

**UNIVERSITI TEKNOLOGI MARA**

**DEVELOPING A GREEN HIGHWAY  
ASSESSMENT FRAMEWORK FOR  
TROPICAL CLIMATE**

**NUR ILLIANA BINTI HUSIN**

Thesis submitted in fulfilment  
of the requirements for the degree of  
**Master of Science**  
**(Built Environment)**

**Faculty of Architecture, Planning and Surveying**

**October 2018**

## ABSTRACT

Highway plays a vital role in the functioning as the arteries of human civilisation providing pathways for human settlement, commerce, culture, and adventure. The development of highway involves massive activity. However, the rapid development and construction of highway nowadays would cause negative impact to the surrounding environment ecosystem and overall environmental quality. In Malaysia, National Green Technology Plan (NGTP) was launched in 2009 as the main agenda to promote green technology initiatives. Various green initiatives have been taken to support global efforts in maintaining the world's ecological balance. Most green initiatives that have been implemented in this country are mainly related to buildings. Reviews of literature revealed that Malaysia is still lacking of a framework that can be used for assess and development of green highway project. Due to this issue, the research is carried out with the aim to develop a Green Highway assessment tools framework for tropical climate. This research was done using mixed method exploratory which consist of qualitative and quantitative method through discussion with highway expert and questionnaire survey. 143 respondents from local authorities and highway concession companies are involved for this research where they are experts in the construction and development of highway. The data was analysed by using factor analysis, factor score and weightage value to determine the elements, criteria and sub-criteria of green highway. The findings of 5 main elements, 22 criteria, and 138 sub-criteria lead to the establishment framework of green highway assessment tools for tropical climate. The framework was run through the validation process with 3 highway expert. The main elements of green highway assessment are sustainable design and construction activities, environmental and water management, energy efficiency, material and technology, and social and safety. This research contribute framework of green highway for tropical climate , assessment form and also certification level can be used as a guide to government agencies and professional bodies that directly or indirectly involved in the planning and development of highways in Malaysia.

## ACKNOWLEDGEMENT

Firstly, all praise is to Allah, the Almighty and the Benevolent for His blessings and guidance for giving me inspiration for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor Sr. Dr. Asmalia Che Ahmad. Thank you for the support, advice, comments, guidance, patient and encouragement all the time to keep me on the right track.

Almost gratitude to Universiti Teknologi Mara (UiTM) and a remark of indebtedness to the Fundamental Research Grant Scheme (FRGS) (FRGS/1/2014/SSI11/UITM/02/9) by the Ministry of Education, Malaysia for its grant award. Special thanks also to all the concession companies and local authorities who have given their cooperation during the research been conducted.

Finally, this thesis is dedicated to the loving memory of my very dear late father and mother for the vision and determination to educate me. This piece of victory is dedicated to both of you. Alhamdulillah.

# TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>ii</b>
<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>xi</b>
<b>LIST OF FIGURES</b>	<b>xv</b>
<b>CHAPTER ONE: INTRODUCTION</b>	<b>1</b>
1.1 Background of Study	1
1.2 Problem Statement	2
1.3 Research Question	5
1.4 Research Aim	5
1.5 Research Objective	5
1.6 Scope of Work	5
1.7 Significance of Study	6
1.8 Research Methodology	7
1.9 Chapters Outline	9
1.10 Summary	10
<b>CHAPTER TWO: LITERATURE REVIEW</b>	<b>11</b>
2.1 Overview	11
2.2 Definition	11

2.2.1	Green Highway	12
2.2.2	Assessment System	14
2.2.3	Tropical Climate	14
2.3	Green Highway Approaches	16
2.3.1	Greenroads	16
2.3.2	Washington Internship for Students Engineering	18
2.3.3	GreenLITES	20
2.3.4	Illinois Livable and Sustainable Transportation (I-LAST)	23
2.3.5	Building Environmental and Economically Sustainable Transportation (BE2ST)	25
2.3.6	Greenroads Manual	27
2.3.7	Malaysia Green Highway Index	29
2.4	Analysis on Green Highway Approaches	31
2.4.1	Sustainable Design and Construction Activities	31
2.4.2	Energy Efficiency	34
2.4.3	Environmental and Water Management	36
2.4.4	Material and Technology	38
2.4.5	Social and Safety	40
2.5	Conceptual Framework	42
2.6	Summary	44
<b>CHAPTER THREE: RESEARCH METHODOLOGY</b>		<b>45</b>
3.1	Overview	45
3.2	Research Design	45
3.3	Research Method	47
3.3.1	Preliminary Study	47
3.3.2	Main Study	49