

DEVELOPMENT OF WEIGHTAGE FACTOR ON SOCIAL AND SAFETY  
CRITERIA FOR MALAYSIA GREEN RURAL ROAD

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## **DEDICATION**

This is for Dr. Eeydzah Aminudin and Sathiyavani Ramasamy.  
One owns my mind while the other owns my heart.

Thank you

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Thank you for the Lord's grace in helping me to complete this study.

Thank you for my dear mother for all the contribution tangible or non tangible. Each year it become so difficult to express gratitude to you, I don't know how to start and to what extend. I love you very much.

To my supervisor Dr. Eeydzah Binti Aminudin. A workaholic with very soft heart. Always have time for appointment. She sat down and corrected my sentence structures with calmness.

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Green Road Project : Prof Rozana, Dr Izzie Adiana ,PM Rosli. Mr Shafiq and

IR Jeffrey

## **ABSTRACT**

Green Rural Road (GRR) is an inventiveness for the infrastructure to be environmental and sustainable responsible to the societies. With the initiatives of management and technical approach for rural road life cycle from construction to its maintenance processes, it is important to assess the assessment system which highlights the most critical tools on GRR Assessment which mostly agreed the development of green based on SITES, GreenLites, Envision and BE2ST in-Highways and MYGHI that uses the social and safety as major category of assessment model. Social and safety criteria's basically covers the pollutants that endanger the public health, global climate, biodiversity or integrity of ecological processes which allows the basic approach requirements of individuals and societies to be met safely. The aim of this study is to analyse the social and safety elements which therefore outlined in Malaysia GRR Index and its assessment. Data was achieved through an extensive literature reviews, which also been validated by expert point of view and has been distributed among 100 experts but only 73 responses included experts and stakeholders have been taken into consideration for further analysis. The data had been analyzed using SPSS with factor analysis method. From the early benchmarking ,its been highlighted that there are (35) elements that have been taken into consideration. It were then classify into (10) sub criteria and finally (5) criteria. The result have shown that five of the criteria reflected social sustainability (economy, public acceptance and environment) while three reflected safety issues (services and facilities, pollution reduction, management issue). There were (35) variables that had been analyzed but three (3) items were removed due to not significance loading. Therefore the final model consists of 32 items. Analysis of the major factor weights shows that Services and Facilities is weighted the highest accounting for 58%. This signify that most of respondents profess the importance of providing planned pedestrian networks, disable user infrastructure and improving health and education communities over better road access. As conclusion, by developing the indicator of social and safety for rural road, the sustainability development will be holistically accomplished.

## ABSTRAK

Jalan Luar Bandar Hijau merupakan satu inspirasi untuk infrastruktur yang bertanggungjawab terhadap isu alam sekitar dan kelestarian. Dengan inisiatif pengurusan dan pendekatan teknikal bagi kitaran hidup luar bandar jalan dari pembinaan bagi proses penyelenggaraan, ia adalah sangat penting untuk menilai suatu sistem yang memaparkan alat kritikal yang paling di Penilaian yang kebanyakannya bersetuju pembangunan hijau berdasarkan SITES, GreenLites, Envision dan BE2ST dalam Lebu Raya dan MYGHI yang menggunakan kriteria sosial dan keselamatan sebagai kategori utama dalam model penilaian. Ciri-ciri sosial dan keselamatan pada dasarnya meliputi pencemaran yang membahayakan kesihatan awam, iklim global, biodiversiti atau integriti proses ekologi yang membolehkan keperluan pendekatan asas individu dan masyarakat yang perlu dipenuhi dengan selamat. Tujuan kajian ini adalah untuk menganalisis unsur-unsur sosial dan keselamatan yang oleh itu digariskan dalam Jalan Luar Bandar Hijau Malaysia dan penilaiannya. Data telah dicapai melalui ulasan dari literatur secara luas, yang juga telah disahkan oleh titik pakar pandangan dan telah diedarkan di kalangan 100 pakar tetapi hanya 73 jawapan termasuk pakar dan pihak berkepentingan yang telah diambil kira untuk analisa selanjutnya. Data yang telah dianalisis menggunakan SPSS dengan kaedah analisis faktor. Dari analisis, yang telah menekankan bahawa terdapat (35) elemen yang telah diambil kira. Ia kemudian dikelaskan ke dalam (10) kriteria sub dan akhirnya (5) kriteria. Keputusan menunjukkan bahawa empat kriteria menunjukkan kemampuan sosial (ekonomi, penerimaan awam dan alam sekitar) manakala tiga isu-isu keselamatan terpantul (perkhidmatan dan kemudahan, pengurangan pencemaran, isu pengurusan). Terdapat (35) pembolehubah yang telah dianalisis tetapi tiga (3) item telah dikeluarkan kerana tidak penting. Justeru itu, model akhir terdiri daripada 32 item. Analisis menunjukkan berat faktor utama ialah penerimaan awam menunjukkan bacaan tertinggi pada 58%. Kesimpulannya, dengan membangunkan penunjuk sosial dan keselamatan untuk jalan luar bandar, pembangunan kelestarian secara holistik akan tercapai.

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## **LIST OF ABBREVIATIONS**

GRR	-	Green Rural Road
MVA	-	Mean Value Analysis ( MVA)
NSYDOT	-	New York State Department of Transportation
OECD	-	Organisation for Economic Cooperation and Development
SDG	-	Sustainable Development Goals
UNESCO	-	United Nations Educational Scientific and Cultural Organization
UTM	-	Universiti Teknologi Malaysia

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Study

The road industry produce the highest level of greenhouse gas directly through fossil energy (Pearce, 2012) used in mining, transport, paving and vehicle emissions. It is undeniable that the perpetual growth in the number of road vehicles and therefore of traffic produces a significant increase in pollution and noise commotion. Likewise, major challenges await the road construction market, such as economic and improved development, construction and of course, maintenance (Nahmens, 2012) all the more so as raw materials are becoming inadequate and environmental regulation is becoming more stringent in terms of air pollution and noise pollution. The road construction sector, like the rest of the companies, wants to face the sustainability conflict. Sustainability is the ability to meet our requirements without compromising next generations ability to meet theirs. This concept harmonizes aspects of the economy, society and the environment. Sustainability can also be defined as a way of using a system in order not to deplete or permanently damage the latter.

What's a green or sustainable road? It is a network of roads that, by different sustainable practices, restrict their collision with the earth to an edge. The goal is to boost a roadway's life while reducing its emissions. We find the application of recycled materials, the formation of an ecosystem management, and the use of energy reduction actions throughout the dissimilar construction method. Essentially, all road construction projects are accountable to the Ministry of Environment's compulsory Environmental Impact Assessment (EIA) process.



Figure 1.1 : Green rural roads (Google, 2019)

## 1.2 Problem Statement

For the past few years, the Malaysian government has taken new interest in promoting the aim of sustainable development by making it mandatory to assess the sustainability achievement of different government programs and projects. Malaysia has developed several of its own infrastructure sustainability tools, including pH JKR, MyGHI, LCCF and MyCREST. Thus, under one of the thrusts outlined in the 2016-2020 Construction Industry Transformation Programme, Malaysia (CITP, 2016) claimed that there is a shortage of global quality metrics that can determine the use of sustainability-related materials and practices. This software had therefore recommended further study in order to achieve better results.

The road construction in Malaysia needs a proper consideration of the country's geology. With these physical structures and topography, the advancement of road infrastructure in the country is considerably difficult. Even a small, incorrect development may cause the natural environment to be destabilized thus affecting the safety of infrastructure, especially non-toll roads. Requirements for the condition have

been undetermined and the threats are called developmental strain. Land degradation, siltation, soil erosion and biodiversity loss (Mulmi, 2009) are some of the adverse effects. The conventional approach to building transport infrastructure has less regard for the environment, improper use of demolition outcomes, and broader mass movement and slope instability have significant impacts on road users social and safety conditions. Although, on the other hand, the construction of road infrastructure contributes to improving the socio-economic status of the local region, thus opening up more opportunities for rural urban economic development. A good construction design guide is important and the planned infrastructure development works should be carried out with social aspects in mind. Considering that different factors influence road construction for rural areas, a sustainable approach to the development of road infrastructure in rural areas is very relevant.

### **1.3 Aim and Objectives**

The aim of this study is to determine the most critical criteria for social and safety that can be incorporated in Malaysia Rural Road infrastructure sustainability tools. This aim will be supported by the following objectives:

- i. To determine the social and safety sustainability aspect in rating of green rural road.
- ii. To categorize criteria and sub criteria of social and safety sustainability for green rural road
- iii. To develop weightage factor for social and safety in green rural road.

### **1.4 Scope of Study and limitation**

This study focuses on the most far-reaching social and safety standards for rural roads relative to the other three sustainability methods for Malaysia's infrastructure, MyGHI and PHJKR, while at the same time cross-referencing GreenRoad, GreenLites,

I-Last, In-Vest, Envision, Be2st, SUNRA, IS, SITES, STARS, SIPRS and STEED to international road resources. A systematic literature review of various green development manuals has been performed, the comparison of each criterion is stated in the respective manuals and standards. The study focuses primarily on comparing social and safety standards, whether it presents parallels or provides additional requirements that are more suitable for rural roads. The target respondents for this study are government agencies, highway stakeholders, concession companies and related infrastructure resources authority, and the developer is involved in Malaysia's road infrastructure development. This research assesses the social and safety criteria in the index of green rural roads. That respondent's feedback will be evaluated through an evaluation tool to explain the specific dimension that can be considered as part of the sustainability of social and safety.

## **1.5 Brief Methodology**

The detailed research approach will be further clarified in Chapter 3, as follows:

- i. Preliminary Stage of Study

The research methods used for the purpose of this analysis are literature review, including books, journal papers and Internet details.

- ii. Data Collection and Analysis

The approaches for data collection are semi-structured interviewing and circulating questionnaires within the identified groups. Understanding the perceptions and individual preferences associated with the road and building is significant.

- iii. Conclusion Stage

Some recommendations were made for further action on the basis of the data obtained from the study. Chapter 5 addresses the guidelines.

## 1.6 Significant Study

Table 1.1 Shows a matrix checklist of previous researchers that was put on the sample. The path evolution classification scheme is I-LAST, BE2ST-in-Highways, GreenLITES, Greenroads, INVEST and STARS that originated in the United States. Such rating tools focused in the US are used to assess the construction of roads and highways while the majority of the available rating tools hardly measure overall infrastructure work. In addition to international rating methods, the basis for cross-examination will also be MyGHI and pHJKR (Roads), which are developed specifically for road and highway in Malaysia. It will include the type of phases of infrastructure, origin and evaluation to identify the best road assessment tool that can be applied up to the operation and maintenance process.

Just three (3) of the rating tools apply to road-specific categories, namely Greenroads, STARS & pHJKR (Federal Roads), while others are strictly developed for the highway. Severely, none of the resources mentioned are built in the operation and maintenance process for the layout and handling of rural roads. The comparison admitted that since road infrastructure in Malaysia consists of a total length of 235,021,473 km compared to the total length of 2,000,880 km of highways, the inadequacy of rating tools measuring sustainable rural roads from planning, design, construction to operation phase is very important in maintaining the performance of road services. This research will also contribute to the overall suitability of the all-cross assessment on social and safety factors that will later be used to build Malaysia Rural Road Green Tools.

Table 1.1: List of rating tools for sustainable transportation.

Origin	I-LAST	BEST in Highways	Green LITES	Green Roads	INVEST	STARS	MYGHI	PhJKR (roads)
	US	US	US	US	US	US	Malaysia	Malaysia
Type-Highway	√	√	√	√	√	√	√	X
Type-Federal Road	X	X	X	√	X	√	X	√
Type- Rural Road	X	X	X	X	X	X	X	X

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