

HIGHWAY MAINTENANANCE MANAGEMENT : CASE STUDY AT PROJEK
LEBUHRAYA UTARA SELATAN (PLUS)

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*Specially dedicated to
my supportive parents,
my beloved wife and
my precious son.*

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In the name of Allah the Most Benevolent and Most Merciful.

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ABSTRACT

The application of highway maintenance management is important. It is a centrally implemented tool for consistent decision making to optimize maintenance strategies for entire infrastructure network, in compliance with established policies. However, only some of the highway's concessionaire has implement it. It may due to lack of awareness and lack of requirement by authority. The aim of this study is to investigate the highway maintenance management practiced by PLUS Expressway as the biggest highway concessionaire in Malaysia. Three objectives has been set for this study. The objectives are to study the current practice of the highway maintenance management at PLUS Expressway, to identify types of typical defects occurred to the highway assets and to identify the critical factors in selecting appropriate repair method for different type of defects. The methodology of this study were through document study, site visit and interview with related representative of the PLUS (concessionaire), OPUS-NMM (asset management consultant) and PROPEL (contractor). From this case study, it can be concluded that PLUS has appointed OPUS International (M) Bhd through its project team known as OPUS-Network Maintenance Management (NMM) as their asset management consultatnt. OPUS-NMM integrates network planning and management, periodic inspections, routine and planned maintenance to optimise the 'whole of life' cost of asset ownership. The defects that always occur are cracks and broken drain that may contribute to slope failure. Besides, the results show that the design and selecting method for the remedial works depends on the slope characteristic and the severity of the damage.

ABSTRAK

Pengurusan penyelenggaraan lebuhraya adalah penting. Ia merupakan satu kaedah yang digunakan untuk membuat keputusan yang tepat dalam melaksanakan strategi penyelenggaraan secara optimum untuk seluruh rangkaian infrastruktur disamping mematuhi polisi rasmi yang telah ditetapkan. Walaubagaimanapun hanya segelintir syarikat konsesi lebuhraya melaksanakannya. Ini mungkin disebabkan kurangnya tahap kesedaran dan penguatkuasaan yang tidak ketat oleh pihak berkuasa tempatan. Sasaran utama kajian ini adalah untuk mengkaji pelaksanaan pengurusan penyelenggaraan lebuhraya oleh pihak Lebuhraya PLUS sebagai sebuah syarikat konsesi lebuhraya terbesar di Malaysia. Tiga objektif telah ditetapkan untuk kajian ini iaitu mengkaji bagaimana pengurusan penyelenggaraan lebuhraya yang dilakukan kini di Lebuhraya PLUS, mengenalpasti jenis-jenis kecacatan yang berlaku kepada aset lebuhraya dan mengenalpasti faktor kritikal dalam memilih kaedah baikpulih yang sesuai untuk kerosakan yang berlainan. Metodologi kajian ini adalah menerusi kajian dokumen, lawatan tapak dan temubual bersama wakil-wakil yang berkaitan daripada PLUS (konsesi), OPUS-NMM (perunding pengurusan aset) dan PROPEL (kontraktor). Daripada kajian kes ini, disimpulkan bahawa pihak PLUS telah melantik OPUS-Network Maintenance Management (NMM) yang merupakan anak syarikat OPUS International (M) Bhd, sebagai perunding pengurusan aset. Syarikat OPUS-NMM mengintergrasikan rangkaian perancangan dan pengurusan, pemeriksaan berkala dan penyelenggaraan rutin untuk perancangan kos keseluruhan hayat aset secara optimum. Kecacatan yang biasa berlaku adalah keretakan dan kerosakan pada sistem saliran. Disamping itu, keputusan menunjukkan bahawa rekabentuk dan pemilihan kaedah baikpulih adalah bergantung kepada kriteria cerun dan tahap kerosakan tersebut.

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LIST OF ABBREVIATIONS

PLUS	-	Projek Lebuhraya Utara Selatan
PEB	-	PLUS Expressway Berhad
MHA	-	Malaysia Highway Authority
OPUS	-	OPUS International Consultant
NMM	-	Network Maintenance Management
AMC	-	Asset Management Consultant
PROPEL	-	Projek Penyelenggaraan Lebuhraya
Section C1	-	Bidor to Ipoh Selatan

CHAPTER 1

INTRODUCTION

1.1 Introduction

The application of Highway Maintenance Management System is important. It is a centrally implemented tool for consistent decision making to optimize maintenance strategies for entire infrastructure network, in compliance with established policies. An improperly maintained highway can also represent an increased safety hazard to the user, leading to more accidents, with their associated human and property costs. However, only some of the highway concessionaire in Malaysia concern and implement the established Highway Maintenance Management System. It may due to lack of awareness and lack of requirement by authority. Besides, others concessionaire may assume it is very costly to develop a system of Highway Maintenance Management for their highway.

The North-South Expressway starts at Bukit Kayu Hitam in the North and ends in Johor Bahru in the South, linking all major cities on the West Coast of Peninsular Malaysia between Thailand and Singapore. Projek Lebuhraya Utara-Selatan Berhad (PLUS) holds the concession to operate and maintain a total of 848 kilometre length of highway. The main objectives of the expressway are to create a

complete and effective road network between all major towns to cater for the increasing traffic.

1.2 Problem Statement

On 6 January 1996, one major slope failure occurred at Gunung Tempurung, Kampar, Perak which located at KM303 North Bound, PLUS Expressway. Deep-seated rotational slide affected lane closure to all traffic between Gopeng and Tapah. It causes inconvenience to the highway user and disruption of highway operations beside affecting PEB's revenue. The view of slope failure is shown in Figure 1.1.



Figure 1.1 View of slope failure at KM303 NB, Section C1, NSE

To avoid that kind of disaster and ensure the highway users safety, comfortable and convenient journey, PLUS Expressways Berhad (PEB) has set millions for every year for the maintenance of the North-South Expressway. More than 1,000 professionals including engineers and technical personnel conduct an average of 20,000 inspections every year and monitor major assets along the expressway. The maintenance strategy is aimed towards preventive maintenance rather than curative maintenance of all major assets which include 952 lane-km of pavement, more than 6,000 slopes, 562 bridges, more than 4,000 drainage culverts, 2 tunnels, 87 toll plazas, 24 rest and service areas, 4 Overhead Bridge Restaurants and 43 lay-bys . The overall view of North South Expressway is shown in Figure 1.2.



Figure 1.2 Overall view of North-South Expressway.

PEB has also developed the first integrated Highway Maintenance Management System of its kind in the country. Completed and in use since 2000, TEMAN (Total Expressway Maintenance Management System) is acknowledged by the Malaysian Highway Authority as an important asset management tool.

The core modules of TEMAN consist of a Pavement Maintenance Management System (PMMS), Expressway Slope Maintenance Management System (ESMaS), Bridge Maintenance Management System (BMMS), Drainage Maintenance Management System (DMMS) and Tunnel Maintenance Management System (TMMS) [1]. This study will investigate the defects occurred to the highway asset and what the action plan taken to carry out the remedial works with regard to the Highway Maintenance Management.

1.3. Aim and Objective of Study

The aim of this study is to investigate the highway maintenance management practiced by PLUS Expressway Berhad as the biggest highway concessionaire in Malaysia.

Three objectives has been set for this study. The objectives of this research are as follows :

- i) To study the current practice of Highway Maintenance Management System in PLUS Expressway
- ii) To identify types of typical defects occurred to the highway asset
- iii) To identify the critical factors in selecting appropriate repair method for different type of defects

1.4. Scope of Study

The scope of work for this study as shown below:

- i) Study on assets of slope that located in the PLUS expressway
- ii) Focus at location of Central Region, Section C1 (from Ipoh Selatan to Bidor) for three consecutive years (2007, 2008 and 2009)

1.5 Methodology

The methodology in conducting this study are through literature review, document study, site visit and interview with related representative of the PLUS (concessionaire), OPUS-NMM (asset management consultant) and PROPEL (contractor). All these method were successfully conducted to understand and meet the objective of the study. Besides, the data for this study has been generated using methodology case study. The overall sequence of research process that was undertaken for this study is shown in Figure 1.3.

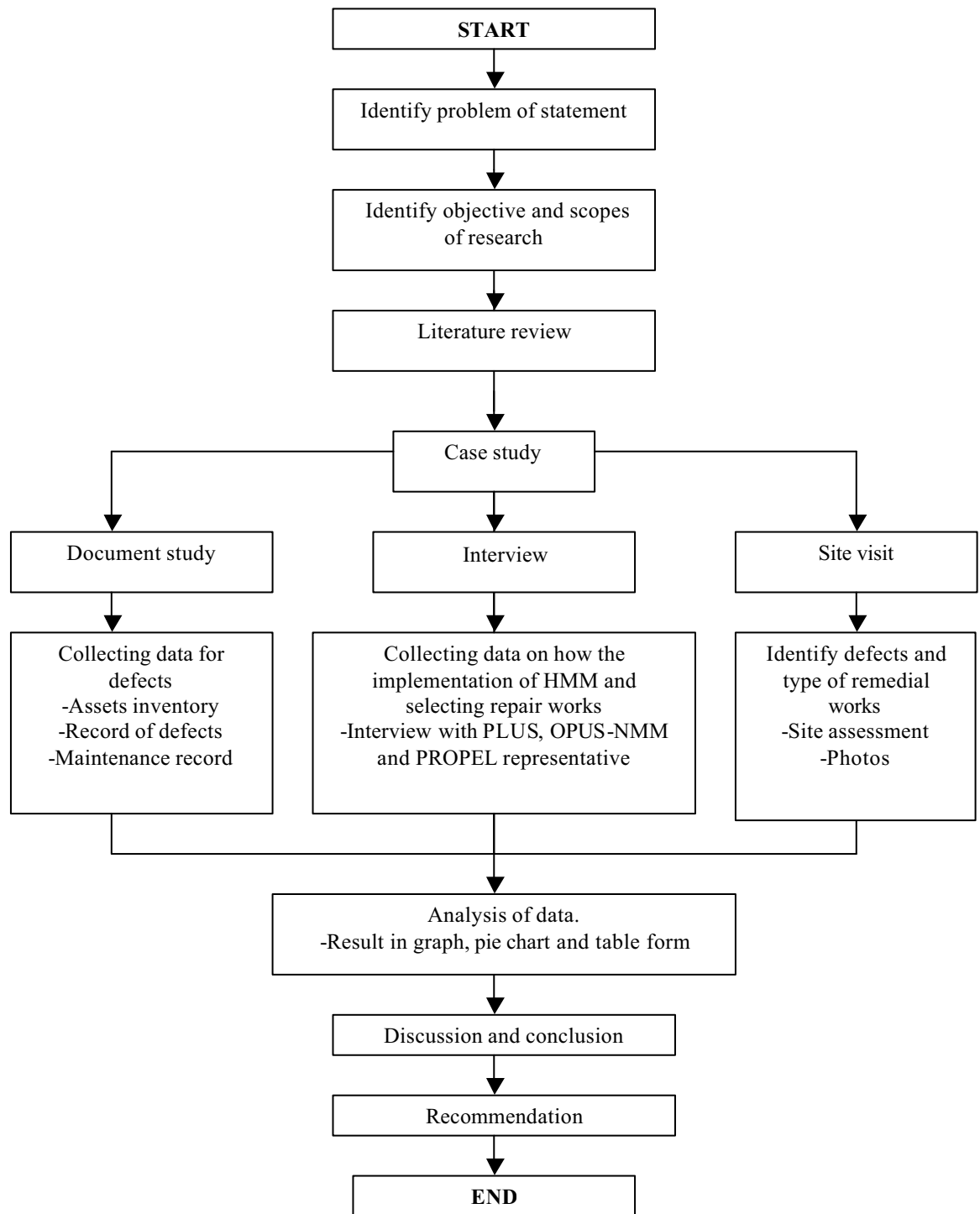


Figure 1.3 Research methodology sequence for this study