

PERPUSTAKAAN UMP



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MAINTENANCE AND OPERATION IN HIGHWAY

OPERATION

CASE STUDY: EAST COAST EXPRESSWAY

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ABSTRACT

The application of highway maintenance management is important in order to maintain the highway network for the safe and convenient movement of people and goods. An improperly maintained highway can represent an increased hazard to users, leading to accidents and also will increase the maintenance cost. This study is conducted to study the current practice of the highway maintenance management at East Coast Expressway; to identify types of typical defects occurred to the highway and also to gauge the level of satisfaction of users of the East Coast Expressway. The data was collected via interview with companies involved in the maintenance management of East Coast Expressway, and questionnaires developed for the expressway users. From the study, the maintenance carried out in the East Coast Expressway is the preventive and curative maintenance system. There are several types of defects that usually occur on expressway which are defects on pavement, slope, bridge, and drainage. Overall, expressway users are satisfied with the current maintenance being carried out. Apart from these, this study also identified several measures to improve the maintenance management of expressway which could be used as future guidelines for a better and more effective maintenance management.

ABSTRAK

Pengurusan penyelenggaraan lebuhraya adalah penting untuk mengekalkan jaringan lebuhraya yang selamat dan memudahkan pergerakan pengguna dan barangan. Penyelenggaran yang tidak sempurna akan membawa kepada bahaya kepada pengguna, penambahan kepada kemalangan dan meningkatkan kos penyelenggaraan. Kajian ini dijalankan bertujuan untuk mengkaji pelaksanaan pengurusan penyelenggaraan di Lebuhraya Pantai Timur; untuk mengenalpasti kerosakan dan kecacatan yang berlaku pada lebuhraya dan menilai tahap kepuasan pengguna Lebuhraya Pantai Timur. Pengumpulan maklumat diperolehi melalui temubual bersama syarikat yang terlibat dengan pengurusan penyelenggaraan Lebuhraya Pantai Timur dan soalan kaji selidik terhadap pengguna lebuhraya. Berdsarkan kajian, penyelenggaran yang dijalankan di Lebuhraya Pantai Timur ialah sistem penyelenggraan pencegahan dan rawatan. Terdapat beberapa kerosakan yang berlaku pada lebuhraya terutama pada turapan, cerun, jambatan dan perparitan. Secara keseluruhannya, pengguna berpuas hati terhadap system penyelenggaran sedia ada. Dalam kajian ini juga terdapat beberapa penambahbaikan kepada system sedia ada dikenal dan boleh digunakan sebagai panduan kepada pengurusan penyelenggaran di masa hadapan.

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LIST OF ABBREVIATIONS

BS	-	British Standard
ECE	-	East Coast Expressway
LPT	-	Lebuhraya Pantai Timur
MHA	-	Malaysia Highway Authority
MOW	-	Ministry of Work
NOD	-	Notice of Defects
PHASE 1	-	Karak – Jabor
UMP	-	Universiti Malaysia Pahang

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CHAPTER 1

INTRODUCTION

1.1 Background of study

Highway maintenance is important to maintain the highway network for safe and convenient movement of people and goods. The core objectives of highway maintenance are to deliver a safe, serviceable and sustainable network, taking into account the need to contribute to the wider objectives of asset management, integrated transport, corporate policy and continuous improvement.

The proper road maintenance can contribute to reliable transport at reduced cost, as there is a direct link between road condition and vehicle operating cost. While an improperly maintained road will increase safety hazard to the user, leading to more accidents, with their associated human and property cost. An effective and efficiently managed transport network is an essential requirement of any developing trading nation.

East coast expressway is one of the expressways in Malaysia where it provides a link from the west coast of peninsular Malaysia to the east coast of the peninsular Malaysia. East coast expressway makes travelling between destinations in the east coast easier. East coast expressway consists of four phases of

expressway; which phase 1 in Pahang, phase 2 in Terengganu, phase 3 in Kelantan and phase 4 in east cost of Johor.

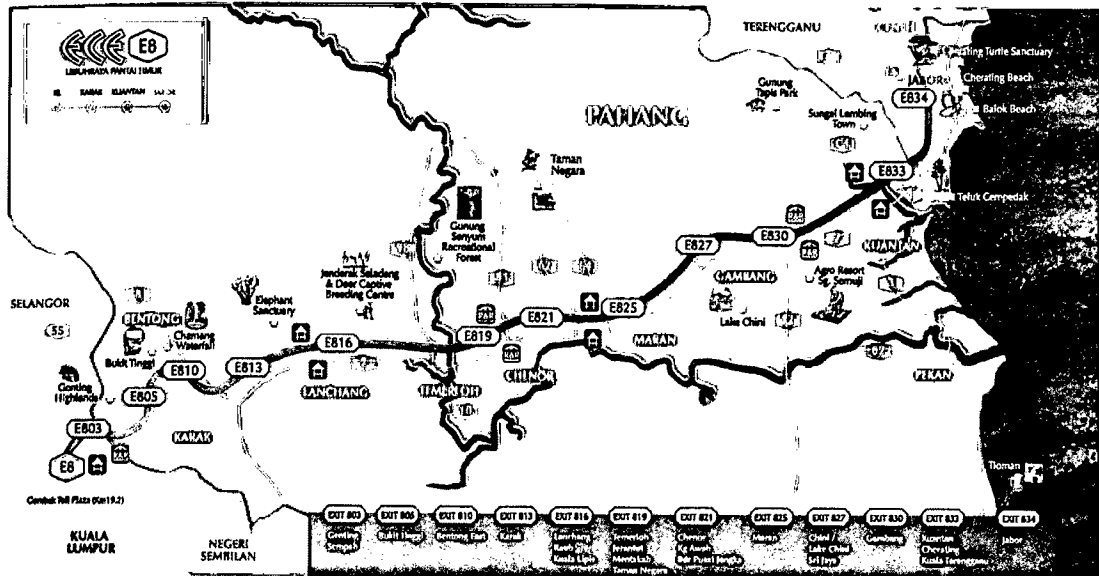


Figure 1.1: East Coast Expressway Phases 1

(Source: MTD Prime Sdn. Bhd)

1.2 Problem Statement

Failure or the damage of the road is one of the contributing factors of road accidents. Road maintenance must be carried out continuously so that road conditions can provide driving in comfort and safety to the all road users. The east coast expressway will become the busiest especially during the festive season where the vehicle from other states goes to the other states by using this expressway. Without proper maintenance, it will lead to difficulty to the road users where the traffic jammed will occurs and give the harder to them.

There have a lot of accident occurred in East Coast Expressway since it open to users on 8th January 2004. Utusan Malaysia on 18th October 2004 reported that already 150 accidents occur in East Coast Expressway in a two month since open for users. This happens due to recklessness of highway users and also by the road conditions. MTD as ECE's concessionaire has spent between RM30 million and RM50 million annually for upgrading and repair works on the expressway.

The effect of regular and timely maintenance is to increase the life of the roads by putting of the date at which is needs to be reconstructed. Maintenance is done to ensure that the road that has been constructed, or improved, is maintained in its original condition (International Labour Office, 2007).

Without proper maintenance, the highway will become easy to failure in short term where will also lead to the increasing of traffic accident. Some of accident will occur because of pavement problem, landslide, and the some other factors that contribute to the accident. It will also increase the cost of maintenance when the maintenance is often done in the same place.

1.3 Objectives

The aim of this study is to identify the maintenance management in East Coast Expressway. Three objectives have been set for this research. The objectives of this research are as follow:

- i. To study the current practice of highway maintenance management system in ECE expressway operation
- ii. To identify the types of defects that contributes to highway failure
- iii. To determine the views and opinions from ECE expressway users about their satisfaction on East Coast Expressway

1.4 Scope of Study

This scope will be conducted in the area of East Coast Expressway. The respondent is more to Universiti Malaysia Pahang (UMP) student and staff as the users who are near to expressway and frequently use the expressway. For the scope of the study, the limitation has been done in order to focus and narrow down the topic into the specific area and subject of the study.

The scope of this study for achieving the goals was focus on highway on east coast expressway in peninsular Malaysia. This scope also focuses on the highway failure that usually occurs in this east coast expressway and the type of maintenance which should be done to overcome this problem. Last but not least, this study also focuses on opinion of highway users who used to traveller along the East Coast Expressway regarding the maintenance management that being carried out in expressway to get their opinion for the level of maintenance management. Information and data attained are based on literature reviews, interviews, and questionnaire survey

1.5 Significance of Study

The significance of this study is to understand about the current maintenance management in highway operation. Secondly, to understand the type of defects those usually occur in expressway and factor that contributing to highway failure. Thirdly, to study the customer opinion about the satisfaction level of maintenance management in expressway.

From this study, the public opinion can be collected to assess the performance level of expressway. This assessing and delivery performance is important in determining the overall performance of highway maintenance management. The management of expressway maintenance will know about what the improvement that they need to focus based on customer demand. From the improvement that been made will lead to increase the customer satisfactions on expressway management.

1.6 Research Methodology

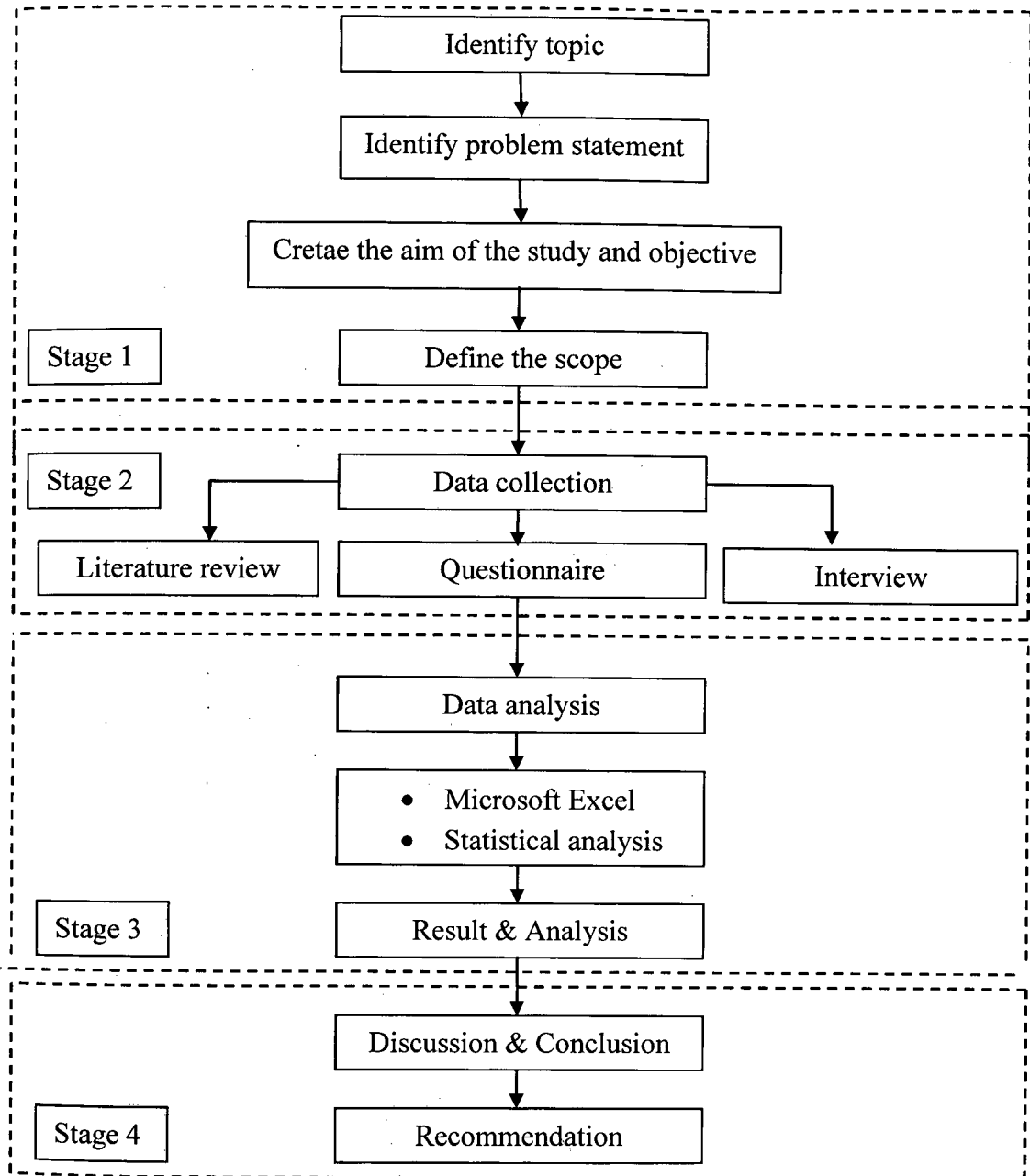


Figure 1.2: Methodology For Study

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The purpose of literature review was to study the theoretical about the maintenance management in highway operation. This literature review will discussing on highway maintenance, maintenance management definition, highway maintenance objectives and activities, maintenance management process, types of highway defects and repair, the factor contribute to highway failure, highway operation and last but not least, MTD as a concession company that responsible in east cost expressway operation.

Nowadays, highway plays an important role in the economy of a country. Hence, the developing countries also tend to highway developing. The application of maintenance management in highway operation is important. A proper maintenance and inspection will lead to effective of highway management regards to future planning, budgeting and manpower.

2.2 Highways

Highways are important in our lives nowadays because important in make the possible rapid, flexible and at the same time, make the relatively inexpensive and easy movement of persons and goods. The physical highways asset is including highway pavements, slope including cut slope and embankment slope, drainage culvert and waterways, bridge, structural and tunnel.

The United Kingdom's highways state that the asset management is a strategic approach in identify the optimal allocation of resources for the management, operation, preservation and enhancement of the highway infrastructure to meet the needs of current and future customers.

The Organisation For Economic Co-Operation And Development (OECD) define asset management as a process of maintaining, upgrading and operating assets, combining engineering assets, combining engineering principles with business practice and the rationale of economic and providing tools to facilitate approach to making the decisions which are necessary to achieve to public's expectations.

2.3 Maintenance management definition

Maintenance management can be defined as a comprehensive system in control the maintenance work done in accordance the level or standard that is acceptable to the management of maintenance (Nurul Hidayu, 2010).

There is four type of maintenance management; planned maintenance planned preventive maintenance, unplanned maintenance and unplanned preventive maintenance (Abd. Hakim and Wan Min, 1999) and shown in figure 2.1.

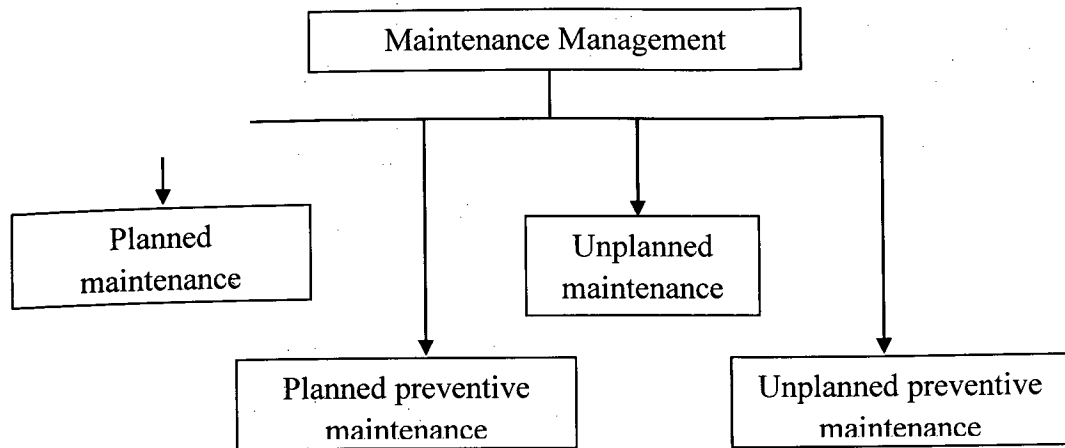


Figure 2.1 Types of Maintenance Management

(Sources: Abd. Hakim and Wan Min, 1999)

2.3.1 Planned Maintenance

This type of maintenance work had been planned and arranged in advanced at the beginning of construction process. The planned was including designing, construction material, location and others that influence in maintenance process. The analysis of any potential or risk in future is done to ensure that the any problem that will occur is at the minimum level.

2.3.2 Planned Preventive Maintenance

This maintenance work had been carried out in specified interval time which had been determined or in accordance with the specific which had been described regarding any matter. The aim of this maintenance types is for minimize the chance of failure or poor performance.

2.3.3 Unplanned Maintenance

This type of maintenance is the cover all the works that had to be done without follow any early planned. This situations happens cause where there had any damages or emergency happens cause by any matters.

2.3.4 Unplanned Preventive Maintenance

This maintenance including the maintenance work that to be done in order to repair any damage happens at equipments until the actual function is recovered.

2.4 Maintenance

Maintenance is the combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in or to restore it to, a state which it can be perform the required function. The effect of regular and timely maintenance is to increase the life of the roads by putting of the date at which is needs to be reconstructed. Maintenance is done to ensure that the road that has been constructed, or improved, is maintained in its original condition (International Labour Office, 2007).

The definition from BS3811:1981 has define maintenance as a combination of both technical and management work done on a specific asset or structure to ensure the structure be in good condition and functioning at its maximum capacity where involves two type of maintenance; repairing work and prevention work.

2.5 Highway maintenances objectives

Maintenance can be defined as all the activities which are necessary to keep a system and all of its components to maintain in their working order. The objectives in any of maintenance program are maintaining the capability of the system while controlling the cost which is the cost can be categorised as maintenance cost of the labour and material and also the cost of production loss due to an inadequate and ineffective maintenance program. (Matthew P. Stephens, 2010).

From the report by OECD Scientific Expert Group (1995), a Road Maintenance Management System is a maintenance management process aimed at systematically and objectively determining the pavement quality, and programming maintenance action in response to observe the condition, budgetary constraint and economic optimisation.

There are four core objectives of highway maintenance that has been identified. The objectives are network safety, network serviceability, network sustainability, and customer services. (Essex Highway Maintenance Strategy, 2008)

2.5.1 Network safety

A network safety objective is done by complying with statutory obligations and meeting users' need for safety.

2.5.2 Network serviceability

The network serviceability is the scopes which are in ensuring the availability, achieving integrity, maintaining reliability and enhancing the condition.

2.5.3 Network sustainability

Scope of this objective are minimising cost over time, maximising value to the community and maximising environmental contribution.

2.5.4 Customer service

The customer service includes the promoting users and community involvement, obtaining information from customers to inform future strategy and the development of levels of service, improving information available to the public regarding the service.

2.6 Highway maintenances activities

The highway maintenance activities are important to maintain the adopted highway network to ensure the safe use for pedestrians and motorists. There are several types of highway inspection that should be carried out with the three highway maintenance objectives. Firstly is the network safety by using the safety inspections or ad-hoc inspections. Second, the network serviceability by doing inspections of utility and licensees works. Third and the last is network sustainability by conducting

a structural conditions survey. In general, highway maintenance activities can be divided into four categorized; routine works, periodic works, special works and development. (Highway System Plan, 2006)

2.6.1 Routine works

These are works that undertaken each year that are funded from recurrent budget. Activities can be grouped into cyclic and reactive works types. Cyclic works are those undertaken where the maintenance standard indicates the frequency at which activities should be taken. Examples are verge cutting and culvert cleaning, both of which are dependent on environmental effects rather than on traffic levels. Reactive works are those where intervention levels, define in maintenance standard, are used to determine when maintenance is needed. An example is patching where carried out in response to the appearance of cracks or pot-holes.

2.6.2 Periodic work

These include activities that undertaken at intervals of several years to preserve the structural integrity of the road or to enable the road to carry increased axle the axle loadings. The category normally excludes those works that change the geometry of road by widening or realignment. Works can be group into works types of preventive, resurfacing, overlay and pavement reconstruction. For example is the resealing and overlay works, which are carried out in response to measured deterioration in road conditions. Periodic works are expected at regular, but relatively, intervals, for example, they can budgeted for on a regular basis and can be included in the recurrent budget. However, many countries consider these activities as discrete projects and fund them to form the capital budget.