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# FRAMEWORK FOR STORMWATER ASSET MANAGEMENT

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A project report submitted in partial fulfillment of the  
requirements for the award of the degree of  
Master of Science (Construction Management)

Faculty of Civil Engineering  
Universiti Teknologi Malaysia

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*To my beloved parents,  
Bapa and Mama,  
You are the aspiration in my life,  
Love you always,  
As to my dear siblings, my fiancé and friends,  
Thanks for always be there for me....*

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## ABSTRACT

The construction industry plays an important role in any country's economic development and has been expected to provide buildings and constructed assets that are of quality, faster to build, cheaper and durable. Infrastructure developments are continually expanding and evolving no matter what economic conditions because the infrastructure is essential services to communities. On the other hand, the infrastructure development will provide a high rate of return with low risk in long lifetimes. After infrastructure assets are constructed, their quality of service delivery should be monitored and operation and maintenance activities should be carried out to maintain their service life and functionality. This study only focused on operation and maintenance phase to develop a framework for infrastructure asset management which specific to stormwater asset management in UTM. The purpose of the study was to provide a proper operation and maintenance of stormwater facilities by reviewing Urban Stormwater Management Manual (MSMA) to insure that they serve their function. The framework developed may benefit further studies on infrastructure asset management and helps UTM to improve the management of stormwater.

## ABSTRAK

Industri pembinaan memainkan peranan yang penting di dalam pembangunan ekonomi Negara dan dijangkakan dapat menyediakan bangunan dan aset binaan yang berkualiti, mengambil masa yang singkat untuk dibangunkan dan tahan lama. Pembangunan infrastruktur berkembang secara berterusan di dalam apa jua keadaan ekonomi kerana infrastruktur menyediakan servis yang penting kepada masyarakat. Di samping itu, pembangunan infrastruktur akan memulangkan kadar keuntungan yang tinggi dengan risiko yang rendah dalam jangka masa yang panjang. Selepas pembangunan aset infrastruktur dibina, kualiti servis yang diberikan hendaklah diawasi dan operasi dan aktiviti penyelenggaraan hendaklah dijalankan untuk mengekalkan jangka hayat dan kebolehfungsiaan aset. Kajian ini hanya tertumpu kepada peringkat operasi dan penyelenggaraan untuk membangunkan rangka kerja pengurusan aset infrastruktur khusus untuk pengurusan saluran air di Universiti Teknologi Malaysia (UTM), Skudai. Tujuan kajian ini adalah untuk menyediakan operasi dan penyelenggaraan yang sesuai untuk kemudahan sistem saluran dengan merujuk Manual Saliran Mesra Alam (MSMA) untuk memastikan saluran air berfungsi dengan sistematik. Rangka kerja akan memberi manfaat kepada kajian seterusnya tentang pengurusan aset infrastruktur dan membantu UTM menambahbaik sistem pengurusan saluran air di UTM.

## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	<b>DECLARATION</b>	ii
	<b>DEDICATION</b>	iii
	<b>ACKNOWLEDGEMENT</b>	iv
	<b>ABSTRACT</b>	v
	<b>ABSTRAK</b>	vi
	<b>TABLE OF CONTENTS</b>	vii
	<b>LIST OF TABLES</b>	xi
	<b>LIST OF FIGURES</b>	xii
	<b>LIST OF PICTURES</b>	xiii
	<b>LIST OF ABBREVIATIONS</b>	xv
	<b>LIST OF APPENDICES</b>	xvi
<b>1</b>	<b>INTRODUCTION</b>	
	1.1 Introduction	1
	1.2 Statement of Problem	3
	1.3 Aim and Objectives	5
	1.4 Scope of Study	5
	1.5 Methodology	6
<b>2</b>	<b>INFRASTRUCTURE ASSET MANAGEMENT</b>	
	2.1 Introduction	7
	2.2 Infrastructure	8
	2.2.1 Infrastructure as an Asset	9
	2.2.2 Infrastructure Investment	10

2.3	Asset Management	13
2.3.1	Implementation of Asset Management Program	18
2.3.2	The Asset Life Cycle	22
2.3.2.1	Operation and Maintenance	24
2.4	Infrastructure Asset Management	27
2.4.1	Standard of Service (SoS)	28
2.4.1.1	Performance Specification	29
2.4.1.2	Minimum Condition Grade	29
2.4.2	Whole-life Cost Analysis (WLCA)	30
2.4.3	Asset Management Plan	32
2.5	Conclusion	33

### **3 STORMWATER MANAGEMENT**

3.1	Introduction	34
3.2	Stormwater as an Infrastructure Asset	34
3.3	Standard	36
3.4	Stormwater Resources	37
3.5	Urban Stormwater Management Manual for Malaysia (MSMA)	37
3.5.1	Background of MSMA	38
3.5.2	Role of MSMA in Urban Stormwater Management in Malaysia	39
3.6	Stormwater Management Infrastructure Assets	40
3.6.1	Stormwater Management	41
3.6.2	Operation and Maintenance	42
3.6.2.1	Drainage System Maintenance	43
3.6.2.2	Waterway Maintenance	44
3.6.2.3	Stormwater Treatment Facility Maintenance	44
3.6.3	Maintenance Agreement	45
3.7	Conclusion	46

<b>4</b>	<b>DATA COLLECTION</b>	
4.1	Introduction	47
4.2	Data Collection	48
4.2.1	Interview	48
4.2.2	Site Observation	48
4.2.3	Records and Documents Inspection	49
4.2.4	Case Study: Stormwater Management in UTM	49
4.3	Conclusion	55
<b>5</b>	<b>STORMWATER MANAGEMENT IN UTM</b>	
5.1	Introduction	56
5.2	Stormwater Management in UTM	57
5.3	Analysis of Framework for Storm water Management in UTM	66
5.3.1	Overview	66
5.3.2	Framework for Stormwater Management	66
5.3.2.1	Step 1- Planning	68
5.3.2.2	Step 2- Stormwater Inventory	69
5.3.2.3	Step 3- Condition Assessment	70
5.3.2.4	Step 4- Financial Forecasts	71
5.3.2.5	Step 5- Operation and Maintenance	71
5.3.2.6	Step 6- Monitoring	72
5.4	Conclusion	73
<b>6</b>	<b>CONCLUSION AND RECOMMENDATIONS</b>	
6.1	Introduction	74
6.2	Findings	74

6.2.1	Finding 1: To study the components for asset management	75
6.2.2	Finding 2: To study the needs for infrastructure asset management	76
6.2.3	Finding 3: To formulate the framework for stormwater asset management	76
6.3	Limitation	78
6.4	Recommendations	78
6.5	Recommendations for Further Study	79
	<b>REFERENCES</b>	80
	<b>APPENDIX</b>	84

**LIST OF TABLES**

<b>TABLE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	Various Definition of Asset Management	3
5.1	The Comparison of Goal and Objectives	68
5.2	Improvement Plan	73

**LIST OF FIGURES**

<b>FIGURE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	Methodology Flowchart	6
2.1	The steps to an asset management program	18
2.2	Asset Hierarchy	19
2.3	The Asset Life Cycle	22
5.1	Framework for Stormwater Management	67

## LIST OF PICTURES

PICTURE NO.	TITLE	PAGE
4.1	Drainage in Kolej 12 area	52
4.2	Drainage in Kolej 17 area	52
4.3	Drainage in Kolej 12 area	53
4.4	Drainage in Kolej 12 area	53
5.1	View of present structure of detention pond 3	58
5.2	Wing wall as a solution of the slope erosion problems	58
5.3	Wing wall in order to direct the water flow for slope protected	59
5.4	Wing wall has been utilized for slope protected	59
5.5	View of present detention pond 5 after modification process	60
5.6	View of detention pond 5 located at Dewan Kuliah P19 area	61
5.7	Another view of detention pond 5	61
5.8	View of detention pond 6	62
5.9	View of detention pond was constructed in order to protect soil erosion	63
5.10	View of detention pond which is the function to protect slope erosion	63
5.11	Detention pond after modification in order to control water flow	64
5.12	View of detention pond located at M46, FKA	64

5.13	View of detention pond after modification process	65
5.14	Large detention pond was constructed near FKA	65

## LIST OF ABBREVIATIONS

UTM	-	Universiti Teknologi Malaysia
MSM	-	Urban Stormwater Management Manual for Malaysia
SoS	-	Standard of Service
WLCA	-	Whole-life Cost Analysis
AMP	-	Asset Management Plan
DID	-	Department of Irrigation and Drainage
BMPs	-	Best Management Practices
BIP	-	Biro Inovasi Perundangan
BQ	-	Bill of Quantities
FKA	-	Fakulti Kejuruteraan Awam

**LIST OF APPENDICES**

<b>APPENDIX</b>	<b>TITLE</b>	<b>PAGE</b>
A	Bill of Quantities	84
B	Schedule of Maintenance Works	85
C	Location of Detention Ponds	86
D	Plan and Drawing	87

## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

The Malaysian Economy continues to be resilient showing encouraging growth due to the Ninth Malaysian Plan (*9MP, 2006-2010*). Projects under the 9MP gave positive impact to the country's main sectors particularly the construction and trade as well as domestic demand. The construction industry plays an important role in any country's economic development and has been expected to provide buildings and constructed assets that are of quality, faster to build, cheaper and durable.

The construction industry encompasses the residential construction of houses and condominiums, the non-residential construction of commercial and industrial buildings and infrastructure construction or civil engineering of physical services and facilities for transportation. Infrastructure construction includes highways, urban and rural roads, bridges, railways, ports, airports and light rail transit system, for telecommunications which include fiber-optic cables, submarine cables and earth stations and for utilities which include sewerage and power plants (*Annual Productivity Report, 2003*).

Infrastructure development during the 9MP period emphasized on the provision of more facilities to all areas as well as improving delivery of services to

support economic activities and improve the quality of life. Increasing accessibility to infrastructure facilities, better integration of transport modes and services as well as higher quality will be enforced in the planning and implementation of infrastructure projects (*9MP, 2006-2010*).

Infrastructure is capital goods which produces a service in combination with other inputs. The services provided are relatively intensive in this form of capital and tend to exhibit important economies of scale (*Oxford Policy Management, 2004*). Managing these assets requires all of the skills employed in the public sector, and more. Private companies make infrastructure decisions with very specific goals in mind. Resources are constrained and savings in the cost and time for delivering required infrastructure provide management with important opportunities to better allocate resources within the enterprise (*Miller, 2000*).

Infrastructure assets typically provide essential public goods or essential services to a broad range of users. Therefore, the cost of maintaining infrastructure assets often represent a significant portion of municipality's operating budget, and it is important to agree on asset management that ensures the municipality has stronger focus on what is required to deliver service rather than simply accounting for the consumption of the resources. To increase the service life and serviceability of the assets, the asset management played by the expression of levels of service or measures of performance that guide such things as operation and maintenance, capital construction, and financing.

On the other hand, asset management is needed to maintain a desired level of service for what the assets provided at the lowest cost. The use of whole-life costs in the organization makes good sense if all parties are to achieve long-term economic systems and buildings. Whole-life costing involves estimating the total cost of a system or structure throughout its entire life.

When calculating the whole-life cost of a system or structure, not only the installation and maintenance costs of the components are taken into consideration but also the running costs, operational costs, utility costs and the overall facility management costs need to be included (*Franklin, 2009*).

Taking a long term view of capital planning and developing a better understanding of whole-life costs and performance are keys to the effective management of expanding asset bases. Asset managers must make decisions regarding the operations and maintenance of infrastructure, planning for future needs, budgeting for current and future needs and also allocating resources because knowledge about the material condition of the devices has always been and will continue to be valuable (*Charles, 2008*).

Besides, Published standards that the Government issued are used as a guideline to indulge the long term needs in ensuring the service life of infrastructures are fully utilized. This standard is fully approved by the Cabinet to be referred and followed by every development infrastructure project. So, tighter rules and regulations couple with practical guidelines and manual shall fulfill the intention to implement practical and sustainable infrastructures in Malaysia.

## **1.2 Statement of Problem**

The weakness of current system for public infrastructure development in Malaysia is due to poor implementation of public officials. The need is simple, much greater than government's current capacity to pay with tax revenues. The public need for environmental remediation, wastewater treatment, improved transportation facilities, ports, airports and other public buildings far exceeds available public cash resources.

An investment in infrastructure is rising up and the pressures on assets increase with demand hence, asset managers face the challenge of ensuring optimal return on new investments whilst at the same time aim at extending the life of ageing assets. All infrastructures are designed to meet higher builder standards which demand longer life span and control of the decaying processes. One approach would be to credit buildings designed for a long service life, 100 years for example, because infrastructure provision requires high expenditure.

People in general take assets for granted. Infrastructure, buildings and facilities are created without sufficient attention to their intended performance. And after these assets are built, they do not monitor their quality of service delivery or carry out maintenance and often allow them to be under or over utilized. In fact, the importance of asset management is rarely mentioned but asset management is an effective tool for decision-making on infrastructure investment programmes.

Many organizations are generally managed and financed on a long term basis but inefficiency and conflicting objectives, lack of coordination, and missed opportunities are still abundant. Many of these problems would be solved if there was more information exchange in the construction industry regarding service life and asset management. Some infrastructure assets are not functioning as they are intended to.

This is where a proper asset management is required to solve the problems that still abundant to guide the acquisition, use, and disposal of an infrastructure asset in order to optimize service delivery and minimize the cost of the asset over its service life.

It is therefore important to formulate the framework for infrastructure asset management by reviewing published standards that issued by the Government in order to maximize the benefit to the users and achieving value for money and satisfying requirements for decisions accountability.

### **1.3 Aim and Objectives**

The aim of this study is to develop management framework for infrastructure asset in Malaysia with particular reference to stormwater asset in UTM. In achieving this aim, the following objectives have been identified:

- i. To study the components for asset management
- ii. To study the needs for infrastructure asset management
- iii. To formulate the framework for stormwater asset management

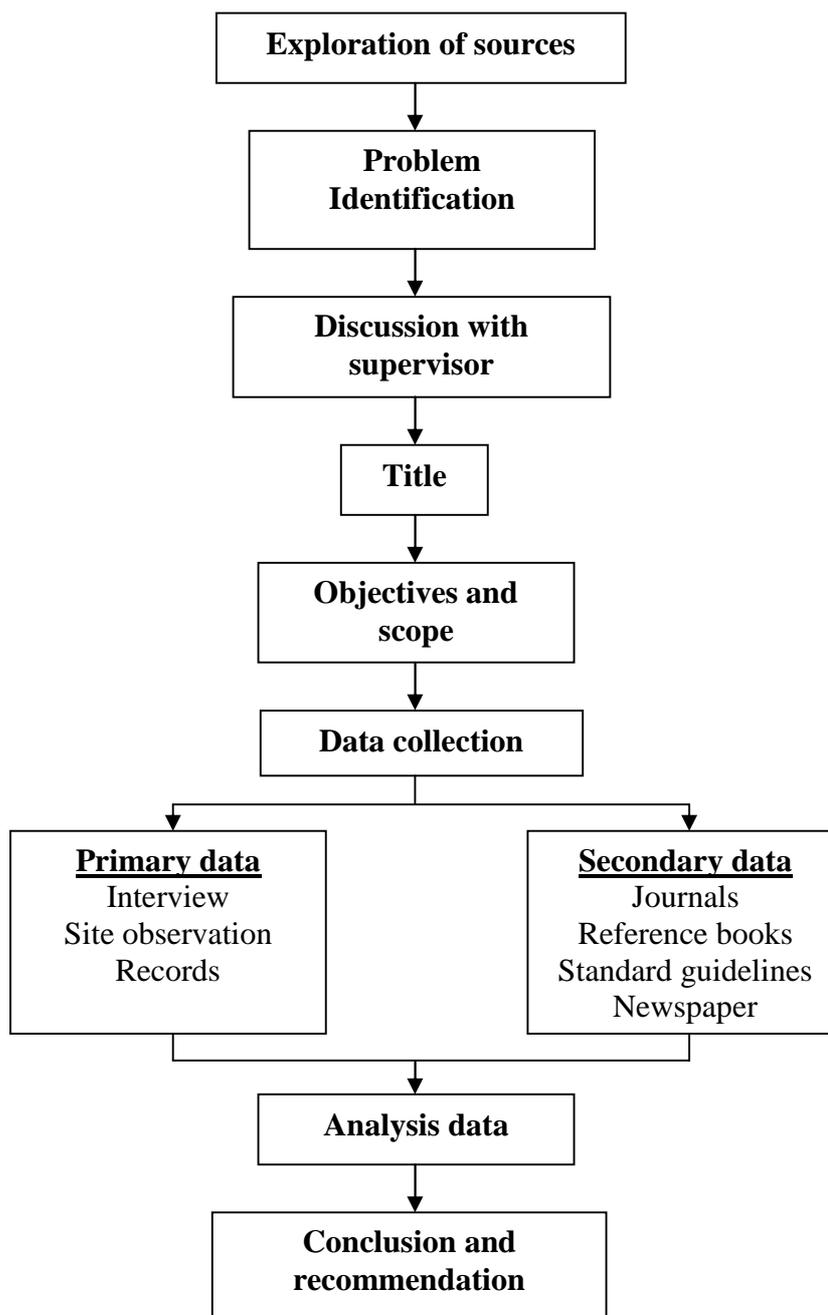
### **1.4 Scope of Study**

Previous studies had look into different issues separately. Maintenance has been an important aspect of asset management considered in many studies. In civil engineering, stormwater has been investigated from the division of construction, stability, etc. Whilst in regard to the construction of stormwater, MSMA has been analyzed in detail in many studies (*Gan Seng Kian, 2002*). There is no attempt to look at stormwater as an asset. Stormwater as an infrastructure asset requires particular attention.

In relation to the objectives of the study, this study is focus on the infrastructure in Malaysia. Stormwater management in UTM has been selected as a case study and published standard which is Urban Stormwater Management Manual for Malaysia (MSMA) is used in this study.

## 1.5 Methodology

To carry out the study, several research methodologies were used, which includes literature review, knowledge acquisition and data analysis techniques. Figure 1.1 showed the activity flow used to achieve the objectives that have been set.



**Figure 1.1** Methodology Flowchart