Faculty of Electrical and Electronic Engineering Technology

REMOTE SENSING FOR LAND COVER SUSTAINABILITY AND OBSERVATION OF DURIAN TUNGGAL

SHESAN A/L ARUMUGAM

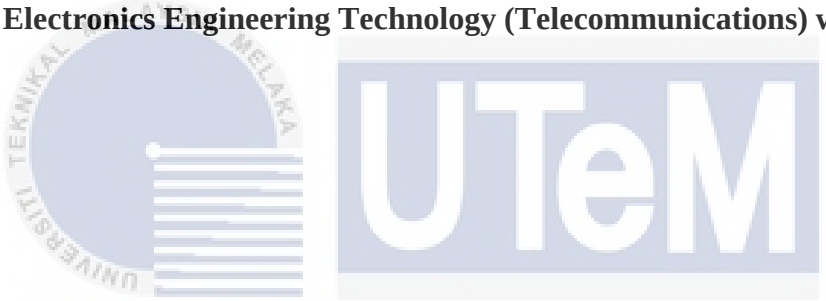
Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

2022

REMOTE SENSING FOR LAND COVER SUSTAINABILITY AND OBSERVATION OF DURIAN TUNGGAL

SHESAN A/L ARUMUGAM

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology (Telecommunications) with Honours



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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

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Sesi Pengajian : 2021/2022

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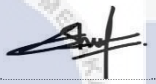
Signature : 

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I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

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Supervisor Name : AZIEN BINTI MOHD AZIZE

Date : 11/1/2022

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

To my beloved father Arumugam A/L Silasammy and mother Parasmesswary A/P Seenivasan, supportive supervisors Puan Azien Binti Mohd Azize, My faithful panels, lectures of FTK and My BEET classmates who strongly supported throughout the journey.

ABSTRACT

The fundamental idea of this project work is to study Durian Tunggal Malacca's surface for a remote sensing for land cover sustainability and observation. Durian Tunggal is located in Alor Gajah District, Malacca, Malaysia which is just 4 kilometres from Ayer Keroh Tol Plaza. This place is surrounded with major industrial, agricultural along with a heavy forest. A study is carried to understand more about the land cover of the area. Since there is an environmental change happened in that area, to test and observe the sustainability of the land cover mainly it require to use a remote sensing which is a passive sensors. With the help of the sun's energy which is a natural energy it will provide a radiation for remote sensing during day time to capture a picture of a surface from the satellites. With the help of ArcGIS software it supply tools for remote sensing, photogrammetry and to work with maps and geographic information. Finally, with this the expected result of the project will be obtain by mapping and analysing the land cover in Durian Tunggal where can study the factors of this changes happen.

ABSTRAK

Idea asas kerja projek ini adalah mengkaji permukaan Durian Tunggal Melaka untuk penginderaan jauh untuk kelestarian dan pemerhatian kegunaan tanah. Durian Tunggal terletak di Daerah Alor Gajah, Melaka, Malaysia yang terletak hanya 4 kilometer dari Ayer Keroh Tol Plaza. Tempat ini dikelilingi industri perindustrian, pertanian dan hutan lebat. Satu kajian dijalankan untuk mengetahui lebih lanjut mengenai penggunaan tanah kawasan tersebut. Oleh kerana terdapat perubahan persekitaran yang terjadi di kawasan itu, untuk menguji dan mengamati keberlanjutan kegunaan tanah, ia memerlukan penggunaan penginderaan jauh yang merupakan sensor pasif. Dengan bantuan tenaga matahari yang merupakan tenaga semula jadi ia akan memberikan sinaran untuk penginderaan jauh pada waktu siang untuk menangkap gambar permukaan dari satelit. Dengan bantuan perisian ArcGIS, ia menyediakan alat untuk penginderaan jauh, fotogrametri dan bekerja dengan peta dan maklumat geografi. Akhirnya, dengan ini hasil yang diharapkan dari projek akan diperoleh dengan memetakan dan menganalisis kegunaan tanah di Durian Tunggal di mana dapat mengkaji faktor-faktor perubahan ini terjadi.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Puan Azien Binti Mohd Azize, of the Faculty of Engineering Technology at Universiti Teknikal Malaysia Melaka (UTeM), for her assistance in providing ideas and advice during the creation of this project. In addition, I am grateful to my loving family for their continuous encouragement in furthering my mission. I owe them a debt of appreciation for their comfort, love, and passionate support that they have shown me. Aside from that, I owe a huge big thank to my 3 BEET classmates, who have always been willing to lend a hand when I'm having problems with the project. Without a doubt, their insights, advice, support, and assistance with various diseases are quite useful.

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LIST OF SYMBOLS

%	-	Percentage
°	-	Degree
‘	-	Prime
“	-	Double Prime

LIST OF ABBREVIATIONS

GIS	-	Geographic Information System
MYSA	-	Malaysian Space Agency
USGS	-	United States Geological Survey
ArcGIS	-	Aeronautical Reconnaissance Coverage Geographic Information System
RSE	-	Remote Sensing Environment
NASA	-	National Aeronautics and Space Administration
USDA	-	United States Department of Agriculture
NOAA	-	National Oceanic and Atmospheric Administration
SPOT	-	Satellite Pour l'Observation de la Terre
IKONOS	-	USA Satellite
SAR	-	Synthetic Aperture Radar
LiDAR	-	Light Detection and Ranging
EO-1	-	Satellite
NDVI	-	Normalized Difference Vegetation Index
LCM	-	Land Cover Mapping
ArcView3	-	Geographic Information System Software
IDRISI	-	Geographic Information System Software
ENVI	-	Geographic Information System Software
CA-Markov	-	Cellular Automata Markov Chain
UGB	-	Urban Growth Boundary
UCB	-	Urban Containment Boundary

Landsat 5 TM	-	Landsat Thematic Mapper
Landsat 5 OLI	-	Landsat Operational Land Imager
GeoTIFF	-	Remote Sensing File Format
NITF	-	Remote Sensing File Format
JPEG	-	Remote Sensing File Format
ECW	-	Remote Sensing File Format
MrSID	-	Remote Sensing File Format
HDF	-	Remote Sensing File Format
NetCDF	-	Remote Sensing File Format
GPS	-	Global Positioning System
PC	-	Personal Computer
ArcMap	-	Geographic Information System Software
ArcCatalog	-	Geographic Information System Software
ArcGis Pro	-	Geographic Information System Software
ArcScene	-	Geographic Information System Software
ArcGlobe	-	Geographic Information System Software
MXD	-	Map Exchange Document
CPU	-	Central Processing Unit
3D	-	Three Dimensional
APRX	-	Project File Format
3DD	-	Three Dimensional Design
SXD	-	Scenes File Format
EML	-	Erdas Macro Language
ER Mapper	-	Earth Resource Mapping

ANGKASA	-	Malaysian Space Agency
MRSA	-	Malaysian Remote Sensing Agency
R&D	-	Research and Development
AOI	-	Automated Optical Inspection
GloVIS	-	Global Visualizer

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

As per (Ayyanna, Rama Roa and Bachina, 2019) in an urban or built up area with current changes in climate, environment and human health causes decadence to the surrounding. The study of land cover data is very important because through that we can study or understand on how much a area is balance by forests, agriculture, wet and dry land, and other land. By knowing this we can know on how to use a land for a landscape such as for development, preservation or other use. A different group of land cover can be direct or uses quite separately. Land cover can be decided by examine satellite and aerial imagery. By doing this, land cover maps allowed details to understand the landscape on impacts of natural phenomena for the uses.

According to (Al-Doski et al., 2020) remote sensing has turn out as a major tool to progress and understanding the global, it will measure, obtain, analyze and apply the information of a surface on Earth without making any physical contact. There are two types of remote sensor, one will be active and another one will be passive. Active sensor is a source of energy for their own illumination which can measure anytime, regardless of the time and day. Passive sensor is a external source of energy for illumination which can measure depend on the time, whether and season.

GIS and remote sensing technologies have shown to be quite useful in resolving research problems in a wide range of sectors. As a result, using remote sensing and a GIS method, this study investigates the changes in land cover pattern in Durian Tunggal. Significantly, this research is likely to assist decision-makers in developing a stronger emergency response and action plan for sustainable land development, as well as minimizing the problems of growing urbanization.

1.2 Problem Statement

Causes of the degradation of the environment and human health in an urban setting, natural and human induced environmental changes are of concern today. The study of land cover variations is critical for appropriate planning, usage, and management of natural resources. Remote sensing has evolved into a valuable tool for developing and studying global physical processes that influence the planet. In Malaysia we need land cover identification, delineation, and mapping because it is essential for worldwide monitoring, resource management, and planning. Land cover identification gives the ground cover information for baseline thematic maps and generates a baseline from which monitoring operations may be carried out.

Malaysians and the government should be concerned about the long-term sustainability of land cover. Environmental damage has occurred from national expansion, forcing the ecology to become imbalanced. Remote sensors will be the most effective technique to track and monitor the country's land cover sustainability. By employing remote sensing images to examine and monitor the conditions of land cover in a given location, authorities will have a better knowledge of land cover changes. When a map is utilized as baseline data, classification is possible. This will assist in the classification of a broad region

of the location into different zones to observe the changes. We also shall confront several challenges if remote sensing technology is not used. One of it will be to detect land cover changes, we will need additional time to collect data from a large area. Authorities, on the other side, will be unable to keep track on the state of a broad region. Authorities will have to do risky tasks in order to gather data in order to analyze the area's long-term sustainability, which will take a long time. Land cover destruction will go undetected for a long period, resulting in environmental damage.

1.3 Project Objective

The objective of this thesis in completing this project will be the guidance for developing the project:

i) To map the urban changes of Durian Tunggal based on the satellite image using remote sensing and GIS application.

ii) To identify the land cover changing by times by using GIS analysis.

iii) To analyze the land cover change in Durian Tunggal.

1.4 Scope of Project

The scope of this research is to look into the long-term viability of land cover in Durian Tunggal using remote sensing images from websites like MYSA and USGS. The major goal of this study is to use remote sensing GIS to identify urban changes in Durian Tunggal. Another scope of the project will be to learn how to collect satellite photos from reputable sources such as MYSA and USGS. The usage of ArcGIS software to analyze land cover changes is crucial when studying satellite data. Also, not to forget to look into the elements

that influence land cover change in Durian Tunggal. This requires a clear understanding of the image classification phase.

1.5 Thesis Outline

The following are the chapters that make up the reports:

Chapter 1: Introduction

This chapter will simply provide an overview of the project. Introduction, problem statement, objectives, scope, and thesis outline are all included in this chapter.

Chapter 2: Literature review

This chapter's goal is to clarify the chosen project, which is remote sensing for land cover sustainability and observation.

Chapter 3: Methodology

This section provides the technique employed in this field of study, as well as investigations conducted in accordance with the project's goal.

Chapter 4: Results and Discussion

This chapter covers the project's output.

Chapter 5: Conclusion and Recommendations

This chapter explain the project's overview and also the future of the remote sensing.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter looks at and reviews previous experiments and researches that are important to this project. The information and data gathered provide the system with an external source of data to research and produce more productive work. The use of remote sensing for land cover sustainability and observation of Durian Tunggal is investigated, and various key points are used as alternate support or references in this study. Information is gathered from journals, books, and articles on the internet. To obtain a better understanding of the project's research, a few literature reviews were conducted.

2.2 Previous Research Review

2.2.1 History of Remote Sensing

According to (Bauer, 2020), Remote Sensing of Environment (RSE) was the third remote sensing journal when it first appeared in 1969. RSE developed a different strategy than its predecessors, focusing on scientific research and quantitative sensing with electronic sensors instead of cameras, film, photogrammetric measurements, and visual interpretation of aerial pictures. It started from the National Aeronautics and Space Administration (NASA), the United States Department of Agriculture (USDA), the United States Geological Survey (USGS) and the National Oceanic and Atmospheric Administration (NOAA) introducing the larger phrase of remote sensing and recognition in the early 1960s. The

potential of multispectral sensing, including optical and microwave wavelengths from satellites as well as aircraft, and digital image processing and analysis for a variety of applications, including agriculture, forestry, geography, hydrology and water resources, oceanography, and meteorology, has been recognized by them.

For 15 years, David Simonett was a major microwave sensing scientist at the University of Kansas, and then the founding chair of the Department of Geography at the University of California, Santa Barbara. Establishing an internationally acclaimed remote sensing section was part of his vision and leadership of the department. As associate editors and editorial board members, Professor Simonett was joined by other outstanding experts, all pioneers in remote sensing research, who shared his vision of remote sensing for monitoring and analysis of the environment and Earth resources. These experts' technical domains become an important keys of remote sensing research and applications, and they are become important people in RSE, along with many others.

2.2.2 Remote Sensors

According to (Toth & Jóźków, 2016) Remote Sensing technology's goal is to enable observation of a physical parameter in a mapping frame at a certain time or period. Physical space is a huge concept that encompasses man-made items, flora, atmospheric conditions, and everything in between, starting with the form of the Earth. Next, as per (Ghassemian, 2016), there is a comparable range in terms of spatial and temporal resolution. All the require information are included in the spectral, spatial, and temporal fluctuation of electromagnetic energy arriving from the scene. The classification method gives each pixel of the picture to a specific class of interest in order to build a high-accuracy map. Because pixels in remote