Cawangan Perak

ISCU 2025

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WELCOME SPEECH FROM THE CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

بسم الله الرحمن الرحيم السلام

عليكم ورحمة الله وبركاته

Greetings to all,

It is with great pleasure that I welcome you to the 17th RISM International Surveying Conference for Undergraduates (ISCU 2025), themed *"Embracing Construction Revolution 4.0: Transforming Malaysia's Built Environment."* On behalf of the Royal Institution of Surveyors Malaysia (RISM), I also wish to express our sincere appreciation to Universiti Teknologi MARA (UiTM), Perak Campus, for graciously hosting this significant event.

As we navigate the era of the Fourth Industrial Revolution (IR4.0)—or in our context, Construction Revolution 4.0 (CR4.0)—we are witnessing transformative advancements across the global construction sector. Technologies such as Building Information Modelling (BIM), the Internet of Things (IoT), artificial intelligence (AI), robotics, big data analytics, and cloud computing are redefining the way we build, manage, and interact with our built environment. For Malaysia, embracing CR4.0 is a strategic imperative to achieve our socio-economic and environmental goals.

This conference serves as a vital platform to unite surveying undergraduates from various disciplines, fostering critical dialogue on industry challenges, enhancing professional networking, and preparing a new generation of talent for the rapidly evolving construction landscape. It is also an opportunity for employers to engage with and inspire our future professionals.

I would like to extend my heartfelt thanks to all industry speakers, paper presenters, judges, and participants for their time, contributions, and support in making ISCU 2025 a success. I also commend the organising committee for curating a meaningful and dynamic conference experience.

May the knowledge gained, connections formed, and ideas exchanged during this event inspire all participants to lead and innovate in their future endeavours.

Wishing everyone a productive and memorable conference.

Prof. Ts Sr Dr. Adi Irfan Bin Che Ani'
Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM CO-CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

Bismillahirrahmanirrahim.

السلام عليكم ورحمة الله وبركاته and greetings to all.

It is my great pleasure to welcome everyone to the 17th International Surveyor Conference for Undergraduates (ISCU 2025), proudly hosted by Universiti Teknologi MARA (UiTM) Perak Branch in collaboration with the Royal Institution of Surveyors Malaysia (RISM). This event is a meaningful platform for students in the built environment to share ideas, showcase innovations, and build professional networks. We are honoured by your presence and enthusiastic participation, with 135 accepted papers and 78 poster presentations this year.

UiTM Perak, home to the College of Built Environment, has long been a hub for academic excellence in architecture, planning, and surveying. Our commitment remains strong in nurturing competent graduates who meet industry demands and contribute to nation-building.

While you're here, we invite you to experience the heritage and culture of Perak Tengah from the architectural richness of Rumah Kutai to the historical towns of Pasir Salak, Bota, and Kampung Gajah.

To all presenters and winners, congratulations on your achievements. Let your work today be a catalyst for future success and academic growth. We hope this conference will inspire you to explore new ideas, foster collaboration, and make lasting memories.

My deepest thanks to the Royal Institution of Surveyors Malaysia (RISM) and the organising committee for making this event a success.

We hope your experience here will be rewarding and unforgettable.

Thank you. Selamat datang dan selamat berjaya.

Associates Professor Dr. Nur Hisham Ibrahim, *PMP*
Co-Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM THE PROJECT DIRECTOR

RISM 17th International Surveying Conference for Undergraduates 2025

Alhamdulillah, all praise to Allah S.W.T. for His guidance and blessings in making the RISM 17th International Surveying Conference for Undergraduates (ISCU) 2025 a reality.

It is with great honour and gratitude that I welcome all participants, guests, academicians, and industry professionals to this prestigious event, proudly organized under the Royal Institution of Surveyors Malaysia (RISM). This 17th edition of ISCU stands as a proud testament to our collective dedication toward academic excellence, professional collaboration, and youth empowerment in the field of surveying.

I extend my heartfelt appreciation to RISM for its unwavering support, to the hardworking ISCU 2025 Organising Committee, and to all 16 partnering universities across Malaysia for their commitment and contributions. Your efforts have shaped this conference into a dynamic platform for knowledge exchange, innovation, and professional growth.

To the academicians and practitioners present, your insights are invaluable in bridging the gap between academic theory and real-world practice. To our undergraduate participants, your passion, curiosity, and commitment are the very foundation of our future. May this conference not only deepen your academic journey but also ignite a spirit of leadership, integrity, and sustainable thinking.

Let this gathering serve as more than an academic milestone. May it foster lifelong networks, inspire transformative ideas, and chart new directions in our shared professional journey.

Wishing everyone a rewarding and inspiring conference experience.

Sr Dr. Nurul Fadzila Zahari
Project Director
RISM 17th ISCU 2025

LANDSLIDE SUSCEPTIBILITY MAP IN CAMERON HIGHLANDS 2023

Raja Zuhnun Al-Misri Bin Raja Harun Al-Rashid [1], Mohd Najib Bin Husain[2*], Haslina Binti Hashim [3], Suzannah Binti Abdullah[4]

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ABSTRACT

This research examines the landslide susceptibility of Cameron Highland in 2023. Landslides are a major natural hazard in Cameron Highlands, Malaysia, which seriously endanger infrastructure, agriculture, and human life. These activities tend to be triggered by a synergy of natural and anthropogenic drivers such as high rainfall, land clearing, and poor land use. The present study therefore attempts to investigate the landslide hazard within the region through the analysis of major physical variables, particularly drainage density and elevation gradient, given that they stand at the apex of slope stability determinants. High-resolution USGS geospatial data is used in crafting GIS-based techniques that provide a better understanding of landslide hazardous terrain. Spatial processing and analysis of data are done using ArcGIS Pro software. A DEM is laid out on which slope, and elevation information will be collected, which is of very high importance in the overall morphology of the area. Moreover, drainage patterns are assessed to establish areas that predispose to the collection of water, which tends to raise the risk of soil erosion and escalate the possibility of landslide. The research will integrate these criteria into one comprehensive spatial analysis framework to build an intensive landslide hazard map that delineates zones of varied hazard levels in Cameron Highlands. These results are expected to enhance the scientific understanding of the dynamics of landslide significantly in this very critical area. The risk map that was generated would be an important tool for municipal governments, urban planners, and disaster management agencies to identify hazardous locations and set priorities for mitigation.

Keywords: Landslide, Susceptibility Map, Hazard.

I. INTRODUCTION

Background and problem statement

The Cameron Highlands is a widely known highland region in Malaysia that is very frequently exposed to landslides due to steep topography, high rainfall, and intensive land-use changes. The natural landscape has been grossly altered due to rapid urbanization, deforestation, and agriculture, developing an increased risk of slope failures. These landslides happening in this area spoil not only infrastructural facilities but also pose a grave threat to human life and the environment. Landslide susceptibility mapping is, therefore, of utmost importance as an aid for delineating zones at risk in planning for mitigation strategies. Potential landslide occurrences may be predicted from a geospatial analysis that identifies the influence of slope gradient and drainage characteristics among other important geospatial parameters. The work applies ArcGIS Pro in analyzing the aforementioned parameters and prepares a landslide susceptibility map for Cameron Highlands. Integration of DEM and hydrological analysis will be really useful to find the steepness of slopes and drainage pattern that could relate to the occurrence of the landslide.

First issue based on the high landslide frequency in the Cameron Highlands, mostly due to heavy rain and land use modification. Despite a high number of studies being carried out, most have omitted the interaction between the slope gradient and drainage density using a geospatial approach. This study bridges the gap by investigating these factors to create a landslide susceptibility map to aid in effective disaster risk management and urban planning.

Objectives of study

This research therefore seeks to evaluate the susceptibility to landslides in the Cameron Highlands based on slope and drainage characteristics. The relationship between slope gradient and drainage pattern parameters with respect to landslide occurrences will be analysed within a geospatial framework. The study will utilize DEMs and ArcGIS Pro spatial tools to generate the susceptibility maps.

Specific objectives of the project are:
1. To create a DEM model for Cameron Highlands.
2. To develop a landslide susceptibility map for Cameron Highlands using spatial analysis techniques
3. To study the relationship of slope gradient and drainage pattern parameters with the landslide susceptibility condition in Cameron Highlands.

II. Methodology

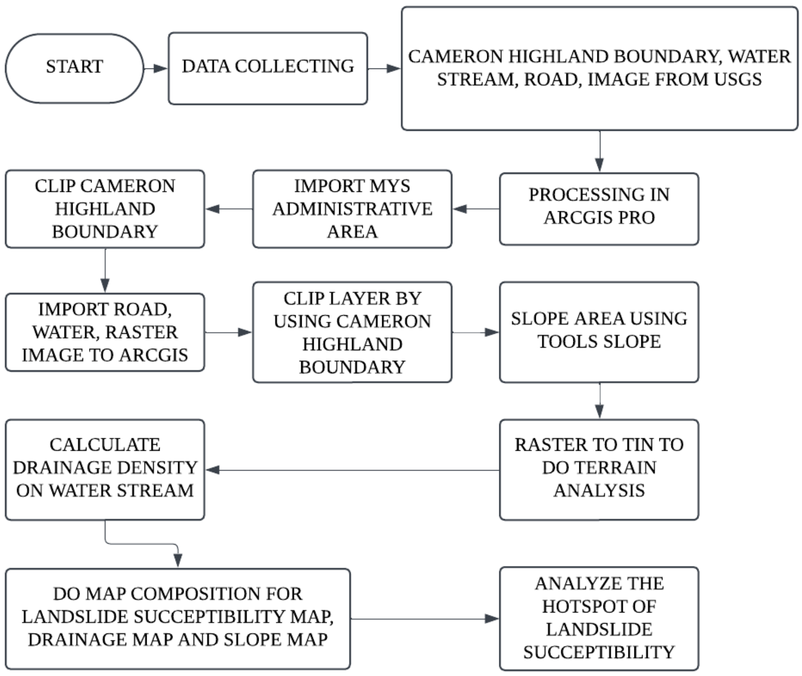

Figure 8.0 Flowchart of the project

A. Study Area

This research aims at Cameron Highlands, which is dominated by land mountains, water streams, and road networks. The aim is to assess landslide hazards using spatial analysis techniques in ArcGIS Pro. Various geospatial data like USGS raster imagery, administrative boundaries, water streams, and road networks have been utilized for the analysis.

B. Data Preparation

The data gained then insert into ArcGIS Pro for processing and analysis. The datasets included:
- USGS raster images
- Administrative boundaries (MYS_adm2.shp)
- Water stream data
- Road network data

All spatial datasets were projected using the World Geodetic System 1984 (WGS1984) to ensure consistency in analysis.

C. Data Processing in ArcGIS Pro

i) Importing Data

A new project was created in ArcGIS Pro, and all the data gathered were imported using the "Add Data" tool. The administrative boundary of Malaysia was imported first, followed by road networks, water streams, and raster images.

ii) Clipping the Study Area

The Clip tool was utilized to retrieve data relevant to the Cameron Highlands area. The procedure involved the selection of the Cameron Highlands boundary and using the Clip tool to acquire a subset of each dataset, such as:

- Water stream data
- Road network data
- Raster imagery

iii) Raster Image Noise Reduction

To enhance the quality of raster images, the Focal Statistics tool was applied multiple times to reduce noise and improve clarity.

iv) Slope Analysis

Slope tool of the Spatial Analyst toolbox was used to generate a slope map of the raster data. The slopes were reclassified into five classes using the Reclassify tool.

v) Reclassification of Data

The reclassification process was performed to categorize data into classes that can be used for risk assessment. The steps involved:

- Classifying slope data using Natural Breaks (Jenks) into five categories.
- Assigning appropriate symbology for visual interpretation.

vi) Raster to TIN Conversion

The Raster to TIN tool was used to convert elevation raster data into a Triangular Irregular Network (TIN) model to analyze terrain variations.

vii) Drainage Density Calculation

To determine drainage density:

1. The Summarize Within tool was used to calculate the total length of water streams within the study area.
2. The length of the water streams was divided by the total area of Cameron Highlands to derive drainage density.
3. The results were stored in an attribute table, with drainage density classified into three categories: Low, Moderate, and High.
4. The Feature to Raster tool was used to convert drainage density data into raster format.

viii) Weighted Overlay Analysis

To assess landslide susceptibility, a weighted overlay analysis was performed:

1. The slope and drainage density maps were reclassified into three categories.
2. The Weighted Overlay tool was used to combine the layers, assigning appropriate weightage to each factor.

E. Map Composition

A final map layout was created to visualize the landslide risk assessment results:

- The A2 format was selected for the map layout.
- The map frame was inserted, displaying the weighted overlay results.
- Legend, north arrow, scale bar, and dynamic text elements were added.
- Metadata including data sources, projection system (WGS1984), and study area description were incorporated.

This methodology ensured a structured approach to analyzing landslide risk in Cameron Highlands using GIS techniques.

III. RESULT AND ANALYSIS

A. DEM Map

The DEM model for Cameron Highlands 2023 is a representation in digital form for the elevation characteristics of the land surface. For the slope value classification, elevation values are identified in the color gradient map to show green for low slopes with a range from 0.00 to 10.00, yellow to orange for a moderate slope between 10.00 and 46.40, and red for steep or high-elevated areas greater than 1000.00. The waterways-blue, show the pattern of rivers and streams, generally following the contour lines of nature, affecting erosions and discharging water flows. The roads, indicated in yellow, introduce the infrastructure net and its courses regarding topographical variations. This DEM model is imperative in landslide risk assessment, town planning, and environmental management, for areas with steep slopes are susceptible to erosion and instability. Variation in slope values indicates the landforms, from gently sloping valleys to steep ridges that may affect agriculture, construction, and water management strategies. Integrating the elevation and slope data will facilitate better decision-making on land use planning, hazard mitigation, and sustainable development in Cameron Highland.

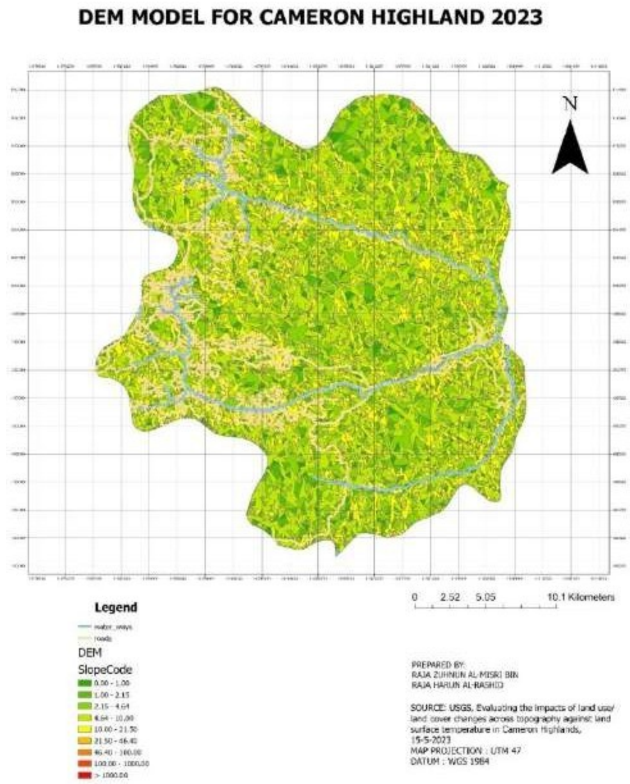

Figure 2.0 DEM Model for Cameron highland 2023

B. Slope and drainage density map

i) Slope map

The Slope Map of Cameron Highlands, 2023, attached, shows the slope variation within its topography. Slopes are categorized between 1 to 5, representing the most gentle to very steep slopes, respectively. Indeed, it expresses the area that also has both steep and gentle slopes. This further shows a good assembly in terms of the putting together of water features like rivers and streams facing a greater extent of the drainage system. The roads and pathways, too, show that there was some infrastructure in the region. However, it does not provide the specific locations of the settlements or other features.

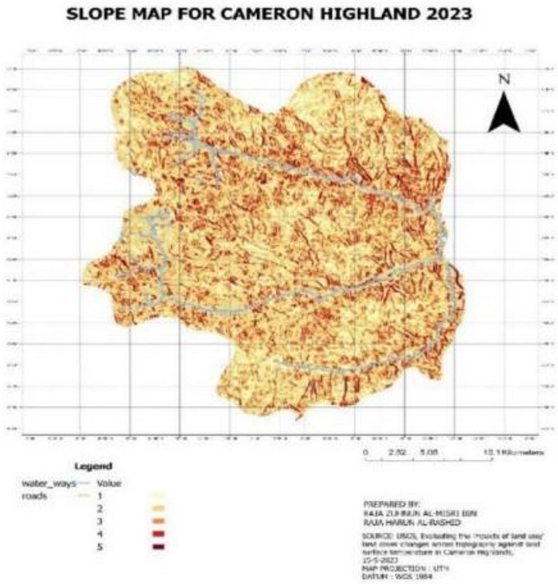

Figure 3.0 Slope map

ii) Drainage density map

Cameron Highlands Drainage Density Map 2023, this map shows, in detail, the hydrological network of the area, after which the water streams are dispersed and how these relate to man-made infrastructures. Watercourses such as rivers and streams are represented by blue lines while roads by yellow lines, hence bringing into view transportation in the area. In addition, the light yellow shading shows drainage of moderate density. These findings show that the drainage in Cameron Highlands is well distributed, which is important to maintain an appropriate flow of water and keep ecological balance. The alignment of roads with or across water streams shows the potential flood area, hence it needs proper drainage management. The drainage pattern therefore reflects influence from topography where streams trace natural contours, probably contributing to erosion or landslide risk in those places. Besides, water bodies distribution will play a leading role in changing land use practices such as agriculture, developing cities, or transportation planning. This map has been prepared by using USGS data, which is essentially used for interpreting the relationship among drainage patterns and land use for environmental stability of Cameron Highlands.

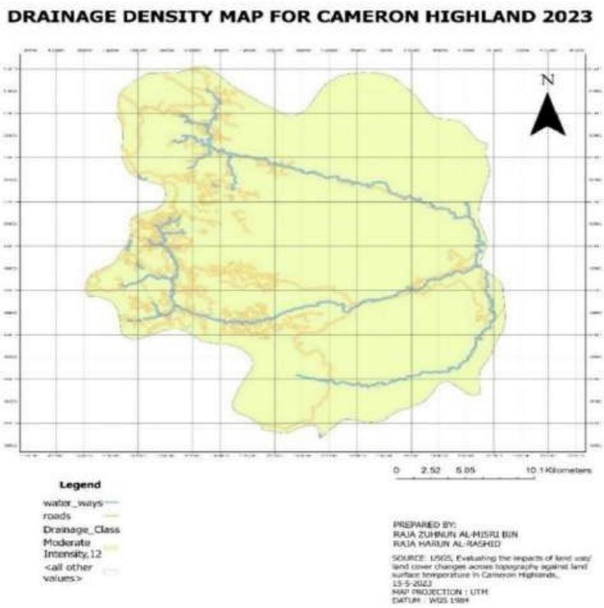

Figure 4.0 Drainage density map

iii) Lanslide susceptibility map

The landslide susceptibility map of the Cameron Highlands (2023) presents regions of high risk primarily in the west and south, where potential landslide occurrences are red-colored. Susceptibility is represented on the map with brown-red color, which represents landslide-prone regions. The spatial distribution of landslide occurrences is observed to follow along major roads and streams. In situ evidence of roadways provides information about interactions among zones of vulnerability and infrastructure, while nearness to streams can signify conformation among hydrology and locations for landslides. Steep slopes and visually observable patterns in land usage throughout Cameron Highlands reflect sites of presumptive instability.

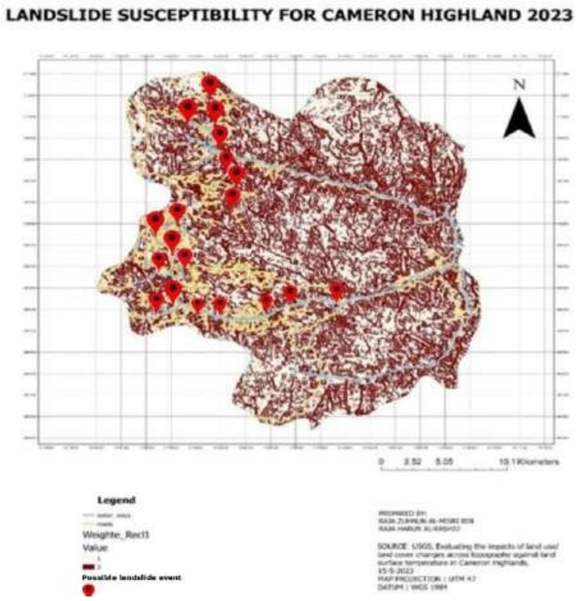

Figure 5.0 Landslide susceptibility map

iv) Landslide event map

The Land Use Map shows different categories of land use in a region, with colors that are easy to identify. The red dots indicate landslide-prone areas, while the green color represents forests. Industrial zones are purple, and water bodies, such as rivers and lakes, are light blue. Infrastructure and utilities are white, and public amenities like parks and schools are blue. Commercial uses are in light orange, mixed development zones in orange, and transportation infrastructure in yellow. Agricultural uses are in light green, residential areas also in light orange, and vacant land in dark green. Recreational spaces are in light green. This map has a coordinate grid, a scale bar to measure distance, and a compass symbol showing north.

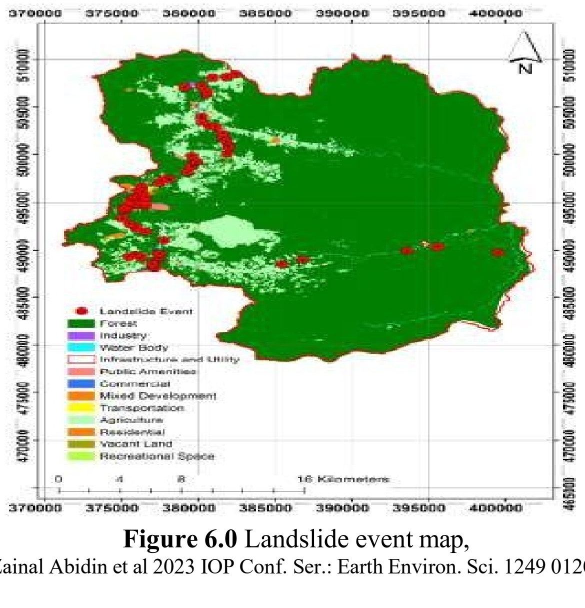

Figure 6.0 Landslide event map,
(source: R Zainal Abidin et al 2023 IOP Conf. Ser.: Earth Environ. Sci. 1249 012005 (page 7))

IV. DISCUSSION

Landslide susceptibility analysis of Cameron Highlands (2023) highlighted slope and drainage density as significant causative factors. The result indicates that landslide occurrence is greater in regions with higher slopes and drainage density due to high soil erosion and water saturation. The landslide susceptibility map created in this study provides a spatial implication of risk distribution, which can be utilized in disaster management and land use planning.

The research, however, has a few limitations in that it considers only two parameters—slope and drainage density—without factoring in other important variables such as land use, soil type, and rainfall. Incorporating these additional parameters would increase the accuracy of landslide risk assessment. In addition, higher resolution datasets and field validation would render the results more credible.

Despite these limitations, the study highlights the importance of geospatial analysis in defining high-risk areas and warrants efforts on increased disaster preparedness, risk reduction, and sustainable development in Cameron Highlands. Future research should include other environmental and climatic factors to further improve the landslide susceptibility model.

CONCLUSION AND RECOMMENDATIONS

The Cameron Highlands landslide susceptibility map is calculated based on **slope and drainage density**. Places with **high slope and high drainage density** are more prone to landslides due to the fact that greater accumulation of water and soil saturation cause weaknesses in slopes and trigger landslides. This map is applicable to land-use planning and disaster management since it pinpoints high-risk zones. It lacks consideration of other important parameters including **rainfall intensity, soil type, land use, and geology**. It is still a good foundation for further studies despite this limitation. For improved precision and usability of landslide risk analysis, future studies need to include rainfall patterns, soil characteristics, and geological data. The results can be verified by field surveys, and advanced techniques like machine learning can enhance the precision of predictions. Mitigation measures such as slope stabilization, reforestation, and sustainable land use are required for high-risk areas. Furthermore, early warning systems and public awareness campaigns can reduce the impacts of landslides. Finally, this map should guide **land-use planning by restricting building and farming in high-risk areas**, resulting in the sustainable development of Cameron Highlands.

ACKNOWLEDGEMENT

I want to thank earnestly Universiti Teknologi MARA and the Department of Built Environment], for providing all the resources and guidance necessary for this study to be carried out. My appreciation goes to my supervisor/lecturer, Sr. Gs. Mohd Najib Bin Husain, for their insightful suggestions, encouragement, and unreserved support throughout the research. I would also like to thank my lecturer whos also teaching me and gave me much useful knowledge to make this project anad also for their cooperation and assistance in data collection and analysis. Special thanks to USGS, Global Solar Atlas, and other data sources for providing useful datasets that assisted in this study. Lastly, I thank my friends and family for their encouragement and support during this process. Without their support, this project would not have been possible. Thank you, may Allah bless each of you.

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