects. Firstly, the management of asset is a process which closely related to Total Quality Management (TQM). TQM process model is based upon the "PDCA" management or control cycle which is also known as the Deming or Shewhart cycle (Hollmann, 2006). PDCA stands for Plan, Do, Check, Act. Secondly, management takes place in different levels of organization which affect the service delivery. The fundamental categories in organizational level are represented by the strategic, tactical and operational level of organization.

Asset management has been evolved and will still be enhance in the future. Amekudzi (2005) has been identified some issues that should be incorporate for

the asset management in the future such as improving data quality, automated data collection, better warning systems, using remote sensing capabilities, defining performance measures, tradeoff in the decision making process, asset valuation methodologies, infrastructure security, sustainable development, and applications of emerging technologies.

II.1.2 International Practices

Asset management is a modern and well developed discipline that practiced in many countries and across a wide range of industries (including highway) (UK Roads Liaison Group, 2005). International experiences with asset management diverse in term of their institutional structure, funding resources, populations and area served, and current state of the infrastructure asset considerably (Federal Highway Administration, 2007). Despite variations in experiences, the drivers to adopt asset management within countries are the commitment for best value and transparency of public fund.

In England and Wales, asset management starts to be considered when the Local Government Act 1999 enacted (UK Roads Liaison Group, 2005). The Act focuses on the "Best value" of service to public. Best value has been known in UK since 1980s. Best value originally came from the statutory obligation of highway which covers *Safe for Use* function and *Fit for Purpose* function (UK Roads Liaison Group, 2005). Safe for use function concern with public safe while fit for purpose function focus on the availability of highway for use of traffic. In the local government Act 1999, government requires to publish annual performance plans which report the measures being taken to deliver improvement in public services for local people (UK Roads Liaison Group, 2005). Continuously, North Ireland and Scotland also enacted "Best value" Act. UK generally commits to asset management from the "best value" driver which hopes to bring more benefits for communities.

Improvement in government performance gives more chance in implementing asset management. In UK, transport asset management enhance with the following basis and principles (UK Roads Liaison Group, 2005):

- Framework for Highway asset management (April 2004)
- PAS 55-1 Asset Management: specification for the optimized management of physical infrastructure assets (in 2004)
- PAS 55-2 Asset Management: guidelines for the application of PAS 55-1 (in 2004)
- International infrastructure management manual, UK edition (in 2003)

In US, asset management driver is mostly determined by second asset management driver which is the transparency for the public funds. Management of road has been considered since the completion of highway system in 1980s (Federal Highway Administration, 2007). The need to shift emphasis and resources from new construction of highways to maintain, preserve and reconstruct the existing infrastructure is taken into concern seriously. The legislation of Government Performance and Result (Act of 1993) embarked the performance measures. It calls for states to report what is bought and spend with public funds. Moreover, this legislation is strengthened by the Governmental Accounting Standard Board (GASB) Statement 34, in which it focuses on asset-based approach to state financing report especially for asset valuation (Federal Highway Administration, 2007).

Some of the observations noted in the asset management overview in US, New Zealand, Canada and Australia (Federal Highway Administration, 2007) that can be used as an input for other countries in addition to the drivers are:

- Mostly all agencies had established a management position or office that was the focal point for guidance, information and public participation related to asset management activities.
- Legislation used as a catalyst.
- Technical approaches and data base support for the decision making in asset management. Namely life-cycle approach, location referencing, quality-control, risk-assessment are used in asset management for transportation.
- Changing organizational culture and improving human resources are mostly key challenges in adopting asset management.

II.2 Benefits Applying Asset Management in Roads

Individual management system such as pavement management and bridge management has been evolved since the embarking of them. The integration of systems has taken into consideration by some of road administration for some reasons, especially the benefits provided over the single system. In addition to integrated management system, asset management rely on the integration of organizational and management of road which is more developed that the other road management. Some of the benefits appear in the asset management namely (OECD, 2001):

- Improved communication

  Road administrations usually focus on the technical aspects of roads because they mostly employ technical staff. Asset management could connect the need of engineers to be able to communicate with financial managers in understandable accounting term (OECD, 2001). Instilling communication between technical and financial managers will give confidence for the decision makers that the chosen management strategies are rational and represent best value in money (Pinard, 2001). Better communication either internally or externally of road administration help decision makers to take actions for improving services.

- Up to date asset inventory

  Up to date asset inventory is needed in analyzing and reporting for the decision makers. It is essential for integrated and harmonized database of asset for decision maker support. By having an up to date asset inventory, asset manager will obtain the information needed to optimize trade-offs among financial performance, operational performance and risk exposure (Too, 2010).

- Better condition and level of use

  Improved data quality and consistency is needed in road administrations. With standardized data, road administration managers will be easier in interpreting and analyzing the data (OECD, 2001). Other part of improved quality and consistency in data is the differentiation of information that

could be use from. Information from data will be also depending on the human resource development and technology adopted.

- Increased road network performance

  Better road network performance is one of communities needs in road. Improving performance requires clear understanding of how to manage assets in a way that allow their current performance to improve while ensuring the planning and re-investing in the future (Too, 2010).

- Efficiency and accountability in budget process

  Asset management as an integrated system could show the road network efficiency rather than project/line efficiency. By seeing road management as a network, budget could compare efficiency in a whole. Asset management provides an estimate of the economic effect of spending scenarios (OECD, 2001). Besides efficiency, accountability is important aspect that could be achieved. With so many stakeholders in the provision and management of road, the needs to meet their expectation with spending resources become matter (Too, 2010).

- Staff development

  Asset management provides opportunities to staff development either in knowledge or skill. Introducing asset management in road administration will give staff how to act in the new public management rather than traditional management of roads. Knowledge in asset management is not only about improving internal knowledge but also adopting external knowledge (Herder and Wijnia, 2009). Internal knowledge such as documenting and predicting is not enough to handle asset management. External knowledge such as asset risk and contracting-outsourcing tends to focus on asset management in a broader sense. Combining internal and external knowledge will bring benefits in staff development.

Aside from the benefits in applying asset management, the recipient of benefits will be interesting to discuss. Therefore, the recipients who are also the actors in asset management will be discussed in the next section.

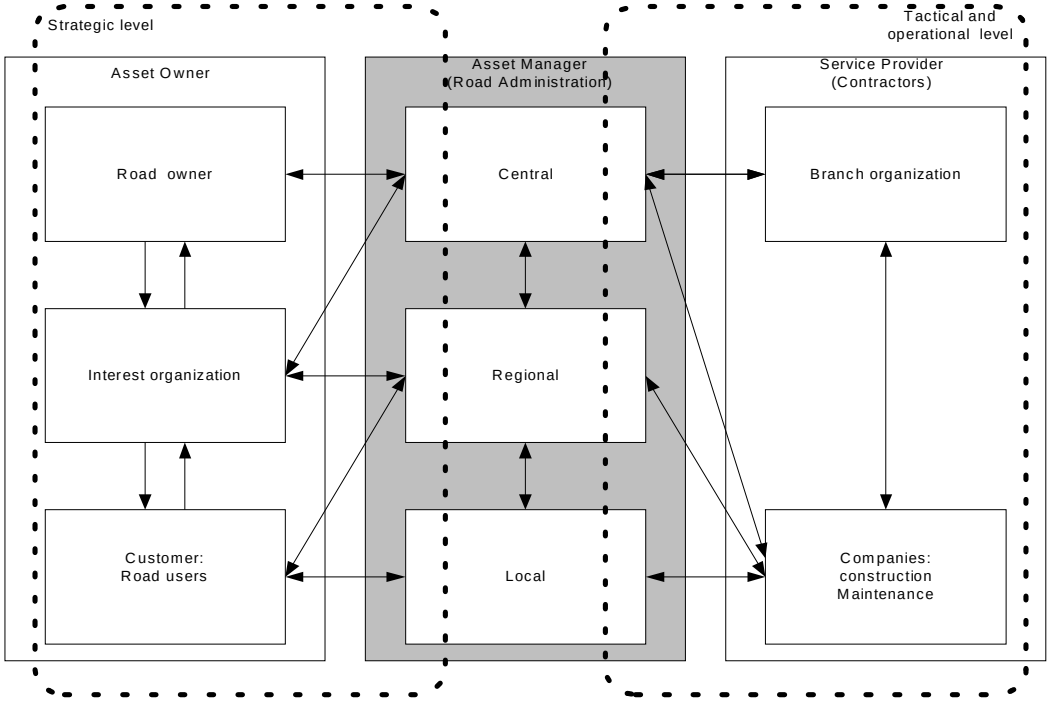
II.3 Actors in Asset Management

Asset management is increasingly being used for the new public management and maximizing satisfaction of users in road management. As the new public management, road administration usually changes in culture. New public management is a management philosophy used by government to modernize the public sector through market orientation (Hood, 1991). Road administration is moving from pure government-controlled organization to a private enterprise. Therefore asset management requires persons with business, technical, operational or service experience who can work effectively with finance, contract and engineering specialist (Hastings, 2010).

In the asset management process, there are many actors involve. The concept of continuous improvement in the asset management results continuous interaction among actors. Complexity of interaction can understand by grouping the key actors. Woodhouse (2003) advocated the dividing of responsibility among key entities into the asset owner, the asset manager and the service provider. Asset owner has to answer the "Where and Why" question; Asset manager has to answer the "What, Where and When" questions and the service provider has to answer the "How" question (Too, 2010). This approach allows the entities to focus on specific capabilities and responsibilities. Moreover, it provides a clear separation between making the decision and carrying out the action (Humphrey, 2003).

Asset owner represent by the road owner, interest organization and road users. Asset manager (Road Administration) usually differentiate into national, regional and local; different level of governments responsible for different road networks. The dialogue between asset owner and road administrations takes place at the national level for the national road network and mainly regional and local level for the other networks (PIARC, 2008). The service provider is the contractor and private parties which usually have an agreement with the road administration for road maintenance and other activities. In general, relationship between parties in road management can be represented by figure II.2. Although there will be variations in road administrations, the core of road management is same, delivering good roads for road users.

Figure II.2 General Road management parties relationship



Source: PIARC, 2008

The approach of asset management actors can also be seen in the organizational perspective which is strategic, tactical and operational level. In the strategic level, road administration and asset owner discuss the main strategic objectives that should be achieved in the road planning. In the tactical and operational level, the cooperation between internal road administration actors and road administration-contractors relationships happens. Actors and components of asset management interacts each other in the process of asset management. Therefore, we will explain component and later the process of asset management.

II.4 Component of Asset Management

The forefronts in asset management concept such as OECD, PIARC, and FHWA give the component of asset management based on their experiences. The component of asset management quiet related to practices. Below we can see their component of asset management respectively.

Table II.1 Component of asset management in general

OECD	PIARC	FHWA
- Goal and policies - Data - Resources and budget detail - Performance models for alternative strategies and program development - Project selection criteria - Program implementation - A monitoring and feedback loop	- Performance measure - Asset value, condition and performance assessment - Alternative generation and evaluation - Trade-off analyses and investment strategies	- Goal and policies - Asset inventory - Condition assessment and performance modeling - Alternative evaluation (budget consideration) - Project selection - Program implementation - Performance monitoring

Sources: (OECD, 2001) (PIARC, 2005) (US Department of Transportation, December 1999)

From the table above, we can see that the difference between components is not opposite each other. They use a different terminology to call certain activities. Overall their component is similar, the difference is the basic point for OECD and FHWA are the goals and policies while PIARC start the performance measure which is an evaluation of the existing performance. Starting the asset management with the evaluation of existing roads could be like a project or short term goals because it only evaluates the project itself without take a look into the process of project. OECD and FHWA are more developed in the future and network of road management.

Actually, those components are general and can be adjust to specific road administration needs. Therefore in this research we will use the FHWA component with the adjustment of component through grouping component into sequence cycle of total quality management (TQM) which represents the process of asset management. The components of asset management include (US Department of Transportation, December 1999):

- Policy development

  Policy development entails activities such as formulating the road use, taking account of environmental sustainable development, noticing the demand of users, and etc.

- Planning

  Planning component represents the business, network, financial, communication of organization.

- Plan execution

  Plan execution entails capital works, rehabilitation, maintenance, consultation and etc. The plan execution can also be called as do phase in the TQM of business development.

- Verification

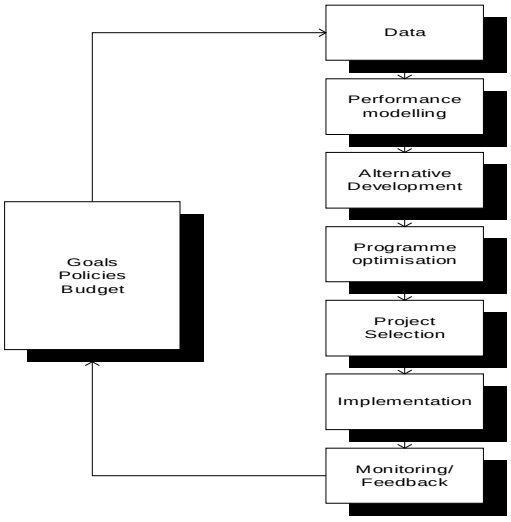
  Verification is the evaluation of performance and condition monitoring. In the TQM, verification is also known as check phase. The verification will lead to the act phase which is the restructuring and reforming the policy development again.

Component of asset management is related to its process. Those components reflect the process in a sequence stages. Therefore component will become clear in the process of asset management which will be explained in next section.

II.5 Process of Asset Management

From the component of asset management in section II.4, in this chapter we will be given the diagram of process in asset management. Asset management process is a set of linked activities and the sequence of activities that are necessary for collectively realizing asset management goal within the context of organizational, management and resources constrain (Amadi, Brown, Willett, & Mathew, 2010). The process of asset management in general can be seen below:

Figure II.3 General Process of asset management



Source: OECD, 2001

Each process in the figure above is made up of number of elements, tools and activities. For example, data can be represented by the collection methods, database and reporting, condition assessment, asset inventory, population data, traffic data and etc. The process emphasizes the importance of defining goals and policies at the start and using performance monitoring as a check. The general process of asset management could also reflect components of asset management which are policy development, planning, plan execution and verification.

Asset management characteristics which are complete organization level and the imposition of total quality management integrated in the process of asset management. Blending together established organization level and total quality management process generates a process of continuous development in asset management. Therefore, we will describe the process of asset management from organizational and management hereafter.

Organizational level and Management process

Asset management is a systematic, structured process covering the whole life of assets, whereby the underlying assumption is that the assets exist to support the organization's delivery strategies and requires a certain level of management insight (CIEAM, 2011). In the organizational perspective, asset management develops in the business circumstance and encompasses the strategic, tactical and

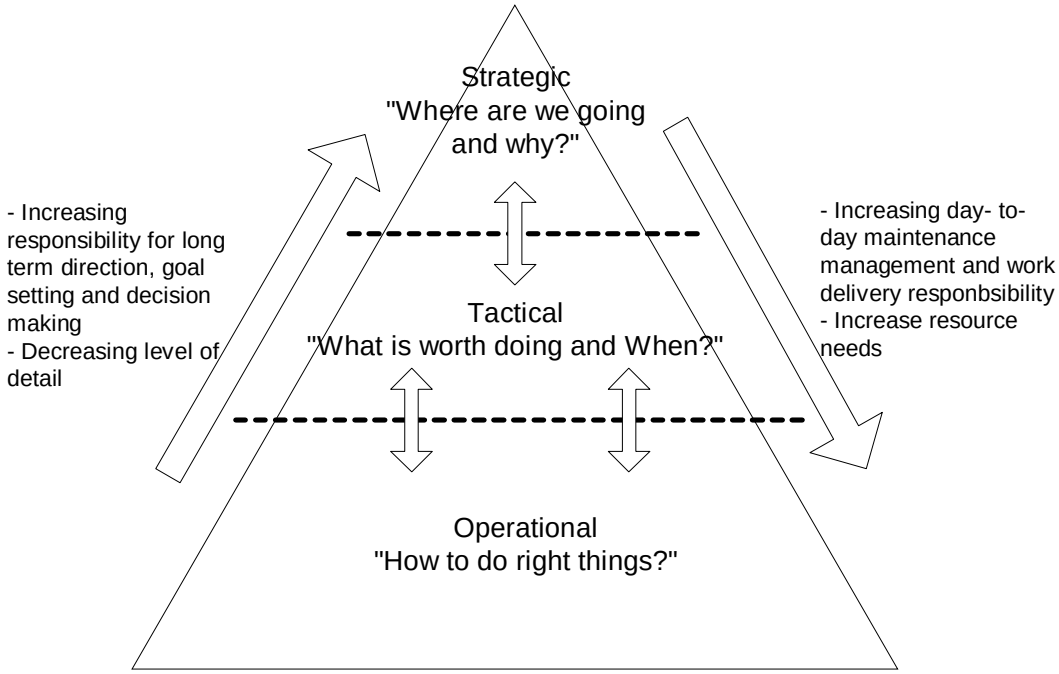
operational level of the organization. While as a process of whole life assets, asset management is best practices when it relates to the total quality management (TQM).

The strategic management process should be able to answer question such as "where are we going and why?" At the strategic level, asset management is building from the stakeholders' expectation with internal/external requirements and or constrains included (UK Roads Liaison Group, 2005). At the strategic level, the long term direction for roads should be established. Moreover strategic planning will be used in the tactical and operational level.

The tactical level management translates the strategic plan into specific plans, objectives, and performance targets for the assets (UK Roads Liaison Group, 2005). At the operational level the management, the detailed work plan (day-to-day maintenance and management) and schedule, especially the short term activities, break down. Collaboration among stakeholders in technical, administrative and managerial is important at this level. Knowledge and technology are used for engineering process in order to carry out the most efficient way to manage assets.

Interrelationship of organizational levels is crucial in asset management. If these levels are not well integrated, it could lead to a lack of consistency in decision making and goal setting (UK Roads Liaison Group, 2005). It comes to undelivered long term strategic goals and objectives and more represent the short term work plans. The ideal hierarchy of management in organizational is shown in figure II.4.

Figure II.4 Idealized organizational structure



Source: (UK Roads Liaison Group, 2005)

In support to the organization process, management process should also been included. The lifecycle of asset suit with the Deming cycle of management (Plan-Do-Check-Act=PDCA). The PDCA cycle of TQM is designed to be used as a dynamic model. The dynamic model for continual improvement of the asset includes the Plan (planning the work); Do (implementing the work); Check (reviewing the work); and Act (acting upon the information to improve the process). The completion one turn of cycle flows into the beginning of the next cycle. In the process of asset management, the back loop from monitoring and feedback comes out to the configuration of new goals and policies.

The process of asset management is extensive. In that sense, process of asset management in each country will be vary based on their predevelopment strategies. Predevelopment strategies for asset management will be described further.

Predevelopment Strategies in Asset management

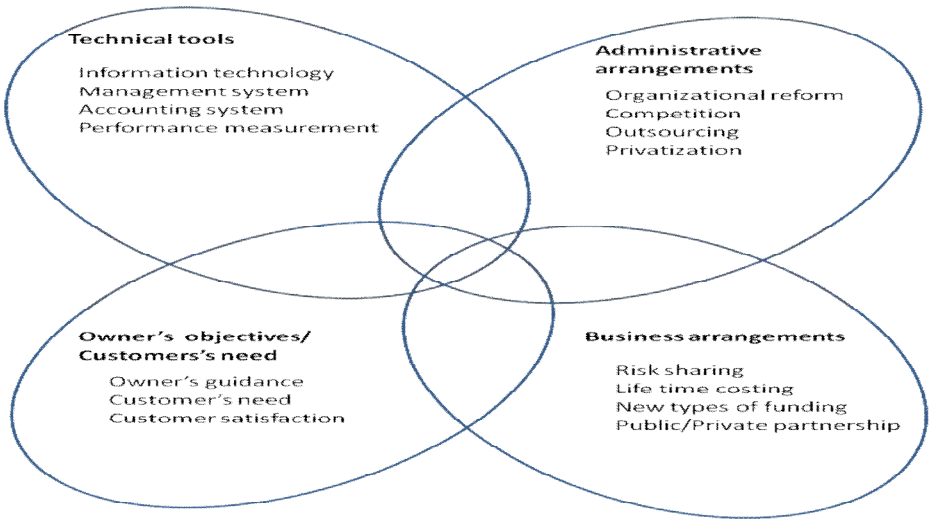
The process of asset management is too broad and generic therefore some of the countries usually start with a different point of view related to their context

(PIARC, 2005). Particular countries may select to concentrate on administrative reform in term of organizational change. Others may prefer to focus on the pavement system development and integration with other system. Predevelopment in asset management entails administrative arrangements, technical tools, owner's objectives/customer's need, and business arrangement strategies (see figure II.5) (PIARC, 2005).

Administrative arrangement strategy implies the change in the organizational which is in some part could be difficult especially the organizational culture. While focusing only on the technical tools strategies, short term goals and technical consideration will restrict the integration of financial and technical management. Owner's objectives and customer's need strategies are needed in the formulation of policies and goals. This strategy has to be realistic in order to be more applicable.

Regardless of strategies for implementation, the adoption of strategies is best determined in the context of a strategic asset management framework. This will allow for the future integration of the respective component and also for the flexibility to incorporate additional asset management features and processes in accordance with changing needs and directions in each various unique jurisdictions (PIARC, 2005).

Figure II.5 Predevelopment strategies in asset management



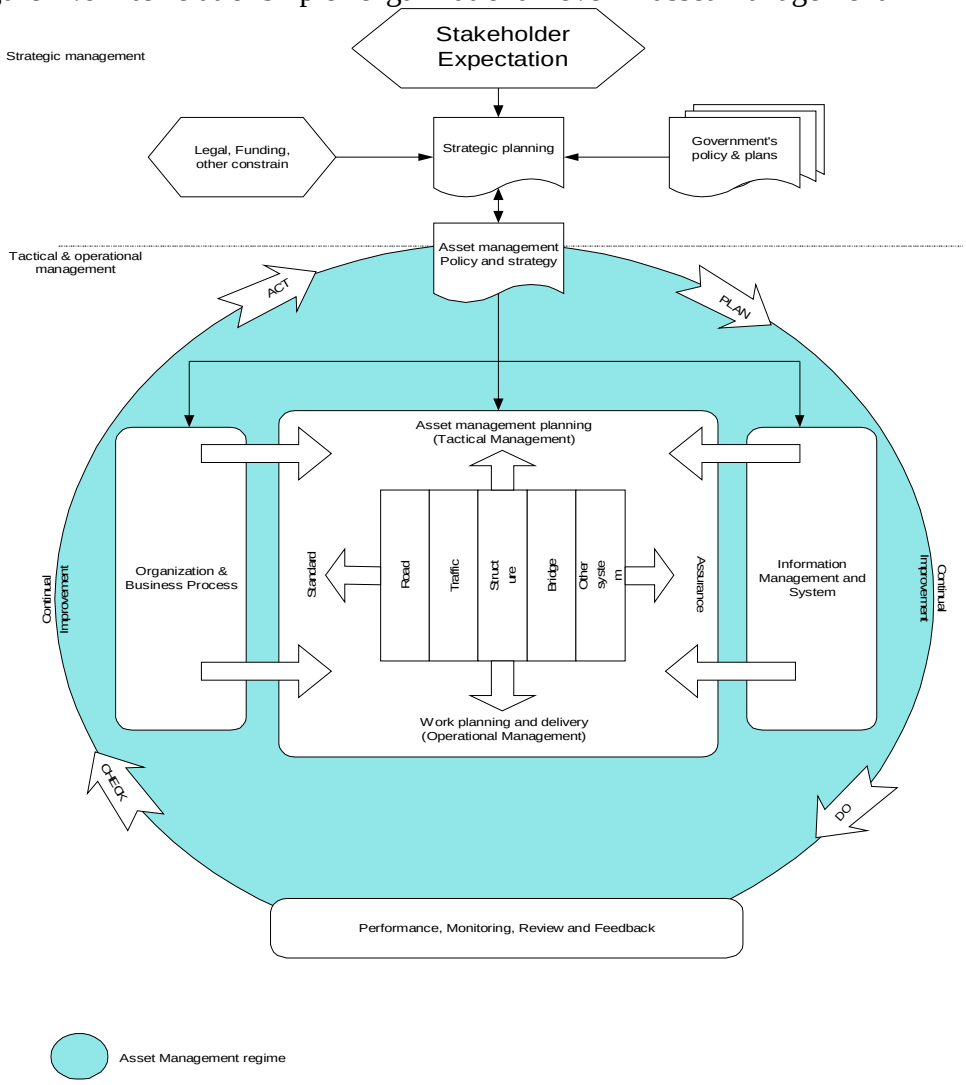
Source: (PIARC, 2005)

II.6 Framework of Asset Management for Roads

Framework for asset management especially for roads is the combination of asset management component and process together with the organizational structure as well as the management process. The asset management process in which included the component of asset management strongly related with the organizational decision maker and the management of business. One of the examples of frameworks that combine them is the framework of transportation asset management in UK. The framework can be seen in figure II.6.

The expectation of stakeholders regards to the transport network is different each other. The strategic plan combines the stakeholders' expectation, government plans, resources constrains. Normally, consultations and surveys are conducted to establish strategic plan (UK Roads Liaison Group, 2005). Strategic plan typically has 10-25 years of horizon which is related to the financial planning, but sometimes it could be enhance in order to fully assess the optimum lifecycle of asset (IIMM, 2006). Some of the components incorporate with the strategic planning are the development of vision, mission, review of the operating, and desire outcomes. Public sector might be more concerned in the social, environment and economics of strategic plan, while the private sector emphases on the economic purposes (IIMM, 2006). Therefore the consultation and survey will reveal the level of service that should be achieved and used in the strategic plan. Strategic plan also disclose in the road administrations plan which sometimes is legally established to bind all the stakeholders.

Figure II.6 Interrelationship of organizational level in asset management

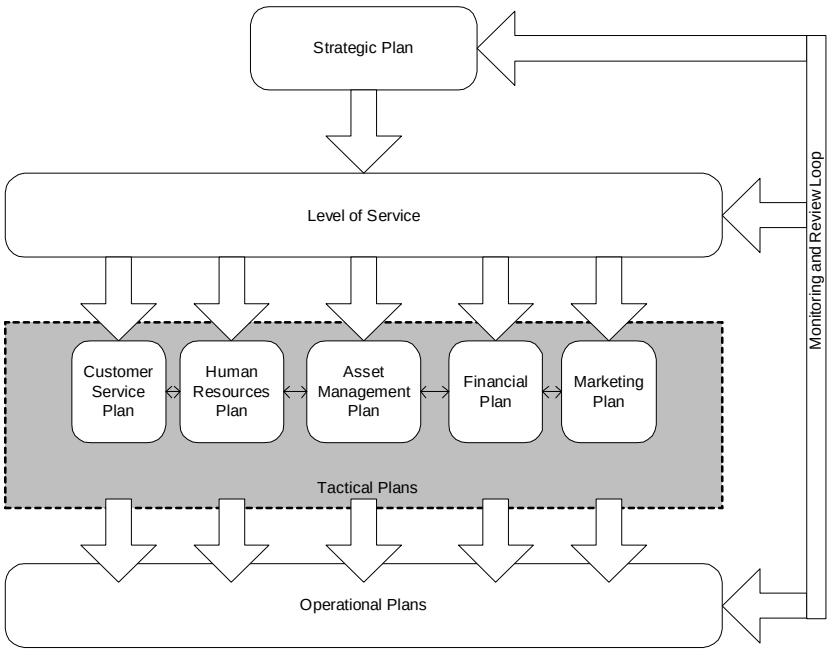


Source: UK Roads Liaison Group, 2005.

The asset management regime (the circle in figure II.6) entails the organizational structure and management process; asset management planning and work delivery process; and information management and system that enable asset management to be effectively planned, implemented and delivered. The organizational structure, roles and responsibility, and management process require to implement and to operate the asset management regime. Information management and system is the source for decision makers to make decision in the limited resources such as financial and time. The asset management planning in the framework represents the long-term objective which could be 5-10 years horizon (UK Roads

Liaison Group, 2005). The tactical plans covers human resource plan, asset plan (road, traffic, bridge, etc), financial plan, marketing plan, and customer service plan (IIMM, 2006). Tactical plan involves the application of detail management process, procedure and standard to meet the strategic planning level of service. The linkage between strategic, tactical and operational plan can be seen in figure II.7.

Figure II.7 Link between strategic, tactical and operational plan



Source: IIMM, 2006

The operational plans (work planning and delivery) cover the day to day management and short term (1-3 years) plan, schedule, and delivery of works. In the operational plans, detailed inspection of asset gives an input for the identification of maintenance need and short term planning (UK Roads Liaison Group, 2005). Example of the operational plans includes local authority annual plans, department annual plans, and business activities plans. Operational plans will be effective with the consideration on (IIMM, 2006):

- correctly reflect priorities arising from tactical plans
- deliver defined levels of services cost-effectively
- be achievable and appropriate to the organization

- contain appropriate auditable performance measures
- promote efficient and innovative service delivery

The continual improvement cycle includes the Plan, Do, Check and Act steps for improving the asset management regime on a continual basis. The process of asset management planning, work planning and delivery gives a feedback for the improvement of asset management strategy.

II.7 Wrap up Asset Management

In the previous section we have discussed from the history of asset management to example of asset management framework. To be able to see the asset management in practices and possibilities for Indonesia to adopt asset management, we will discuss the limitation of asset management framework that will be used in analysis. The combination of asset management process, components, organizational level, actors, management, and strategies can be seen in the table II.2.

Table II.2 Analytical framework for research in asset management

<table>
<tr><th>Process</th><th>Component</th><th>Organizational</th><th>Actors</th><th>Management</th><th>Strategies</th></tr>
<tr><td>Goals/Policies/ Budget</td><td>Policy development</td><td>Strategic + Tactical</td><td>Asset owner + Asset Manager</td><td>Act</td><td rowspan="9">- Technical tools
- Owner objectives/customer need
- Administrative arrangements
- Business arrangements</td></tr>
<tr><td>Data/Asset inventory</td><td rowspan="5">Planning</td><td rowspan="7">Tactical + Operational</td><td rowspan="7">Asset Manager + Service provider</td><td rowspan="5">Plan</td></tr>
<tr><td>Performance modeling</td></tr>
<tr><td>Alternative development</td></tr>
<tr><td>Program optimization</td></tr>
<tr><td>Project selection</td></tr>
<tr><td>Implementation</td><td>Plan execution</td><td>Do</td></tr>
<tr><td>Monitoring/ Feedback</td><td>Verification</td><td>Check</td></tr>
</table>

Analytical asset management framework (table II.2) in this research will be employed to see the national roads in the practices (Australia and South Africa). The national roads are suitable laboratory for asset management because national roads represent the greatest interest of stakeholders regarding its function.

Asset management framework in our research will based on the general asset management process as in section II.5. Setting goals, enacted policies and budget estimation is the policy development component and occur in the cooperation of strategic and tactical level within the involvement of asset owner and asset manager involvement. In the management aspect, those actions could be achieved from the reviewing (act) phase. Strategies in table II.2 represent the predevelopment strategies that could be used by each country to embark their asset management system. Process of asset management will be easier to describe in countries with implemented asset management system, but in the countries which do not implement asset management we can move out the process and focus on the actors, component, organization and management. Organizational level and actors share the same column because organizational level also represents the actors included in them.

Components of asset management in Australia and South Africa will be described and analyzed based on the analytical framework table II.2. The presence of policy development in the asset management component will be a good start for asset management practices. Although strategies from each countries to start the asset management will be different, the presence of policy development will give us a brief explanation the strategies that employed by the countries to start or run their asset management practices.

Actors in asset management within Australia and South Africa will be different because of the countries' context. The role and responsibility of actors also will be different. Incorporate the new public management could differentiate the road administration culture and organization. The decision making inside the organization itself will be different with the traditional road management system.

Based on the framework in the table II.2, we will analyze asset management that have already implemented in Australia and South Africa. While in Indonesia, we will describe existing road management and the appearance of the component, organizational, actor and management. Australia and South Africa will be delivered in chapter III and Indonesian case will be delivered in chapter IV.

Chapter III International Practices of Road Asset Management

In this chapter, we will discuss the practices that already happened in road asset management. Australia represents the developed country while South Africa represents the developing country. A complete road asset management will not be found in any countries in the world because road asset management is a dynamic and evolving approach. Dynamic customers' expectation and innovative technical tools will continuously add in road asset management system. Nevertheless, Australia and South Africa cases will give us a comprehensive view of road asset management. Australian case will be drawn in section III.1 and continued by South Africa case in III.2. Further findings in Australian and South Africa will wrap up in the section III.3 which contains of lesson learned from their practices.

III.1 Australian case

Australia is a vast country in the southern hemisphere. Geographically it lies across three time zones. Rainforest, desert, snow-capped mountains and open grass are all part of the Australian landscape. Climatic and geographic factors create a variety of road building conditions and influence the rates at which roads deteriorate (Austroads, 2005).

Land transportation especially roads is the dominant transport mode in Australia. Sixty-five percent of the freight carried, including most of the high value products, is transported by road (Austroads, 2005). From this fact, managing roads in Australia is very important in social as well as in economic purposes. As one of the developed countries and pioneer in the asset management practices, Australia will give us a brief of asset management. Existing Australian national highway system can be seen in figure III.1.

Figure III.1 Australia's national highway system

Source: Austroads, 2005

Australia is the world's thirteenth largest economy based on the IMF list in 2010. Since their federation in 1901, Australia has maintained a stable liberal democratic political system. Australia has six states- New South Wales, Queensland, South Australia, Tasmania, Victoria and Western Australia- and two major mainland territories – the Northern Territory and the Australian Capital Territory.

III.1.1 Context

History

Australia maintains extensive road networks, it comprises more than 800,000 Km of public roads which are local roads, arterials, highways and major freeways (see table III.1). Australia has six states and two self-governing territories that principally have independent own responsibility for their road network. States have devolved some road responsibilities to local government councils, while the Australian government assists with funding for key interstates routes. Nevertheless, the three spheres of government in Australia (federal, state and territorial authorities, and local) share responsibility for funding the road network.

Previously, from 1974 to June 2004 Australian government funded the interstate National Highway solely (Austroads, 2005).

Table III.1 The Length of Australian roads (in Km)

Road Type	YEAR/ in Km									
	1995	2003								
	AUSTRALIA	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUSTRALIA
National Highway	18,400.00	3,105.00	1,010.00	4,186.00	2,749.00	4,648.00	385.00	2,670.00	20.00	18,773.00
Rural Arterial	96,840.00	29,363.00	18,100.00	27,650.00	8,567.00	18,574.00	2,514.00	3,972.00	290.00	109,030.00
Urban Arterial	12,232.00	4,235.00	3,200.00	1,814.00	911.00	1,785.00	501.00	150.00	455.00	13,051.00
Rural Local	587,700.00	124,147.00	109,400.00	123,015.00	77,106.00	112,604.00	18,469.00	17,137.00	25.00	581,903.00
Urban Local	75,200.00	21,157.00	21,300.00	24,639.00	7,241.00	11,241.00	2,727.00	55.00	1,855.00	90,215.00
Total	790,372.00	182,007.00	153,010.00	181,304.00	96,574.00	148,852.00	24,596.00	23,984.00	2,645.00	812,972.00

Source: Austroads, 2005

NSW : New South Wales
VIC : Victoria
QLD : Queensland
SA : South Australia
WA : Western Australia
TAS : Tasmania
NT : Northern Territory
ACT : Australian Capital Territory

Those states and territories maintain all the roads in their jurisdiction. Each states and territories has their own department to maintain road and traffic. In 1989, Austroad (Association of Australian and New Zealand road transport and traffic authorities) became the organization for improvement in road sectors that consist of states and territories, local government and enhanced in 1993 by embracing federal government (Australia and New Zealand). The strategic stage has been taken into Austroad in order to have the same track within all regions. While the technical and operational of roads still in states and territories responsibility.

Drivers for asset management

Asset management in Australia introduced as the result of practical experiences and reasoning. Practically, asset management in Australia has come from several factors (drivers) such as (May, 1998):

- The size of the asset

  Asset in Australia has been increased since the beginning. The increasing size needs to be maintained and expanded in order to fulfill the increasing number of population. While the increasing size did not significantly in

line with the budget for maintaining and operating as well as developing new infrastructure, government as the provider need to find solutions.

- The age of asset and ascending costs associated

  Some of the public infrastructure in Australia has been over than one hundred years which come to obsolete. These infrastructures need more maintenance in order to keep running. New South Wales Department of Public Works in 1993 estimated that the replacement of New South Wales asset stock could be over thirty times of annual public sector maintenance bill (May, 1998). The condition has put capabilities of providing infrastructure and services into edge.

- Society's dependency on infrastructure

  Infrastructure is an important part of society; it contributes critically for community's quality of life. Moreover, economic growth is dependent upon the provision of infrastructure (National Infrastructure Committee 1996 in May, 1998).

Asset management made its way into Australian public works in 1993. The first legislation driver in asset management is Australian Accounting Standard 27-AAS27 which was issued by Australian standard board that required government agencies to capitalize and depreciate assets rather than expenses them against earnings (Too, 2010). This standard forced public works organization to manage infrastructure assets by considering the life cycle and cost effectiveness of asset investments.

From the legislations perspective, the Financial Management and Accountability Act 1997 (FMA Act) and the Commonwealth Authorities and Companies Act 1997 (CAC Act) has pushed government to be accountable for the public fund spending (ANAO, 2010). The FMA Act principally focuses on the obligations and responsibilities of chief executive and the way officials handle public money, public property and other resources of the Australian government. The CAC Act also requires directors and officers to exercise their powers and duties in the best interests of the body and for a proper purpose. The driver of asset management for Australian government is the same driver with the US driver as discuss in chapter

II. Transparency of public fund in the government body has made the asset management possible.

Road Funding

In the beginning of asset management implementation, budget for national roads came from the Federal government. Fifty seven percent of annual road funding allocated by the Australian Government (federal) is directed towards national roads, and the remainders to local roads and to safety improvement (Austroads, 2005). The Austroads was established to improved Australian and New Zealand road transport and the significant change is the decentralization of state and territory government for national road management. Auslink national network is introduced which subsumes the national highway system. State and territory agencies manage the Auslink national network, but the Australian government still providing funds to specific construction works. State and territory road transport and traffic agencies are responsible for the development, maintenance and operation of the principal road network within their area of jurisdiction (Austroads, 2005). They are also responsible for the funding and maintenance in the state highways. State and local government agencies could contract or retain workforces in their jurisdictions according to their needs.

Australian government raises their income for road management from some of financial instruments. Namely excise on petroleum products, vehicle registration fee, stamp duty on vehicle registration, driver license fees, toll and other instrument could be found in Australia (Austroad, 2005). Excise on petroleum products is melting in the Australian government's general funding pool, while other instrument are collected in state and territory which can be directed automatically for the road sector.

In line with the FMA Act and CAC Act, Australia changed its budgeting process. The Medium Term Expenditure (MTE) program is introduced. Future estimation of budget is the main ideas of the MTE and performance based budgeting is the implementation of the MTE in Australia. Political process of budgeting has also been changed towards MTE; previously Australia government has to negotiate with parliaments for the road fund each year. After the MTE and performance

based budgeting, Australia government did not focus on negotiating the program with parliaments but on the strategic policies and benefits in the policies. Ministerial is responsible for elaborating strategic policies into strategic programs while the states and territories road administrators manage personnel and administration of programs.

III.1.2 Actors in asset management

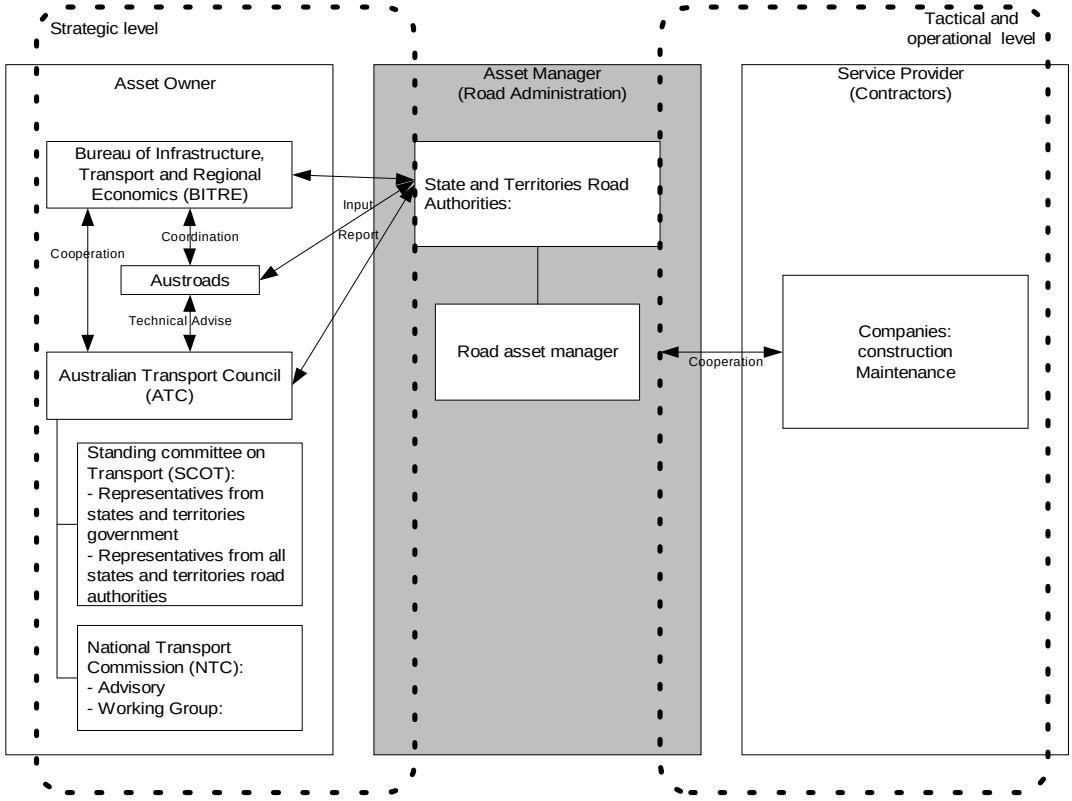
Austroad established on July 1989 to replace the National Association of Australian State Road Authorities (NAASRA). Austroads is an association of road transport and traffic authorities in Australia and New Zealand which provide strategic direction to the development, management and use of the Australian and New Zealand road systems (Austroads, 2005). Austroads main purposes entails providing strategic research on emerging issues for roads; producing and promoting guidelines and manuals; supporting Standing Committee on Transport (SCOT) and Australian Transport Council (ATC) with advices; facilitating knowledge sharing; conducting business activities on behalf of Australian road authorities; and fostering international involvement (Austroads, 2010).

From our analytical framework of actors in asset management, Austroads can be classified as one of the road owner with the strategic level for national roads based on the purposes of Austroads establishment. Besides Austroads, some organizations that also related in the strategic level of road management in Australia are Bureau of Infrastructure, Transport and Regional Economics (BITRE); and ATC (consists of SCOT and National Transport Commission/NTC).

From figure III.2, we can see ATC, Austroads and BITRE have a central role in the strategic level of national roads. ATC is a council that represents all the stakeholders and accommodates all their interest in the national roads. ATC cooperate with BITRE to make policies and legislation related to roads. ATC receive technical advice from Austroads about road management and practices. Austroads as an association of road transport and traffic authorities produce guidelines and manuals for all road transport and traffic authorities in order to have the same performance. BITRE confines policies for transportation, roads and

other infrastructure. BITRE and austroads relate in producing guidelines and manuals for roads with a coordinative relationship.

Figure III.2 Australian National Roads Actors



As an asset owner, those organizations have been representing the road owner, interest group and road users. Asset owner in Australia has been legalized and has a significant role in driving the asset management. As a federation country, national roads in Australia are maintained by the state and territories. The road authorities in each states and territories are the tactical as well as the operational actors that responsible for the mid-term and annually road management through each states and territories road management act and plan. Road authorities adopted all the interests and legislations from BITRE, Austroads, and ATC as well as reported to them for the achievement in road management. In the operational level, road authorities collaborate with the contractors to develop and maintain national road through several type of contracts. In line with the level of responsibility in their organization, states and territories road authorities established the road asset manager in their organization structure. Road asset

manager is the link actor between tactical and operational in the states and territories road authorities.

III.1.3 Component of asset management

Components or elements of asset management for road network in Australia have been described in Road Asset management guidelines in 1994. Mostly states and territories have the same elements since Austroads as the publisher of guidelines is the appointed organization which included all the road authorities in Australia and New Zealand. The eight (8) components are (Austroads, 1994):

- Community benefits;
- Road system performance;
- Asset features;
- Asset condition;
- Asset use;
- Physical treatments;
- Management of use; and
- Asset management strategy.

In accordance with our previous classification of asset management components by FHWA which is policy development, planning, plan execution, and verification; Australian asset management components can be classified as in FHWA. The community benefits and road system performance elements are part of the policy development component. NTC as a commission for roads included community benefits by contributing for regulatory reform in order to meet the needs of transport users and the broader community for safety, efficiency, and sustainability of land transport.

Road system performance component is represented by key performance indicators (KPIs). As a policy development, KPIs in Australia has been accommodating either the physical or social aspect of roads. The detailed of the KPIs that has been enacted in Australia can be seen in Appendix 1. NTC contribute for the road system performance. In NTC annual report 2010, the NTC contributed for the national road safety policy reform in order to increase the safety performance. It is recorded that in 1990 - 2009 the national fatality rate has decrease up to 40% (NTC, 2010).

Asset features, asset condition and asset use component are the planning component. Those components are the data that used in the planning; accurate and up-to-date database in road support for the road asset management planning. They are inputs for the road management systems.

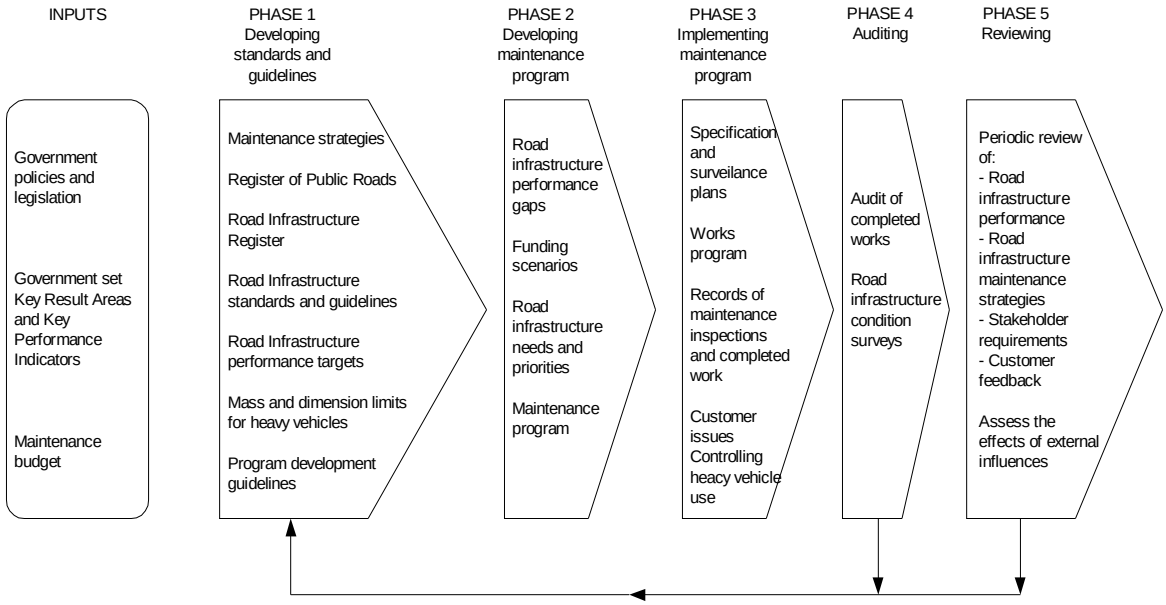
Physical treatment and management of use component are the plan execution component in FHWA asset management component. Physical treatment of road such as development, rehabilitation and maintenance of asset will be varied based on the asset data. The physical treatment also related to the business development that will be used for the road link or network. Some link might give more benefits through performance contract; others might be in the unit cost contract or even in house maintenance operation.

Asset management strategy component is the asset management review and monitoring. This strategy will reveal the planning and plan execution component strength and weakness. The result will be a back loop for the policy development to improve the existing policy in road asset.

III.1.4 Process of asset management

Austroads also released the process of road infrastructure management system in their road asset management guidelines in 1994. Since their guideline is general for all case in Australia and New Zealand, we will take one of the examples in the Victoria State process of road infrastructure management system. The VicRoads (Victoria road authorities) road asset management process can be seen in figure III.3.

Figure III.3 VicRoads Road Infrastructure Management System (Adapted from Austroads Integrated Asset Management Guidelines for Road Network)



Source: Vicroads, 2004

Input for road asset management in Victoria are government policies and legislation; key performance indicators (KPIs) and maintenance budget. In the policies and legislation, as other states in Australia, the Australian Accounting Standard 27-AAS27 and the Road Management Act in 2004 pushed states government to enacted asset management. The result is an obligation for state government to have a road management plan that consist statement of responsibility, a road infrastructure management system and/or a statement of road maintenance standard (US Department of Transportation, Nov 2005). In line with it, Victoria government also uses the Australian performance measures for pavement and bridge. For example in maintenance activities, roughness index of 4.2 for the Auslink national road network (see appendix 1). This was the first phase of the Victoria road asset management system, which is developing standards and guidelines.

The second phase of road asset management in Victoria is to develop maintenance program. The maintenance budget inputs, government and other stakeholders determined the target pavement conditions. The target was to resurface 10% of the network each year, a dramatic change from the 4% average before (US

Department of Transportation, Nov 2005). Maintenance program for roads implemented based on the monitoring of pavement, ranking of rehabilitation program, preventive periodic maintenance with priorities, bridge condition, and road site inventory (Vicroads, 2004). Prioritizing road management in the asset management become crucial because it depends on budget allocation and time. By using gap analysis between latest road condition and performance targets, Vicroads could determine budget needs and allocation for every work activities. The gap analysis increased the bargaining power for the road authorities to get appropriate fund, determined the suitable maintenance activities, and precisely timing frame for maintenance.

In the third phase, implementing maintenance program is based on the data/asset inventory. Vicroads used four primary asset systems to support the management; they are Road Asset System (RAS); Road Crash Information System (RCIS); traffic database; and financial system. All the asset data combined into one system called State Road Referencing System (SRRS) (Vicroads, 2004). In addition to that, Vicroads also conducted a conjoint analysis with the user preference using representative samples of users. The implementation of maintenance program in Victoria conducted through several type of contract such as Public-Private Partnership (PPP) in two toll roads, performance based contract, in-house maintenance, and unit cost contract. The concession also included a responsibility to achieve performance indicators.

Auditing and reviewing in Vicroads mostly did in accordance with the performance target, in which PPP concession also reviewed the concession agreement requirements. Auditing and reviewing is a back loop and use as an input to increase the performance and level of service. Vicroads also conducted several periodic reviews for an input to develop adjustment or renew standard and guidelines such as road performance, maintenance strategies, customer feedback and other external influences.

In order to handle the road asset management process, Vicroads used the administrative arrangement in their predevelopment strategy. A position of manager for asset management is created in the Vicroads in which responsible for developed strategies and program for maintenance; monitoring condition of

network; recommend maintenance investment levels; benchmark performance; develop, maintain, and support management systems; and manage inventory system (Vicroads, 2004).

III.2 South Africa case

South Africa located in the southern of Africa. It is a parliamentary democracy country with nine (9) Province which are Eastern Cape; Free State; Gauteng; KwaZulu-Natal; Limpopo; Mpumalanga; Northern Cape; North West; and Western Cape. The national roads in South Africa mostly are constructed during 1970s by adopting US interstate highways network model. Existing South Africa national roads can be seen in figure III.4.

As in most countries of the world, road transport is dominant means of transportation in South Africa. Road transport now carries 80 to 90 percent of the country's passenger and freight transport (Mitchell, 1998). Therefore, managing roads in South Africa is very important for economic and social development.

Figure III.4 South Africa National roads

Source: SANRAL, 2009

III.2.1 Context

History

South Africa road infrastructure development takes into consideration firstly in National Road Acts (1935) with the establishment of National Road Board/South African National Board (NRB). NRB got fund from National Road Fund (NRF) which derives its primary income from a share of customs duty levied on every gallon of petrol imported into the Union (Floor, 1984). As NRB roles primarily on the national roads, the provincial authorities who also lack of fund tried to pushed their interest in order to have a significant role for NRF. The Transport (coordinating) Act of 1948 incorporated provincial authorities in formulation and implementation of road development. In line with the act, NRB is replaced by National Transport Commission (NTC).

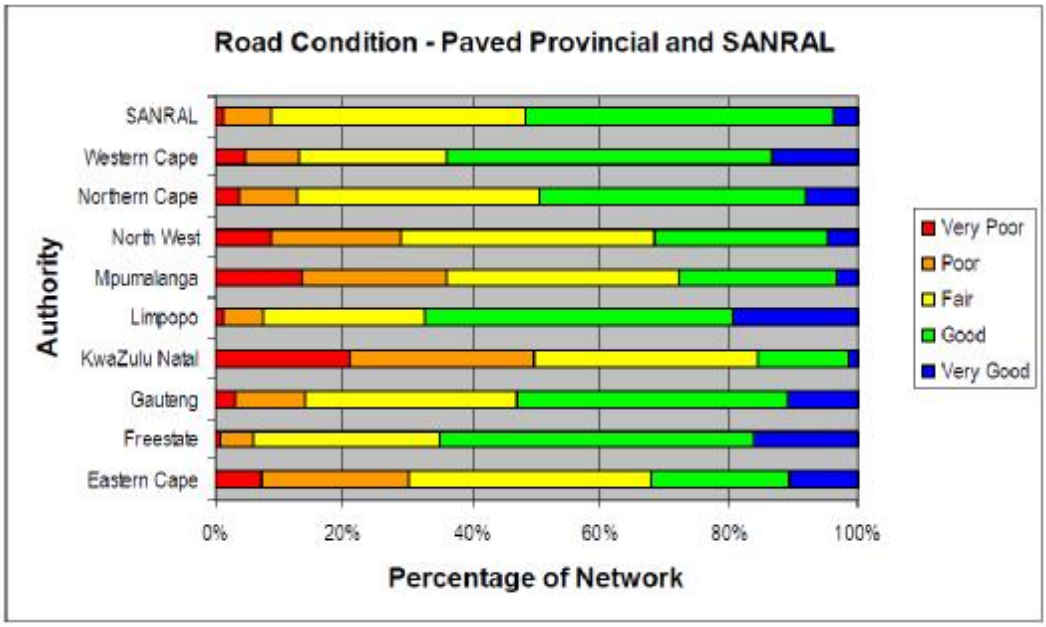
South Africa embarked on a significant road enhancement program from the mid-1960's up to about the end of the 1970's. These were the "golden years" for road development in that country and much of the current primary national and provincial network was built during this period. Unfortunately towards the end of the 1970's adequate resources of road funds started to diminish, as the country became faced with rapidly escalating costs in other sectors of society (Floor, 1984). Moreover, since the termination of earmarked funding in 1987, the road finance for development and maintenance only depends on the central fiscal. The years leading up to the democratic transition in 1994 has extended the disinvestment in the road sector. Even during a period of greatly reduced inflation between 1997 and 2005 expenditure in real terms on roads has remained nearly static, growing only by approximately 10% for this 8 year period (Mitchell, 2006).

The democratization of South Africa brought a new institutional arrangement. National roads are managed by the National Road Agency (SANRAL) on behalf of the National Department of Transport (nDoT), whereas provincial roads and local roads delivered by provincial government and local government. SANRAL was created by *The South African National Roads Agency Limited and National Roads Act, 1998.* The South African national road network is the arteries of the nation-arteries that connect major cities, towns and developing villages in rural areas of South Africa (SANRAL, 2009). SANRAL currently manages 16.170 Km

of roads and expects this to grow by incorporate some of the provincial roads. Approximately 81% of the national road network consists of non-toll roads and the rest of them are the toll roads.

In 2010, more than 40% of the national roads are on the fair to very poor condition. For the provincial roads, it varies among all provinces (figure III.5). Kawazulu Natal Province has the worst road condition with more than 40% road condition in poor and very poor (SARF, 2011). Road condition in South Africa measures with the VCI (Visual condition index). The fair condition (VCI: 50-70) represents the condition that shows some sign of deterioration and needs to get proper maintenance immediately.

Figure III.5 South Africa national and provincial paved roads condition in 2010



Source: SARF, 2011

Drivers for asset management

The decreasing of fund in road has trigger government to find an alternative strategy to manage and develop roads in South Africa. Besides trying to find other kind of funding, government have to use its valuable immovable asset resources effectively and efficiently to achieve its service delivery objectives. Historically, the culture of replacement rather than maintenance eventually practices in South Africa, but as the road fund decreasing, South Africa has to use their resources

effective and efficiently. This culture is an output from the non-uniform government framework and lack of monitoring and evaluation systems (DPW, 2005).

In 1999, the national treasury enacted the Public Finance Management Act (PFMA) and Municipal Finance Management Act (MFMA). The objectives of the Acts are to enforce transparency and effectiveness of management in respect of revenue, assets and liabilities of government (DPW, 2005). The PFMA governs a uniform accounting system for the management of an asset throughout its life-cycle. In line with the Acts, public works established the government immovable asset management policy by means of legislation. The Government Immovable Asset Management Act (GIAMA) enacted in 2007 (No 19/2007).

Donor organization also took part in the transformation in South Africa road management. The influence of donor organization is part of the agreement between donor and recipient countries. Like other Southern Africa countries which are lack of financial capabilities, donor organization has pushed South Africa to implement the donor organization recommendations (Heggie, 1995). PFMA and MFMA are part of the policies which are externally enforced by donor organization. Nevertheless, the establishment of those acts has pushed government officials to change their culture. Therefore, the South Africa asset management driver could be classified into the same category as the Australian and US, the transparency of public fund which is formally in legislation has made the initially of asset management practice.

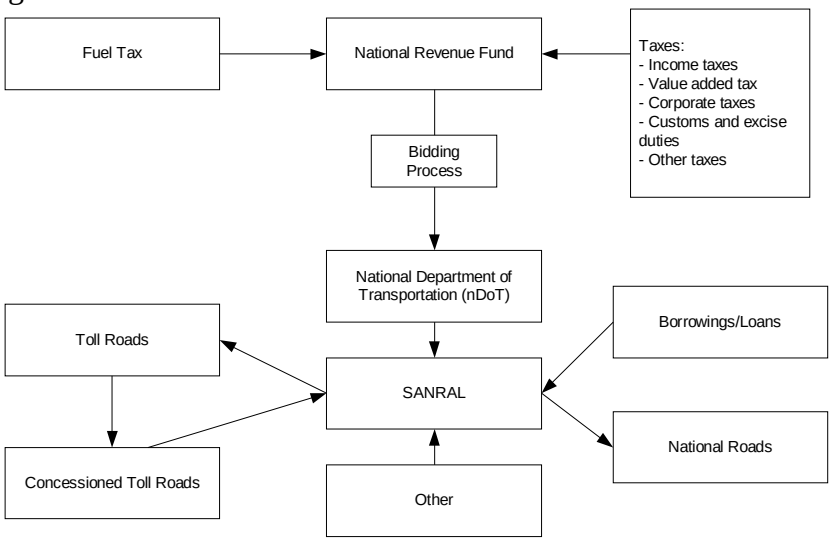
Road Funding

Since the withdrawn of road earmarking fund, the road fund for national roads merely is supported from the national fiscal, tolling and debt finance. SANRAL obtains its funding through two main sources namely grants from the National Treasury for all non-toll roads and raises funds from the capital and money markets for the toll roads. Non-toll roads could also get its fund through loans.

National revenue fund gets its fund from fuel tax and other taxes. National revenue fund distribute its fund through bidding process, in which all sectors will have an equal opportunities to get funds. nDoT receives road funds from national

revenue fund and distributes its national road development and maintenance fund to SANRAL as its parastatal. Parastatal is a company, agency, or intergovernmental organization, that possesses political clout and is separate from the government, but whose activities serve the state, either directly or indirectly. SANRAL also generates revenue from the toll road concession, but spends it towards toll road maintenance and development directly. The source of fund for national road network can be seen in figure III.6.

Figure III.6 Sources of fund for South Africa national road network



Source: National Department of Transport. 2002.

The time series data for road expenditure in South Africa can be seen in table III.2. The road expenditure in national roads increased significantly since 2003 with more than 1000% increase in 7 years. While in the provincial roads, the road expenditure did not increase as much as national roads. The increasing expenditure in SANRAL is caused by the completion some of the toll and non-toll network including completion of the Gauteng new and improvement freeway project which contains about 560 Km roads (SARF, 2011).

Table III.2 South Africa national and provincial road expenditure (R Million)

Year	2003	2004	2005	2006	2007	2008	2009
SANRAL	1,203.00	1,291.00	1,441.00	1,753.00	3,286.00	6,119.00	13,893.00
PROVINCIAL	5,257.00	5,792.00	6,374.00	7,612.00	8,844.00	10,616.00	13,581.00

Source: SARF, 2011

III.2.2 Actors in asset management

The road management actors in South Africa can be classified into strategic, tactical and operational level. They are National Department of Transportation (nDoT); Department of Public Works (DPW); South Africa Road Federation (SARF); South African National Roads Agency Limited (SANRAL); and Contractors.

The nDot is the owner of the national roads which transfers its responsibility to SANRAL for management, maintenance and development of South Africa's national road network. nDoT collaborate hand in hand with DPW in establishing policies and guidelines for the road development. While at the same time, nDoT receive input from SARF. DPW and SARF connected with nDoT in coordination relationship, in which nDoT has to be able to take to account policies from DPW and interest from SARF.

DPW act as the policy actors and regulation in the construction sector including road. DPW has introduced the Government immovable asset management policy and Government Immovable Asset Management Act (GIAMA) for the physical asset. This act has a significant role in the beginning of road asset management in South Africa.

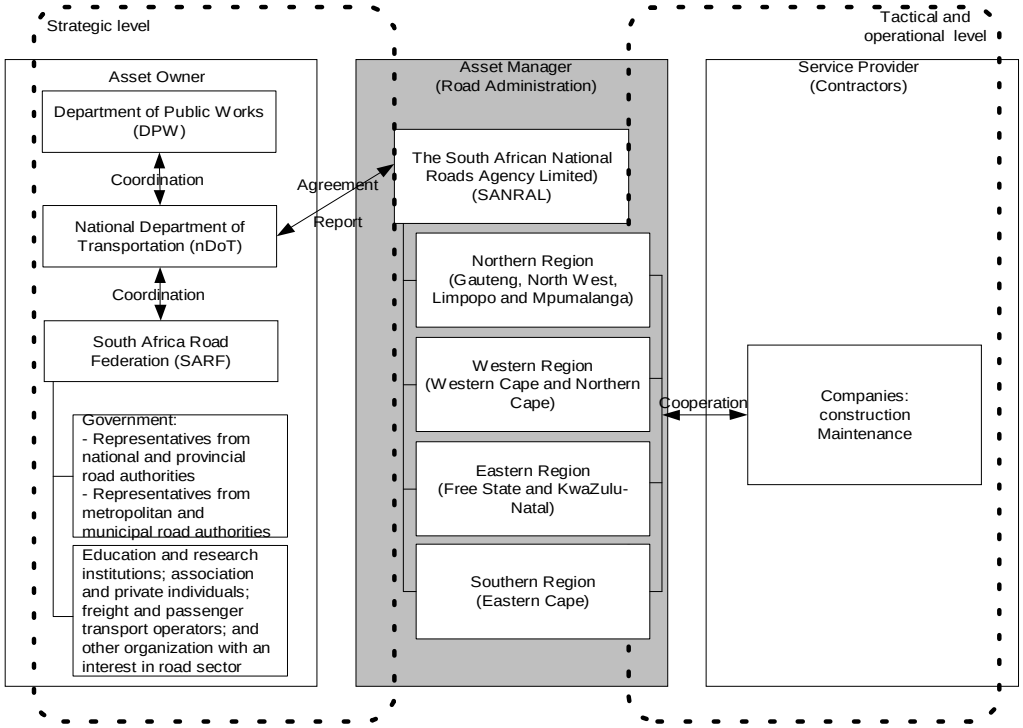
SARF is a non-political organization which represents all interest bodies in any aspect of the road industry and road administration. SARF act as the custodian for all parties with an interest in roads and driving the national agenda for roads. This organization represents the national and provincial road authorities; metropolitan and municipal road authorities; education and research institutions; association and private individuals; freight and passenger transport operators; and other organization with an interest in road sector.

SANRAL was created by *The South African National Roads Agency Limited and National Roads Act, 1998* as a corporatized successor to the South African Roads Board, which was part of the Department of Transport (Act 1998). It was registered as a public limited company on 19 May 1998. SANRAL's operations are divided into two broad categories: toll roads, which are self-funding; and non-toll roads, which are funded by transfers from the Department of Transport. SANRAL as a parastatal of nDoT has to report to nDoT. SANRAL office are

divided between the head office and four regional offices: Northern Region (Gauteng, North West, Limpopo and Mpumalanga); Western Region (Western Cape and Northern Cape); Eastern Region (Free State and KwaZulu-Natal); and Southern Region (Eastern Cape). SANRAL purpose roles are taking charge of the financing, management, control, planning, development, maintenance and rehabilitation of the South African national roads system.

In the strategic level, asset owner such as DPW, nDoT and SARF has represented all the stakeholders in national roads. SARF has the lowest strategic level between them; SARF has not been in a legal legislation structure therefore their contribution to the strategic level is an elective role. The asset manager (SANRAL) has the tactical and operational level. The head office of SANRAL has a role as a tactical level and the four regional offices have the operational level. Contractors such as construction and maintenance corporation lie in the operational level with the contract agreement with SANRAL. Their relationship in the road management can be seen in the figure III.7.

Figure III.7 South Africa National Roads Actors



III.2.3 Component of asset management

The component of asset management in South Africa has been established in line with the of asset management component as in Chapter II. Asset management component in South Africa entails:

a. Policy development

   Policy development for roads in South Africa mainly constructed between nDot, SARF and DPW. Policy development includes vision, performance indicators, and policies regarding road development and maintenance. Together with the other stakeholders, nDot established vision of the national roads in South Africa and delivered it to asset manager which is SANRAL. DPW pushed the asset management practices in all construction sectors to be adopted by regulating and publishing asset management policies. Policies in medium term expenditure for 3 years that have already been enacted in South Africa are also part of the policy development for asset management in South Africa. Medium term expenditure stated in the early 2000 after a long discussion and convincing the legislative about the benefits in applying medium term expenditure. In line with medium term expenditure, KPIs for roads also introduce in South Africa.

b. Planning

   Planning in the South Africa related to the budget expenditure which is in three years' time frame. The planning of national roads development and maintenance is part of the SANRAL responsibility. Planning in the SANRAL procedures classify into three types which are projects with more than $35 million budget; projects within $3-4 million and projects less than $3 million. Usually projects with more than $35 million budgets will be delivered in public private partnership type or loan agreement. The procedures for all road projects in South Africa will be analyzed with procedures such as needs analysis; option analysis; cost-effective analysis; life-cycle analysis; implementation preparation and readiness; budgeting and approval. Road planning in South Africa also did in accordance with the existing management systems that already run in that country.

c. Plan execution

Plan execution in South Africa conducted by the regional office of SANRAL. Plan execution has to take into account the principles of policies in national including Public Finance Management Act (PFMA) and Municipal Finance Management Act (MFMA). In addition, plan executions also consider the Routine Road Maintenance (RMM) manual and the Statutory Control Guideline Manual (SANRAL, 2009). Usually, plan execution did in the term of contract between SANRAL and Construction Company. Some of the contract types are Public Private Partnership (PPP); performance contract and unit cost contract.

d. Verification

South Africa overcomes the monitoring with the verification on the performance agreement between SANRAL and nDoT. The verification of the performance result and the performance indicators in the first step will reduce the shortfall in the management and implementation.

III.2.4 Process of asset management

Process of asset management in South Africa is not the same with Australia. While in Australia, the process of road asset management is already enacted as a guideline, in South Africa the process of road asset management is still in development process (see figure III.8) by the nDoT. It starts with the decision support system (DSS) which is in the strategic level. DSS takes input from social, politics and other interest in roads for policies and legislation in roads. Strategic level of road asset management delivers the key performance indicator (KPIs) and strategic appraisal for SANRAL to be implemented. KPIs both implemented and under development use in South Africa asset management could be seen in Appendix 2.

SANRAL as the tactical level actor in the process of road asset management used some of the management systems such as preserved asset management system, bridge management system, traffic management system and other management systems to plan medium term programs. In the operational, the structured and validated information, and analysis tools will be used for the operational of road

asset management either for development or maintenance of roads. Delivering services for road user gets feed back in term of back information that will be useful for the management and strategic overview. Either tactical or operational level of SANRAL usually will be compared with the KPIs for the evaluation of projects and programs. In the strategic level, inputs from review will be used to reconsider existing road coordination and adjust for modification.

South Africa road asset management is still in process and need to be aware of its inputs from monitoring and evaluation to enhance the process in the future. Total management quality (TQM) in South Africa is based on the private business of SANRAL. Although SANRAL has a benefit of getting grant from government for national road fund, as a private company SANRAL also obtains the private management especially the TQM. SANRAL projects and programs are based on the management information system that will bring the planning into three years plan with certain performance goals. SANRAL also has the main business that should be embody since its establishment which are developing, maintaining and managing the network and traffic on the national road network. In doing its business, SANRAL uses management systems which depend on data inventory. To do its job, SANRAL collaborate with contractors for implementation of annual work programs.

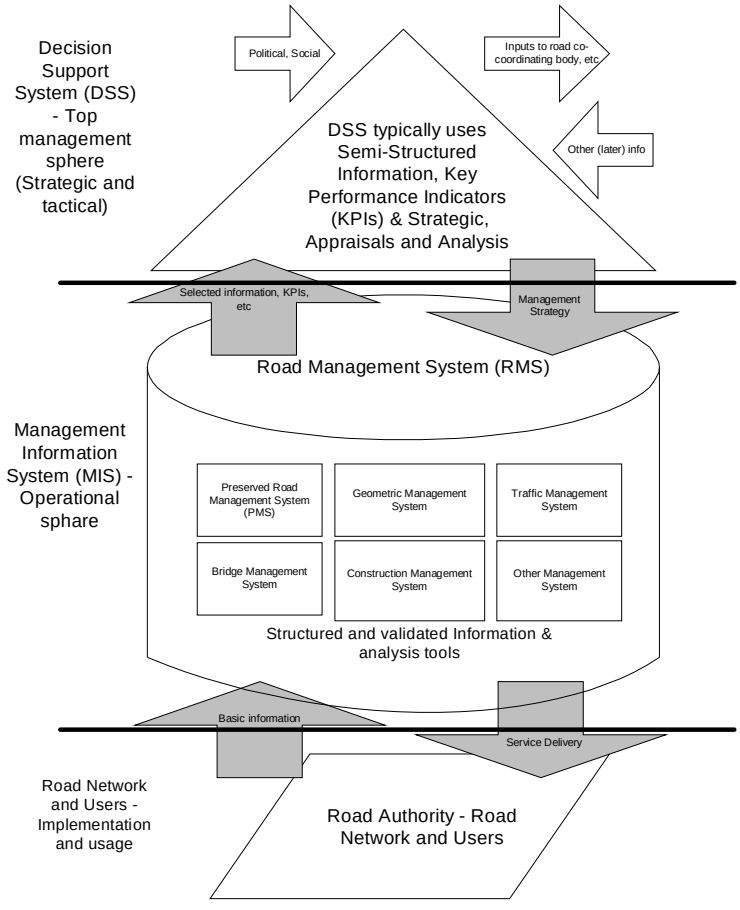
SANRAL did the check phase in their organization in order to have a feedback for the inside management and personnel. Besides, as a parastatal, SANRAL also fully subscribe to the principles of transparency, social responsibility, and accountability as embodied within the Protocol on Corporate Governance in the Public sector and the King II Code of corporate governance. KPIs as the performance measures use to compare between maintained roads and appraisal targets.

SANRAL act phase gives feedback to government. SANRAL uses feedbacks to develop memoranda or service level agreement with government and authorities to ensure synergy in areas such as law enforcement, overload control, emergency service, accident management and utilities. In practices, SANRAL act phase came to the partnership between SANRAL, private and provincial government. Operating Traffic Control Centers (TCC) is one of the examples in this

partnership. Since SANRAL did not have the law enforcement function for roads, SANRAL collaborate with provincial authorities for law enforcement in overload trucks. SANRAL and private companies provide as well as manage the operation and administration of TCC.

South Africa used the administrative strategies in their predevelopment road asset management process by firstly established the SANRAL. SANRAL as a parastatal has an opportunities to change the previous maintenance culture in practices. In addition to that some policies and legislation has been added to smooth the process of road asset management such as the medium term expenditure program, KPIs, and road management systems.

Figure III.8 Road Asset Management Process in South Africa



Source: nDoT

III.3 Lesson Learned from Australia and South Africa

We have discussed the road asset management in Australia and South Africa previously. To summarize what we have learned from both countries, the comparison of both countries from the context, actor, component, and process of road asset management available in table III.3.

In the actors for asset road management, both countries have included all stakeholder and group interest. Although in South Africa the role of South Africa Road Federation (SARF) is still an elective role, the establishment of SARF has opened the possibilities for user to be able to influence the strategic of road plan. The difference in actors for both countries appears in tactical and operational level. In Australia, government administration used for road asset management while in South Africa a parastatal established to cope with the asset management. Australian asset manager is formed in the road authorities' organization which is more easily rather than establishing a new organization because in Australia human resources and skill for road asset management already exist. On contrary, South Africa has to establish a parastatal in order to accelerate the asset management practice. SANRAL has benefits in a human resource and asset management skill. Moreover, South Africa government will be easier to hold accountability based on the agreement between nDoT and SANRAL.

In the policy development component of road asset management system, Australia has been enacted road asset management guidelines while in South Africa the guideline is still general for immovable asset management. The consequence for this is the different in the verification component, as the South Africa merely concerned with the appraisal agreement between government and SANRAL which is Key performance indicators (KPIs), Australia can be more detailed for verification for all the asset management strategy.

Asset management process in both countries could represent the developed and developing asset management practices. Australia is more developed in its asset management process which could be seen from the complete assessment in their process from the planning up to the reviewing phase. Australia has benefit in their stable fund because road management is based on earmark taxes. While in South

Africa, nDoT needs to compete with other sectors to get certain amount of fund for road management.

Table III.3 Comparison of road asset management practices in Australia and South Africa

		AUSTRALIA	SOUTH AFRICA
CONTEXT	*Driver*	Legislation for public fund transparancy	Legislation for public fund transparancy
ACTOR	*Strategic*	BITRE, Austroads, ATC (NTC + SCOT)	DPW; nDoT; SARF
		- NTC has been legalized for input in the strategic level	- SARF role has not been legalized, it is an elective role.
	Tactical	States and Territories Road Authorities	SANRAL
	Operational	States and Territories Road Authorities; and Constractors	SANRAL regional offices and Contractors
COMPONENT	*Policy Development*	- developed vision for national roads through participatory (community benefits and road system performance)	- developed vision for national roads through government target (community benefits and road system performance)
		- Medium term expenditure for programs (3 years)	- Medium term expenditure for programs (3 years)
		- road asset management guidelines (1994)	- The government immovable asset management act initiate the asset management practices
			- Public finance management act (PFMA) and Municipal finance management act (MFMA) enacted
		- Key Performance indicators (KPIs)	- Key Performance indicators (KPIs)
	Planning	- asset features; asset condition and asset use component	- asset features; asset condition and asset use component
		- use road management systems	- use road management systems
		- use life-cycle analysis procedures as one of the project analysis	- use life-cycle analysis procedures as one of the project analysis
			- differentiate the projects into three classifications
	Plan Execution	- physical treatment and management of use component	- physical treatment and management of use component
		- unit cost contract, performance contract, in house maintenance operation and PPP (for toll roads)	- unit cost contract; performance contract; PPP (for toll roads)
			- Routine road maintenance manual and statutory control guideline manual
	Verification	- asset management strategy	- appraisal on agreement between nDoT and SANRAL
PROCESS OF ROAD ASSET MANAGEMENT	*Basis*	- Road asset management guidelines	- Road asset management by nDoT (under development)
		- use road management systems	- use road management systems
	Responsible Organization	- asset management manager in road authorities	- SANRAL as a prastatal
	Process		
	inputs	policies; KPIs; stable budget	policies; KPIs; unstable budget
	developing standard	- road infrastructure performance target (KPIs)	- Key performance indicators (KPIs)
	/guidelines		- Strategic appraisals
	maintenance program	- Funding strategy	- Structured and validated information & analysis tools
		- Needs and priorities	- Road management system
		- State road referencing system (SRRS) as asset inventory for Victoria state	
	implementation	- Annual work programs	- Service delivery
		- Customer issues	
		- unit cost contract, performance contract, in house maintenance operation and PPP (for toll roads)	- unit cost contract; performance contract; PPP (for toll roads)
	auditing	- road condition survey	- basic information for asset inventory update and analysis tools
		- audit of completed works	
	reviewing	- Benchmarking	- Selected information and KPIs achievement
		- gap analysis	

Lesson learned from both countries in their road asset management are:

- Separated the ***policy functions from the implementation function***

  Legislation could change the organization culture by reorganizing the structure of organization. Australia established the road asset manager which responsible for the road asset management in each state and territories road authorities. South Africa chooses to establish the parastatal company which is a national company under the nDoT. Those actors represent the implementation function of road asset management while NDoT and road authorities keep the policy function.

- Using ***Medium term expenditure*** for road fund

  Both countries used medium term expenditure in 3 years for road asset management. Australia could be more precisely about the road performance target which is at least 10% resurfacing of road network annually because of the relative fluctuating road fund. Conversely, South Africa has to set up 3 years appraisal agreement between government and SANRAL to deliver amount of money for the road performance targets. Medium term expenditure gives the road authorities certainty for road fund and leaves the policies and targets in the legislative and political area.

- Enacted the road ***key performance indicators*** as well as the ***tools for analysis***

  Either Australia and South Africa has enacted the road key performance indicators, nevertheless some of the KPIs in South Africa is still under development. In road planning analysis and reviewing, they used the road management systems tool, life cycle approach, performance based contracts, benchmarking, and gap analysis.

Chapter IV Current Practices in Indonesia: Road Management

The study case of Indonesia in pursuing asset management will be described in this chapter. In the section IV.1 we will be given an overview of road management in Indonesia based on its context. Indonesian context will be discussed in term of history, funding and possible drivers that could push asset management into surface. Further in the section IV.2, Indonesian road management actors will be mapped. Continually, we will describe the road management organization and their management in practices in section IV.3. All the information in this chapter will be useful for our analysis in the next chapter.

As Indonesia has not implemented asset management, we cannot assort the previous section from chapter III to Indonesian case; nevertheless we will use actors, component, organizational and management that already exist to describe the current road management practices in Indonesia.

IV.1 Context of Indonesia

Indonesia is the largest archipelago in the world. It is made up of 17,550 islands and lies in the equator. Proportion of population distribution in each region differs markedly; Java Island represents only 7.2% of the country's area but account for 58.6% of the population (BPS, 2004). The road provision distributed unevenly; whereas the Sumatera, Java and Bali Islands represent only 31% of Indonesian area, those islands have more than 70% of road network (Junoasmono, 2009). Indonesian national road spread can be seen in figure IV.1. The Indonesian road network consists of National, Provincial, Regency and Urban roads.

Currently, Indonesian's national road networks are managed and maintained by the Ministry of Public Works (MPW), specifically by the Directorate General of Highway (DGH). Regarding its role, DGH established 10 national road bureaus and placed throughout Indonesia. Provincial, regency and urban roads are tackled by the provincial government, regency government and city government. In our case, we will focus on describing the national roads.

Figure IV.1 Indonesian National Roads

Source: DGH, 2010

History

Road development in Indonesia started in the 19 centuries with the construction of Anyer-Panarukan highway. This highway connected West Java and East Java and became the origin road network system in Java Island. After the Independence Day in 1945, road development becomes one of the government priorities which are more related to the social and economic consideration. The trans-road network system built for several island in Indonesia to achieve that goals such as Trans-Sumatera; Trans-Kalimantan; Trans-Sulawesi; Trans-Halmahera; and Trans-Papua.

The first legislation related to road in Indonesia is the Act No. 3/1965 on traffic and highway transportation. Since this act is mostly related to traffic and transportation, the road act actually released in 1980 (Act No.13/1980). Road act in 1980 stated the road authorities, road status and road maintenance. Road act reformed in 2004 with the administrative decentralization inputs. Act 38/2004 on roads represents the decentralization concept which redistributes authority, responsibility and financial resources for roads to all level of government.

Road management in Indonesia also has been evolved; the commencing of road management system stated in 1980s is mean to assist government in design, implementation, improvement and maintenance in road works. The development of road management system in Indonesia closely related to funding resources notably World Bank. Over the last 20 years, almost all road agencies in the world

have implemented some form of road managements in computerized manner including Indonesia. Therefore, those road management systems in Indonesia also have been integrated with the computerized manner.

According to Public Works Ministerial decree no.376/KPTS/M/2004 on national roads stipulation, the national roads is 34,628.80 Km. Provincial, regency, and city roads length varied based on the proliferation of administrative region. National roads conditions are better since the reduction of very poor condition, but on the other hand the fair and poor condition becomes bigger (table IV.1). Indonesian national roads condition from 2005 till 2008 is as follow.

Table IV.1 Indonesian National roads condition

Road Condition	Road Length							
	2005		2006		2007		2008	
	Km	%	Km	%	Km	%	Km	%
Good	10.873,40	31,40	10.956,60	31,64	11.905,40	34,38	11.620,10	33,56
Fair	17.037,40	49,20	17.314,30	50,00	16.565,70	47,84	17.200,90	49,67
Poor	2.874,20	8,30	3.210,10	9,27	3.232,70	9,34	4.617,90	13,34
Very poor	3.843,80	11,10	3.147,80	9,09	2.925,00	8,45	1.189,90	3,44
Total	34.628,80		34.628,80		34.628,80		34.628,80	

Source: DGH, 2010.

Possible drivers for asset management

Road management in Indonesia evolved in line with the practices all over the world and the internal conditions of Indonesia. Indonesian road agencies recently struggle to balance competing objectives such as maintaining and developing road and bridge networks; staying within severe budget constrains; satisfying political objectives; and meeting demand by road users (Hede, 2001). To overcome these problems, DGH tried some efforts such as:

- Focus on the output and outcome

  In general, planning in Indonesia especially in roads used to have an input approach till 2009. Input in terms of budget used as a benchmark for evaluation. In 2010, DGH restructured its approach to output and outcome approach for road planning (DGH, 2010b). Based on that, the restructured program also happed in DGH with the implementation of Medium Term Expenditure Frameworks (MTEF). DGH tried to use the rolling multi-years budgeting process (MTEF) and performance-based budgeting (PBB)

in order to enhance budgetary effectiveness and efficiency (Peterson, 2011).

MTEF and PBB determine the apparent relationship between activities and specific government organization unit; give responsibilities to the managers to control the program implementations; make the managers to fully responsible for the achievements of the units; and create a clear relationship between the national policy goals and local implementations (IndII, 2010).

- Enacted the pending Acts

  Act no. 17/2003 on state finance; Act no. 1/2004 on national treasury; and Act no. 15/2004 on state audit have been pending for several years because most of ministries in Indonesia have not established their organization to adapt into these new legislations (Peterson, 2011). These acts introduced again in 2010 and some ministries will try to implement them in 2011.

- Performance indicators

  In line with the reformation of legislation in budget (Act 17/2003; Act 1/2004 and Act 15/2004), government regulation no 60/2008 on internal control for government organization also enacted. Ministry of public works issued the ministerial directive no 2/IN/M/2011 on the implementation of the government regulation for ministry of public works. In addition to that, the ministerial decree no 14/PRT/M/2010 on the minimum service standard on public works activities also used for the bureaucracy reform in DGH (DGH, 2010b).

In Indonesian case, the establishment of accountable for public fund spending and minimum service standard has been a new reform in road management in Indonesia. This driver will make the asset management possible in Indonesia, as in other countries like Australia and South Africa the same legislation has pushed government to deliver their services effectively.

Road funding

Road development in Indonesia firstly depended on the domestic resources including state financial. The booming of oil price in 1970s gave a significant budget for developing and maintaining road, road quality in Indonesia was generally confined at that time. Since the budget for road development and maintenance keep increasing and state financial become decreasing, some of the loan agreement enacted to pursue the road development and maintenance.

Financing in road maintenance is very crucial. Almost in all developing countries, road maintenance expenditures are below the level needed to keep road network in stable long-term condition. Most road expenditures are still financed from general taxes revenue, donor financed loans and grants (Heggie, 1995). In most developing countries, fund for road management are allocated as part of the annual budgetary processes. Under this arrangement, each ministry must compete for funds during the annual budget negotiations. In this situation, government will prioritize the program that can give highest economic return (Heggie, 1995). Indonesia in particular also has the same problem with what has been stated by Haggie. Indonesia enacted melting pot system in its national revenue system and MPW has to compete for roads funds.

Financing of road maintenance in Indonesia are based on the status of the road. National road is funded by the central government. National roads in Indonesia get its funds from state budget (Anggaran Pendapatan dan Belanja Negara=APBN). In the Government Regulation (GR no. 34/2006) also declared that financing of province road or regency/city road can be done by the central government with certain provisions.

Over the past decades, Indonesia has invested significant amount of fund for roads but it is still not clear that it has received proportional return. Road development is still the major expenditure in national roads (see table IV.3). It is why the national road condition (table IV.2) could not have an increasing of good condition. Road development is needed in Indonesian case in order to increase the economic growth. Besides that, the development of roads still needed because as a broad country, most of Indonesian regions still have not got suitable roads.

Table IV.2 Indonesian national road expenditure

	Year				
	2005	2006	2007	2008	2009
Expenditure on (billion Rp)					
Good governance	-	42,00	241,00	382,00	465,00
Emergency	-	-	-	-	508,00
Road and bridge preservation	1.349,00	1.648,00	2.676,00	3.004,00	5.330,00
Road and bridge development	4.004,00	5.254,00	6.594,00	11.696,00	10.703,00
Total	5.353,00	6.944,00	9.511,00	15.082,00	17.006,00

Source: IndII, 2010

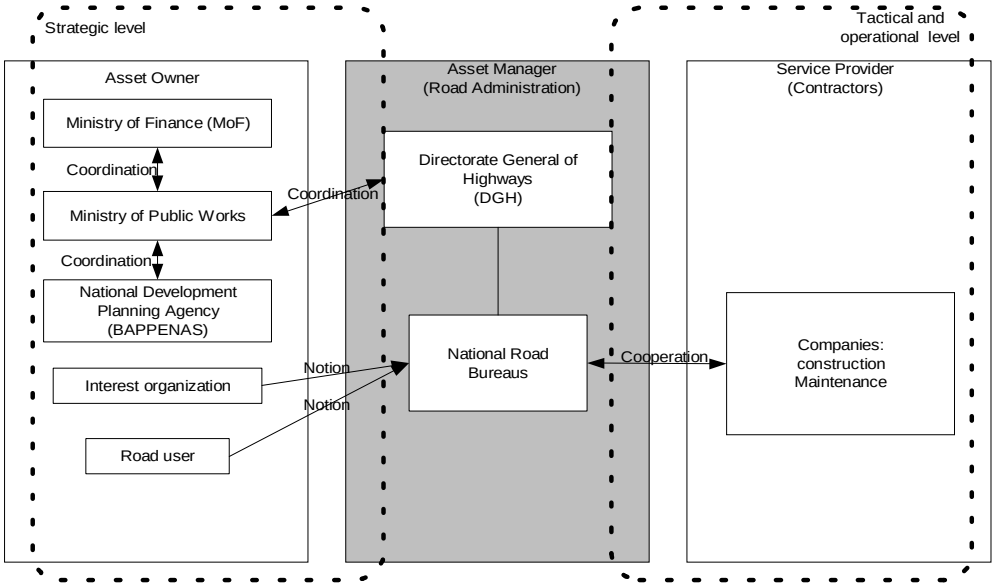
IV.2 Actors in Asset Management

In Article 30 paragraph (1) of Act No: 38 of 2004 explicitly stated that the organizer of the road is Directorate General of Highway (DGH) which responsible for implementation of national road infrastructure. Road agencies must prioritize maintenance, and periodic road maintenance to maintain the level of road service in accordance with minimum service standards that have been defined.

DGH is forming national road bureaus regarding its responsibilities. National road Bureau is formed based on the Regulation of the Ministry of Public Works No.14/PRT/M/2006 on Organization and Administration Implementation of National Road Bureau which has a function to carry out planning and technical supervision, execution of construction, operation and maintenance control, quality control and service, provision of materials and equipment and corporate stewardship organization. The coordination between nation road bureaus, DGH and MPW did in the vertical coordination inside MPW organization.

Besides the vertical coordination inside the MPW, MPW also coordinate with Ministry of Finance (MoF) especially the Directorate General of Budget in term of road fund. MPW not only coordinate with Ministry of Finance but also coordinate with the National Development Planning Agency (Bappenas). This coordination is to collaborate the national goals and target such as the National Government Work Plan (RKP= Rencana kerja Pemerintah). The strategic road plan is constructed between those actors (Figure IV.2).

Figure IV.2 Indonesian national roads actors



Interest organization and road users in Indonesian case did not have a significant contribution for the vision building in road. Interest organization and road users have a strategic level in the annual planning roads implementation through national road bureaus (see figure IV.2). They take part in the beginning of the annual planning process which is called as Public dialog for development plan (Musyawarah perencanaan pengembangan=Musrenbang).

DGH as the asset manager distribute some of its responsibilities especially in the road maintenance and development to national road bureaus. DGH has to achieve the national road plan while at the same time receive input for annual planning from road users and interest organization through national road bureaus. The tactical level of DGH determined the annual work plan for road development and maintenance and delivered it to national road bureaus. National road bureaus did the operational of the annual work plan for roads in each province. Together national road bureaus and construction companies execute the road planning and act in the operational level.

IV.3 Road Management

Road management in Indonesia in this section will be drawing in the organizational structure which contain of strategic, tactical and operational level. In this section, we also describe the management of roads in total quality

management which entail plan, do, check, and act. Road management in Indonesia describe with organizational and management because the process of road asset management is still under development, in that sense we will describe the characteristics of asset management as in chapter II. By describing the organizational and management in Indonesian road management we can figure out the possibilities for adopting road asset management.

IV.3.1 Organizational

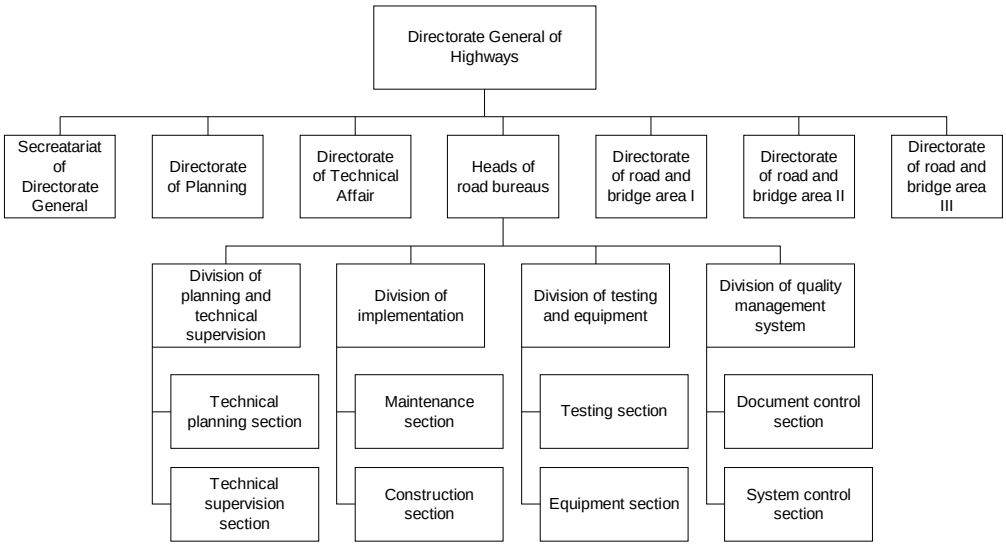
In the strategic level of road in Indonesia, the main vision of road is to provide the sustainable, integrated and reliable road network to fulfill the social welfare and economic growth for Indonesia. As been stated before, the strategic level of roads in Indonesian case only represents limited actors which are government organizations. Inputs from other stakeholders related to road management are still limited in the annual planning of road implementations. Unfortunately, the annual planning usually will influence the target of government in which inputs for annual road management will be used from the users' perspectives. The inability of government to accommodate the users' recommendation in the annual planning will come to the decreasing of distrust in government from the road users.

The tactical level of national road management is still in DGH responsibility. As been stated in the Act no. 38/2004 on roads, DGH has the responsibilities in organizing national road management, setting strategies and policy target in national roads. DGH published its medium term strategic plan every 5 years. The recently reformed of legislation and organizational in government especially in MTEF have a good motivation in the implementation of medium term strategic plan of DGH. The commitment of other actors in strategic level especially for the availability in budget will give tactical level certainty in implementing its medium term strategic plan.

National road bureaus are the operational level of DGH. As in figure IV.3, the planning division in national road bureaus collaborates with the directorate of planning in DGH to meet the road plan for 5 years. In the operational level, national road bureaus focus on the management systems in which corporate the other actors (Construction Company). In the national road bureau organization

structure, we can see division of responsibilities for road management implementation. Unfortunately those national road bureaus have not integrated in one manager, they coordinate in term of their region in the directorate or roads and bridge area I, II and III (figure IV.3).

Figure IV.3 The organization structure of Directorate General of Highways



Construction Company usually coordinated with the implementation division. Besides, the construction companies also collaborate with other division in term of legal formal activities, technical planning, technical supervision and availability of road equipment.

IV.3.2 Management

The management of road which represent plan, do check and act is part of the important aspect in road asset management implementation. Planning in the national roads for Indonesia happened in the two phase. Firstly, the strategic road plan derived into annual plan. This planning based on the IIRMS which contains roads and segments conditions for maintenance and development. Road and segment condition came from the road condition update which is handling by the DGH. IIRMS as a road management tool is only part of the road management system that will be used in asset management. Secondly, planning in national roads came from the MUSRENBANG. Mostly, annual plan in national road plan is trying to accommodate the MUSRENBANG output. This brings the planning of

national roads in the manual system by combining output with the spreadsheet to estimate expenditure (IndII, 2010).

In the "do" phase, national road management previously engages unit price contract with the contractors. As the minimum service standard for roads and performance based indicators has been introduced in DGH, the directorate of technical affair is currently undertaking two pilot projects using the performance based contracts (PBCs) on 30 Kilometers of national highway (Miller and Henning, 2011). PBCs tend to shift the focus toward maintenance, because they make it possible to secure long-term funding for the maintenance of a particular network, and they establish an understanding that the asset will be maintained at a pre-determined level of service.

Previously, DGH did the check phase in the input approach in accordance with the financial audit in Indonesia. Budget used as an input for evaluation. The newest reform of state audit will be in line with the performance based evaluation. The input evaluation will not be suitable for the performance based indicators. Check phase in DGH activities for roads should be based on the performance indicators and performance targets which should be achieved in the medium term. The agreement between strategic level actors and tactical level actor in term of the performance will be the main basis and continued in the next phase. DGH should be act based on the check result to establish a new or reformed the previous performance targets and policies.

IV.4 Notations in Indonesian case

We have described the road management for national roads in Indonesia. Some of the important things we could get from Indonesia regarding road management are:

- Strategic actors in organizational level have not been legalized as well as organized. Strategic actors (society and interest organizations) give input in the tactical and operational level of road management. Indonesian case is almost the same with South Africa case, although in South Africa the strategic actor has been established completely.
- Medium term expenditure framework is being introduced in Indonesia. MTE also has been enacted in Australia and South Africa as part of the performance

based evaluation. This is a breakthrough for a performance based evaluation in Indonesia rather than input evaluation. In line with it, the performance based also represents the key performance indicators (KPIs). Indonesia has not been enacted any KPIs for their road performance, but the minimum service standard for roads has already enacted. This minimum service standard is only an appraisal of road without a certain target that should be achieved in a certain time frame (see appendix c). Nevertheless, this minimum service standard could be enhancing into key performance indicators for roads in Indonesia with certain adjustment.

- IIRMS as a tool in road management has been exist in Indonesian road management. This tool could help road administration in their road management plan. Unfortunately, Indonesia has not maintained inputs for this tool; therefore it cannot function as much as it should be. In Australia and South Africa, road management system has already functioned as it is.

Those situations have been notice in Indonesian road management practices. Based on current situation in Indonesia, road asset management has an opportunity to be implemented in Indonesia. In order to adopt road asset management, we will bring up lesson learned in Australia and South Africa along with the literature review of road asset management on next chapter. Further, next chapter will also answer what should Indonesia do in order to adopt road asset management based on their context.

Chapter V Adopting Asset Management and Strategies for Road Sector Implementation in Indonesia

In this chapter we will discuss Indonesian case related to the asset management practices that already been done in Australia and South Africa and literature review on the road asset management. Firstly we will describe the road management and the newly indication of road management reform in Indonesia. Lesson learned from Australia and South Africa combine with literature review will describe Indonesian possibility on adopting road asset management. Secondly we will try to see the strategies that could be used in order to take Indonesian road asset management into take off position.

V.1 Lesson learned from other countries for adopting road asset management

The road management in Indonesia is ready to take into the next step of road management into road asset management. Australia and South Africa as countries that have already enacted road asset management could give a better understanding in the preparation and implementation of road asset management. In line with that, we will discuss the effect of current situation of actor, component and process of asset management in Indonesia related to the road asset management practices.

Actors

Road management in Indonesia has been conducted in many years and previously has been explained thoroughly. The actors of road asset management in Indonesia could be identified as in other road agencies organization such as Australia and South Africa. Australia and South Africa has their legal organization for the strategic actors while in Indonesia, some actors has not been legalized. In literature review, we can see user as a strategic actor contribute in the strategic plan of road as well as an evaluator of program. Australia has been done this part by legalized Australian Transport Council (ATC) and their role in the strategic level of road plan. Moreover Australia also uses a key performance indicator

which is user satisfaction index to evaluate road program in the user perspective. South Africa case shows South Africa Road Federation (SARF) as user organization have an elective role in the strategic and under development of user satisfaction performance indicator.

The strategic level of actors in Indonesian road asset management is mainly a coordination of the executive (government) areas. The strategy is represented by the Directorate General of Highways (DGH) vision which accommodates the national goals that have already stated by the National Development Planning Agency (Bappenas). Before the Medium Term Expenditure Framework (MTEF) introduced in road management for national roads; roads fund is determined in the consultation between parliaments and executives (DGH and Ministry of Finance). Mostly the DGH needs is higher than what they get annually. It is because the road fund will compete with other sectors to get fund from Indonesian melting pot finance system. This situation is the same as South Africa conditions before the establishment of MTEF budgeting system in South Africa. While in Australia, the earmarking system gives a stable road fund for the road authorities.

The newly introduce MTEF in roads for Indonesia is a beginning of created a situation to separate the strategic level with the tactical level. The MTEF which also has been enacted in Australia and South Africa has benefits including giving the strategic actors to be more concern in the policies and regulations areas rather than focusing on the tactical especially the budget for annual programs. The MTEF budgeting system in road for Indonesia is still in progress, because the changing system from the budget evaluation to the performance based evaluation will be enacted in line with it.

In order to implement the MTEF system in the DGH, a well defined organization should also be established. National road bureaus as the subordinate organization of DGH today represent as the implementation agent for road management. But as the Musrenbang consolidate the annual road plan did in each region, National road bureaus also did the strategic level of road authorities organization which is to bring the users inspirations for the strategic road plan. National road bureaus planning division work for both the strategic plan and tactical plan of roads simultaneously. It is clear that DGH has to reorganize the road management

organization to fulfill the MTEF system. In addition, key performance indicator from user perspective should be clear enough to be one of the evaluation indicators for road program.

At the operational level, all of our case indicates several types of contract for road maintenance which are unit cost contract, performance contract, in house maintenance operation and public private partnership. Operational actors which are contractors are binding cooperation with tactical actors based on performance based or other legislations. In table V.1, we will see the comparison of actors in our cases.

Table V.1 Comparison of actors in road management

	Australia	South Africa	Indonesia
Strategic actors	Completed and legalized actors	Completed actors and part of them are legalized	Incomplete actors and has not been legalized
	Actors are:	Actors are:	Actors are:
	Road agencies	Road agencies	Road agencies
	Interest organization	Interest organization	Other executives
	Road users	Road users	Road users
Tactical actors	Road asset manager in road authorities	Road asset manager in parastatal	Road agencies (national road bureaus)
Operational actors	Contractors and road authorities	Contractors	Contractors

From road asset management literature review in chapter II, we have seen that road user also involve in the evaluation of tactical actors program by contributing in the evaluation of road performance. In our case, Australia is the only case that has enacted it. South Africa is still in developing their road user satisfaction evaluation. While in Indonesia, evaluation remains in the input/budget factor.

Component

In chapter II, we have discussed component of asset management from three forefront organizations in asset management. We also choose the component of asset management from Federal Highway Administration (FHWA) as an appropriate and holistic component from others. Their component entails policy development, planning, plan execution and verification. Based on that, we will discuss component in Australia, South Africa and Indonesia.

In the component of asset management for Indonesian case; MTEF budgeting process, budgeting legislation acts, and minimum service standard for public works are the entry point in the asset management policy development for Indonesia. The policy development entry points are also visible in the case of Australia and South Africa when they tried to implement the asset management for roads. Those policies also simultaneously collaborate with asset management guidelines, key performance indicators and other policies are bringing asset management into practice.

The planning component of road management in Indonesia merely depend on the public consultation (Musrenbang) and gives less space from the IIRMS result as the road management tools that already developed. This situation evolves in the decentralization era, in which stakeholders in each region is trusted to know more about road conditions than the central government. While in the same time IIRMS as the road management tools could not provide a legitimate database because lack of financial support for updating its database. It is why the annual road plan in Indonesia is more depend on the Musrenbang result.

Moreover, in the input (budget) evaluation for programs in roads previously has put the planning of roads to be concern with the 100% of realization of programs rather than in its road life cycle and performance. In that situation, government culture is to find representative programs from regional stakeholders' inputs and at the same time figure out the appropriate and implementable programs. On contrary, the asset management practices in Australia and South Africa has moved the planning into more new public management areas. Using the road management tools and business orientation, road asset management in Australia and South Africa has been able to enacted road asset management. Road user intervention in those countries has been represent in the strategic level, while in the tactical and operational level road users role is as the evaluator which is to give feedback by key performance indicators from road users perspective.

Indonesian planning execution component entail the unit cost contract and in house maintenance. Unit cost contract choose in line with the input (budget) evaluation system. In house maintenance will be done by each national road bureaus with reflection of equipment and human resources availability. In hailing

the MTEF, DGH in 2011 enacted two pilot projects which used the performance based contract (PBC). The PBC has been proved to be effectively done in the Australia and South Africa asset management case. Pakkala (2005) noted about 10-40% cost saving in Australia performance based contract compare to unit cost contract. PBC support the MTEF budget system and in line with the KPIs by concerning on road performance along its life cycle.

Verification component in Indonesian road management usually did in the reflection of budget review. Project review will compare the unit cost standard with project contract and did by the internal and external inspectors. In the asset management component that already discussed in chapter II, the verification is one of the important aspect in which asset manager will get input for future development in policy and management. Monitoring and verification of programs will bring inputs for renew or new policies in the strategic level as well as the operational level. Either Australia or South Africa used KPI, maintenance strategies and user feedback as their tools to monitor and evaluate the asset management practices (see table V.2). Even in Australia, they have established the benchmarking evaluation which could evaluate each state road asset management practice with others. In Indonesia case, KPIs have not been part of the verification. The minimum service standard developed in Indonesia case could be the foundation of KPI. Taking into account KPIs in Australia and South Africa case will enhance Indonesian minimum service standard. Nevertheless, the minimum service standard is still premature, in which it contain only the physical aspect of evaluation for road and bridges. Minimum service standard should be enhancing to KPIs in order to be more integrated and holistic. Table V.2 will describe the comparison between components in Australia, South Africa and Indonesia.

Table V.2 Comparison of components in asset management

	Australia	South Africa	Indonesia
Policy development	- Medium term expenditure framework	- Medium term expenditure framework	- Medium term expenditure framework
	- Budgeting legislation act	- Budgeting legislation act	- Budgeting legislation act
	- Road asset management guidelines	- Key performance indicators	- Minimum service standard
	- Key performance indicators		
Planning	- Road management systems	- Road management systems	- Public consultation (Musrenbang)
	- Business orientation	- Business orientation	- Availibility of roads
Plan execution/ implementation	Unit cost contract, performance contract, in house maintenance operation, and public private partnership	Unit cost contract, performance contract, and public private partnership	Unit cost contract, performance contract (pilot project), in house maintenance operation, public private partnership
Verification	- KPIs	- KPIs	- Budget
	- Maintenance strategies	- Maintenance strategies	
	- User feedback	- User feedback (being develop)	
	- Benchmarking		

As been described in chapter II, almost all components of asset management have appeared in Indonesia case. The main pitfall in Indonesian case is the lack of condition assessment and performance modeling that should be integrates in the planning component. Either Australia or South Africa has integrated the condition assessment and performance modeling in their road management systems which applied in the practice. Another component that should be integrated in Indonesian asset management is the performance monitoring which is part of the verification. Budget verification is not enough for representing the project/program performance but need to include the performance indicators and user feedback.

Process

Process of asset management is different in Australia, South Africa and Indonesia. Australia is the most developed road asset management process between them. By enacted the process into guidelines, Australian road management process is a general process for road management. South Africa also has their road asset management process although it is not legalized into guidelines or law.

The process of road management in Indonesia has not enacted road asset management. In this condition, we will relate the management and organizational characteristics of road asset management. Those characteristics are fundamental part of the asset management process that already explained in chapter II. Besides, Australian case and South Africa case in building their road asset management process will be a lesson learned for Indonesia.

The management characteristic in process asset management mostly did in the PDCA cycle. Planning in Australia and South Africa for road plan is same with Indonesian planning. Tactical actors recommended several programs in medium term years and discussed with the strategic actors. In Indonesian case, the medium term program usually distract along with the MUSRENBANG which is held annually. Australia and South Africa has stable medium term program rather than Indonesia because strategic actors and tactical actors have the agreement in road management plan. For South Africa, SANRAL even do the contract to achieve certain performance target for roads.

Road management in Indonesia as a cycle process has taken into account since the establishment of IIRMS as a tool. Planning, programming, budgeting has been included in the IIRMS system. The process of asset management in general is a complete process from the policies, goals and budget constrain until the implementation as well as feedback for the next process of road management. IIRMS as a tool is only part of the road management in general. IIRMS could not represent the strategic level of management in which the policies, goals and budget element produced. Nonetheless, IIRMS as a road management tool could help the process of road management to answer the tactical question which is "what is worth doing". Australia and South Africa also has the road management systems to support the asset management process. In Australia (Victoria) road management system is called as state road referencing system which includes some other management system, whereas in South Africa it is called road management system. Road management system in Australian and South Africa also has integrated with other management system.

Management in Australia and South Africa regarding do, act and check is more complete rather than Indonesia because those countries already enacted KPIs.

Based on KPIs, every decision making in the implementation will be review either physical of roads or in user satisfaction index. But in the implementation of road program; Australia, South Africa and Indonesia conducted the same methods which are in-house maintenance, unit cost contract, public private partnership, performance contract. Indonesia is still in the beginning of introducing performance contract in their implementation.

The process of asset management in the organizational has been explained in line with the actors previously. The divisions and sections of Indonesian national road bureau as in figure IV.3 have the component of the plan, do, check and act cycle. These division and sections will be organization's strength in order to implement the road asset management. The collaboration in strategic, tactical and operational level of organization will bring a long term strategic goal and do the things right in the operational level. Strategic level organization should be concern in the long term direction, goal setting and decision making rather than in detail of resources and day-to-day maintenance management and work delivery responsibility.

V.2 Strategies for implementation in Indonesia

In pursuing road asset management, Indonesia tries to use the administrative arrangement predevelopment strategies. Australia and South Africa experienced the same phase with Indonesia. The reformation in public expenses changes the road management and enacted road asset management. In order to smooth the transition to road asset management, Indonesia should learn the resistors that will barrier the implementation of road asset management. On the other hand, overcome the resistor with certain strategy will accomplish Indonesian road asset management. Barriers in adopting road asset management for Indonesia could be caused by the legalization of actors, incomplete policy development, and lack of skilled human resources.

The barrier in the strategic actors for road management in Indonesia could be handling with the MTEF system and reformed the strategic actor in the legislation as in the Australian case. The Australia has legalized the strategic actors which represent all the stakeholders in road management. To that purpose, Indonesia should integrate all the stakeholders and put them in an organization that could be

representing all stakeholders. In Indonesian case, a lot of interest organizations for roads should be synchronized to have a same vision for future roads. The legalization of the organization will be used in the strategic road plan assessment which setting up the medium term performance of roads. Therefore the MTEF system will be useful and running if there is a well organized between strategic level and tactical level.

Policies development for Indonesian road management could not stand only on the MTEF itself. MTEF should be integrated with the performance measurement such as key performance indicator and performance based contract. Minimum service standard in Indonesia only represent part of the key performance as have been developed in Australia and South Africa. Policy development will still develop from the reviewing and verification of management, in which it will find a flaw of management and improve the existing policies. In South Africa, policy development also related with the law enforcement in road.

Indonesian national road bureaus have possibilities to be an organization as SANRAL in South Africa or Asset Manager in Australia. Focusing on the implementation of road management and act as a private organization which tackle in the PDCA cycle will enhance these bureaus capabilities. Nonetheless, the human resources and technological barrier could shadow the national road bureaus. Qualified human resources are needed to operate the road management system (IIRMS) that have already existed and integrate this management system with other management systems. In addition, it needs time to change national road bureaus management culture in doing its management. The modifications in national road management bureaus also influence the contractors. Contractor management will need to adjust to the new type of national road bureaus organization and improved their skilled staff.

Above of all the barriers in Indonesian case, solutions which are the strategies in adopting road asset management in Indonesia should be integrated with the good governance practices. Indonesia is still struggle to leave behind the collusion, corruption, and nepotism that has been government culture previously. To that purpose, road asset management will still include the good governance legislation in order to avoid those government cultures.

To summarize the strategies for adopting asset management in Indonesia, we can put them in the next table (table V.3). In glance, adopting road asset management seems to be focus on the preparation during the development, but it is also related with the activities in implementation and post implementation. Therefore we can divide our strategies to adopt road asset management into three steps of action. First is the preparation during the development of road asset management. Mainly the strategies are to develop some policies regarding asset management. In addition, the establishment of defined organization for road actors should be enacted. Nevertheless, the existing system should not be replaced entirely. Government should sort out all the organization and system regarding road asset management including human resources and technologies inside the organization and system.

In the implementation of road asset management, government need to focus on preserving database of roads for IIRMS tools as well as quality assurance and quality control programme. The KPIs as one of the quality control could be varied either physical of roads or immaterial of roads. Thus, the implementation of road asset management will change the culture in public organization which takes time to be effectively running well.

Although asset management has not been enacted, Indonesian government should aware of the problems in the post implementation of road asset management. Monitoring for internal and external change is needed to provide input for the policy development and system improvement in the future of road asset management. As a new introduced culture in road management, road asset management will not eventually show the result. In South Africa case, they took about 4 years for settling in the road asset management system.

Table V.3 Strategies in predevelopment, implementation and post implementation of road asset management in Indonesia

Stage of Asset Management	Strategies/Actions
Development	• To keep on reforming legislation (policy development): o legalized the strategic actors, o measurable agreement between strategic and tactical actor, o Key performance indicator, o performance based contract, o law enforcement, • A well defined organization: strategic, tactical and operational actors should be defined its rights and obligations properly • Beware of replacing existing system, focus on enhancing system. • Human resource and technology development
Implementation	• Preserve and cleanse legacy data • Continuous training • A quality assurance and quality control programme.
Post implementation	• A new public management culture will not directly show the result but it will gradually improve. • Ongoing monitoring of internal and external change.

Chapter VI Conclusion, Recommendation, and Reflection

In this chapter we will conclude and summarize the research as well as suggestion for further research. In section VI.1 we will conclude all the discussion from previous chapters and also these will be the answer for all the research questions in this thesis. Furthermore, we will use them as the basis for recommendations in section VI.2. To complete the research, we will describe the further research in section VI.3.

VI.1 Conclusion

This research was started by an indication of road management problem in Indonesia. The road management practice in Indonesia could not bring a significant improvement in road conditions over the past decade. Therefore this research was aimed to understand the management of roads in Indonesia and the possibilities to adopt the road asset management for the future of road management in Indonesia.

In order to answer the research objective, this research question is raised which are:

q1. *What is the development processes in managing road asset historically; what are the component, process and benefits for applying asset management; what is the framework of asset management in road sector;*

Managing road asset has been evolved from the 1950s, the evolution of road management are pavement management system, bridge management system, infrastructure management system and asset management system. In the literature review, we explained asset management system in term of component, actors, and process. Asset management component incorporate policy development, planning, plan execution and verification. Actors in asset management can be classifying into asset owner, asset manager and service provider. The process of asset management system includes the organization and management level. Organizational level entails strategic, tactical and operational level, while management level entails total quality management (Plan-do-check-act) cycle. Actors role are influenced by the organizational level while the component of

asset management blended into management level. The interrelationship of organizational level and management shape the asset management into asset management framework.

q2. *What are the current practices of road asset management in developed and developing countries?*

Road asset management has been well known in practices for developed countries such as America, UK, Australia and many others. In developing countries, there are only few countries that enacted road asset management, among them is South Africa. In Australia, asset management practice in the road authorities with an asset manager role while in South Africa road authorities separate from the road asset manager. Choices are made based on the budget and legislation context. Both countries has been enacted medium term expenditure, key performance indicators, road management systems, and total quality management. Nevertheless, Australian road asset management is more complete in legislation and guidance rather than South Africa for example the key performance indicators.

q3. *How is the road management in Indonesia being implemented, who are the decision makers' inroad sector for Indonesia?*

Indonesian road management conducted in democratization euphoria; in which mostly annual road plan depend on public consultation. The road management system which is IIRMS could not operate significantly because of unskilled human resources and out of date database. Indonesian road management actors have not been representing a good interrelationship. Government organization, interest organization, road user and construction company identify as the decision maker for Indonesian road management. As been noted in literature review, interest organization and road user included as decision maker in strategic level, but in Indonesian case those actors only influence the tactical and operational level.

q4. *How could road asset management system implemented in Indonesia* and *what are the strategies and resistors factors in Indonesia context?*

Recently, a new legislation of medium term expenditure in Indonesia embarks the possibilities in adopting road asset management. Policy development

predevelopment strategy also appears in Australian and South Africa case. This new legislation has been followed by the pilot project of performance based contract and minimum service standard for roads. Those legislations itself could not complete the road asset management in Indonesia, several actions has to be done namely enhancing the policy development, restructuring the road organization, developing human resources skill and technology, developing quality control, monitoring and evaluating scheme.

In the short term which time frame is during the development of road asset management, enhancing policy development and restructuring road organization will be focus on. Policy development and restructuring road organization includes the legalization of strategic actors and their role, key performance indicators establishment, and law enforcement in roads. Indonesia could use national road bureaus as the asset manager. Asset manager in a road authority's organization could be effectively implemented as in Australia. Besides, national road bureaus have been reflect the total quality management in their divisions.

Three of the latest actions could be classified as the long term actions which include actions during the implementation and post implementation of road asset management. Developing human resources skill and technology is needed for the maintaining and operating IIRMS. In line with it, developing quality control and monitoring as well as evaluation actions should be tackled. It is also noted that in Australia those actions evolve in accordance with the road asset management practice. Australia has used the life cycle approach, benchmarking and gap analysis for the quality and evaluation actions.

VI.2 Recommendation

The policy development that already enacted recently either in the financial system or in the performance based is one of the effort from government to bring asset management into practices. Nevertheless, policy development should not be stagnant in that process. More policy development should be enacted and released. It is recommended that government could enhance the policy development to pursue the performance based. In line with it, the reorganization

of road actors in Indonesia is needed in order to effectively deliver road asset management.

Government is recommended to keep on policy development in the frame of road asset management development. Besides the policy development, government should consider to upgrade its organization and managerial system. The strategic, tactical and operational level in road organization should be clear enough in their rights and responsibilities; it could be done in the reorganization of road agencies as well as other road actors. Nonetheless, upgrading human resources and technology should be done gradually to cope with the IIRMS. Because in the road asset management, IIRMS as a tool will be consider as an important tool in determining the road annual work plan.

Several practical agenda that could be done by government are:

- Restructuring national road bureaus into one asset manager organization. A coordinator for all national road bureaus can be established and it acts as an asset manager. Congruent with it, the strategic actors (road users and interest organizations) and their role for road management should be legalized. Humphrey (2003) noted that by dividing responsibility among key entities, it will provide a clear separation between decision makings and carry out the action.
- Established the performance based agenda such as performance based indicators and performance based contract to cope with the medium term expenditure program. In the medium term expenditure, government will be evaluated based on their ability to achieve the performance targets which agreed between legislatives and executives. Therefore, performance indicators should be established to be one of the indicators for performance appraisal.
- Utilization road management systems in road plan for national roads. Nonetheless, human resources and technology should be improved so that road management systems could run well. Training to use IIRMS software for road agencies staff as well as upgrading computer equipments will be the first starting point.

VI.3 Reflection

This research is becoming interesting in using international comparison. Australia and South Africa used road asset management system in their road management based on their context. Therefore, this research focuses on what could be learned from Australia and South Africa asset management process and tries to adopt in Indonesian context. However, because of some different context between both countries and Indonesia, policy development has to be carefully adopted.

Asset management practices spread in a wide range of industries including road. It reflects the new public management for government agencies which requires technical, operational, service, finance, and business specialist (Hastings, 2010). Asset management is a continuous process, in which actors and components blends together. Components as in the literature review are almost the same with the Deming cycle. Deming cycle for asset management appears only in the tactical and operational level, while the components include all the strategic till operational level.

Because asset management is an interaction among several actors in roads, asset management needs to integrate the good governance practice. In the asset management theory, good governance has not been appear as a necessity, it might be assumed that all the countries that will be enacted asset management has already did it. Good governance implementation relate to the actors behavior that found differently in Australia, South Africa and Indonesia case.

This thesis is focused on describing the comprehensiveness of asset management from its actors, components and process. This thesis is still open for improvement because this thesis only discusses the possibilities in adopting road asset management with the lesson learned from other countries. More detail data and indication should be integrated to estimate the future road condition when asset management implemented. This thesis also has not covered the detailed organizational and operational arrangement in public road administration in this case directorate general of highways for example the road funds.

Therefore, for further researches to improve this thesis, it is strongly recommended the following researches such as: the detailed of organizational level related to the rights, obligations and standard operational procedure of the

organizations; determined the first implemented road asset management for national roads by considering the road length, road condition and type of surface for the pilot project; and type of agreement between strategic, tactical and operation of road for asset management.

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APPENDIX

Appendix A Australian Performance Indicators

CATEGORY	INDICATORS	PURPOSE	TARGET
ROAD SAFETY	Serious Casualty Crashes (Population Basis)	Monitor incidents of major safety failures in road system	Serious Casualty Crashes per 100,000 population
	The number of serious casualty crashes per year normalised per 100,000 head of population. Serious casualty crashes are crashes in which at least one person has been killed or hospitalised. The data supplied refers to crashes occurring within the road reserve.		
	Serious Casualty Crashes (Veh-km Travelled Basis)		Serious Casualty Crashes per 100 million veh-kms
	The number of serious casualty crashes normalised per 100 million kilometres of travel. Serious casualty crashes are crashes in which at least one person has been killed or hospitalised. The data supplied refers to crashes occurring within the road reserve.		
	Road Fatalities (Population Basis)		Fatalities per 100,000 population
	The crash experience expressed in terms of fatalities per year, normalised per 100,000 head of population. Fatalities are persons who die within thirty days as a result of injuries received in a crash. The data supplied refers to crashes occurring within the road reserve		
	Road Fatalities (Veh-km Travelled Basis)		Fatalities per 100 million veh-kms
	The crash experience expressed in terms of fatalities per year, normalised per 100 million kilometres of travel. Fatalities are persons who die within thirty days as a result of injuries received in a crash. The data supplied refers to crashes occurring within the road reserve.		
	Persons Hospitalised (Population Basis)		Persons hospitalised per 100,000 population
	The crash experience expressed in terms of persons hospitalised per year, normalised for population. The data supplied refers to crashes occurring within the road reserve.		
	Persons Hospitalised (Veh-km Travelled Basis)		Persons hospitalised per 100 million veh-kms
	The crash experience expressed in terms of persons hospitalised per year, normalised per 100 million vehicle kilometres of travel. The data supplied refers to crashes occurring within the road reserve		
	Social Cost of Serious Casualty Accidents (Population Basis)		$ million cost of serious casualty crashes per 100,000 population
	The social cost to the community of serious casualty crashes per year, normalised for population. Serious casualty crashes are crashes in which at least one person has been killed or hospitalised. The data supplied refers to crashes occurring within the road reserve.		
	Social Cost of Serious Casualty Accidents (Veh-km Travelled Basis)		$ million cost of serious casualty crashes per 100 million veh-kms
	The social cost to the community of serious casualty crashes per year, normalised per 100 million vehicle km of travel. Serious casualty crashes are crashes in which at least one person has been killed or hospitalised. The data supplied refers to crashes occurring within the road reserve.		
ASSET MANAGEMENT	Smooth Travel Exposure	To monitor whether roads are providing acceptable travel conditions	%
	The proportion of travel undertaken each year on roads with conditions above the targeted conditions for those roads.		
	- Smooth Travel Exposure Urban (4.2 IRI)		
	- Smooth Travel Exposure Rural (4.2 IRI)		
	- Smooth Travel Exposure All (4.2 IRI)		
	- Smooth Travel Exposure Urban (4.2 IRI) Auslink National Network		
	- Smooth Travel Exposure Rural (4.2 IRI) Auslink National Network		
	- Smooth Travel Exposure All (4.2 IRI) Auslink National Network		

PROGRAM / PROJECT ASSESSMENT	Return on Construction Expenditure The indicator is a graph showing percentage distribution of programmed expenditures by benefit cost ratio (BCR) range. The indicator is a graph showing percentage distribution of programmed expenditures by benefit cost range. The BCR used is one attributed to the project when the decision to fund it was made.	Monitor the predicted community benefits from road transport and traffic authority programs	% of funds
TRAVEL SPEED	Actual Travel Speed (Urban) Conversion to average actual travel speed (ATS) of aggregation of travel times per kilometre on a representative sample of arterial roads and freeways in the urban metropolitan area (ATT) in order to monitor the impact of the arterial road system on the level of service to road users.	Monitor the impact of the arterial system on the level of service to road users.	km/hr
	Nominal Travel Speed (Urban) Conversion to average nominal travel speed (NTS) of aggregation of nominal trip times per kilometre at the speed limit on a representative sample of arterial roads and freeways in the urban metropolitan area (NTT) in order to establish base system capability for measurement of level of service to road users	Establish a base system capability for measurement of level of service to road user.	km/hr
	Congestion Indicator (Urban) Aggregation of delay per kilometre on a representative sample of arterial roads and freeways in the urban metropolitan area in order to monitor the impact of the arterial road system on the level of service to road users.	Monitor impact of the arterial road system on the level of service to road users.	min/km
	Variability of Travel Time (Urban) Measurement of the variability of travel times on a representative sample of arterial roads and freeways in the urban metropolitan area in order to monitor the impact of the arterial road s stem on the level of service to road users.	Monitor the impact of the arterial road system on the level of service to road users.	%
LANE OCCUPANCY RATE	Lane Occupancy Rate (Persons) The LOR/P (persons/lane/hour) and LOR/F (tonnes/lane/hour) are used to monitor system impact on road user costs and road use efficiency, and are based on data collected from the representative urban travel time network.	Monitor operational efficiency of the urban arterial road system	persons/lane/hour
	Car Occupancy Rate	A set of standard procedures which are to be followed in calculating and reporting the Performance Indicator for Car Occupancy Rate for urban travel to monitor operational efficiency of the urban arterial road system	persons/car

USER SATISFACTION INDEX	User Satisfaction Index The index is based on road users' ratings of a number of attributes related to the road system. The attributes considered were grouped into the following six areas:		based on:
	- Road Features		- a telephone survey of road users aged 17
	- Safety Issues		- n samples
	- Environment		- a satisfaction scale from 1 to 5 was used labelled as Very Dissatisfied, Dissatisfied, Neither Dissatisfied or Satisfied, Satisfied and Very Satisfied
	- Social Issues – Meeting Needs		- satisfaction with the road system as a whole.
	- Social Issues – Services		

Source: National Transportation Commission, 2010.

Appendix B South Africa Performance Indicators

CATEGORY	INDICATORS	PURPOSE	CONSIDERATIONS	TARGET
ROAD NETWORK	Smooth Travel Exposure (STE) The proportion of travel undertaken each year on roads with roughness conditions (longitudinal surface undulations affecting the wear and costs of vehicles on the road through excitation of the vehicle mass), less than the specified level.	To monitor whether roads are providing acceptable travel conditions.	The Smooth Travel Exposure (STE) indicator represents the proportion of travel undertaken each year on roads with surface roughness less than the defined level	95% of travel on less than 4.2 m/km roughness
	Low Rut Exposure (LRE) The proportion of travel undertaken each year on roads with rut depth conditions (surface depressions that can hold water and cause a vehicle to aqua-plane) less than the specified level.	To monitor whether roads are providing acceptable travel conditions	The Low Rut Exposure (LRE) indicators represents the proportion of travel undertaken each year on roads with rut depth less than the defined level.	95% of travel on less than 20mm rut depth
	High Texture Exposure (HTE) The proportion of travel undertaken each year on roads with macro-texture conditions (visual coarseness of the road surface that affects surface friction at high speeds (> 60km/h) for wet conditions) higher than the specified level.	To monitor whether roads are providing accpetable travel conditions	The High Texture Exposure (HET) indicator represents the proportion of travel undertaken each year on roads with macro- texture higher than the defined level	95% of travel on higher than 0.4 mm texture
	Bridge Condition Exposure (BCE) The proportion of vehicles per year that travel over or under bridges with conditions higher than the specified level	To monitor whether bridges are providing acceptable travel conditions	The Bridge Condition Exposure (BCE) indicator represents the proportion of vehicles that travel over or under bridges with overlall condition index (OCI) higher than the specified level	90% of travel over or under bridges with OCI higher than 80%
	Return on Construction Expenditure (RCE) The weighted Internal Rate of return of total capital construction expenditure per annum	To monitor the predicted economic benefits to the community from Road Agency capital programmes	The RCE indicator is based on weighted internal rate of return estimates of capital projects undertaken by the road agency. The internal rate of return is calculated as the discount rate for which community life-cycle benefits equal the road agency life-cylce costs	IRR > 15%

ROAD NETWORK	Expenditure Efficiency Index (EEI) The percentage of annual expenditure spent on overhead costs	To monitor the efficiency of the Roads Agency.	The expenditure efficiency index (EEI) is the annual percentage spent on overheads by the Agency compared to the total expenditure of the Agency.	5%
	Private Sector Investment Index (PSII) The proportion of total annual expenditure secured from private sector.	To monitor the attraction of private sector investment.	The Private Sector Investment Index (PSII) is the ratio between expenditure funded from private sector and expenditure funded from the fiscus.	0.85
	Road Maintenance Effectiveness (RME) A cost index reflecting the proportion of the road network which is being maintained to target conditions and the expenditure per kilometre required.	To monitor the effectiveness of maintenance functions undertaken by the Agency.	The Road Maintenance Effectiveness (RME) indicator represents the cost per kilometre to maintain the roads in smooth condition (less than defined roughness level).	Under development
	Asset Preservation Index (API) The ratio between expenditure and increase in pavement layer asset value	To monitor the efficiency of the Roads Agency.	The asset preservation index (API) is the ratio between construction expenditure and the increase in the asset value of the pavement layer portion of the pavement.	Under development
ROAD SYSTEM	User Satisfaction Index (USI) Index of users' qualitative evaluation of satisfaction with national road network.	To provide a qualitative indication of users' perceptions of the performance of the national road network.	The User Satisfaction Index (USI) is a measure of road users' satisfaction with the national road network. The index is based on road users' ratings (roadside surveys) of a number of national road network.attributes related to the	Under development
NATIONAL ROAD DEVELOPMENT INDEX	National Road Development Index (NRDI) The annual proportion of vehicle travel on the national road network in relation to all vehicle travel in South Africa.	To monitor the importance of the national road network	The National Road Development Index (NRDI) is the ratio between the total vehicle kilometres travelled on national roads and all vehicle travel in South Africa. All vehicle travel in South Africa will be estimated from the annual litres of fuel sold and assumptions with regard to vehicle fuel consumption.	No target since it is just an importance indicator.

Source: SANRAL. (2009).

Appendix C Indonesian Minimum Service Standard

CATEGORY	INDICATORS	PURPOSE	TARGET
ROAD NETWORK	Accessibility	Availibility of roads to link between major city/regency	Undefined
	Mobility	Availibility of roads for society activities	Undefined
	Safety	Availibility of safe roads for society	Undefined
ROAD SEGMENT	Condition	Reliability of roads condition for society activities and safety	Undefined
	Speed	guarantee for road user to achieve road target speed	Undefined

Source: Ministerial Public Works decree no 14/PRT/M/2010 on the minimum service standard