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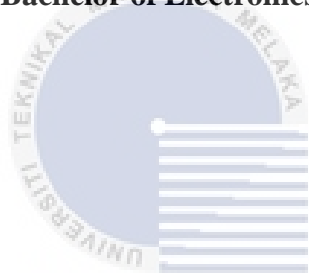
Bachelor of Electronics Engineering Technology with Honours

2021

**DEVELOPMENT OF REMOTE SENSING IN SUSTAINABILITY AND
OBSERVATIONS FOR THE STRAIT OF MALACCA'S MANGROVE FOREST**

KELVIN ONG

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



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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for the Strait of Malacca's mangrove forest

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I declare that this project report entitled “Development of Remote Sensing System in sustainability and observations for the Strait of Malacca’s mangrove forest” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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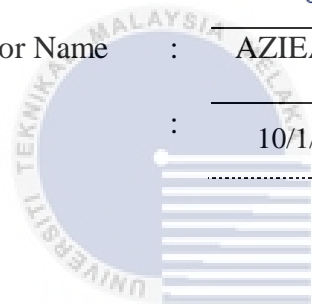
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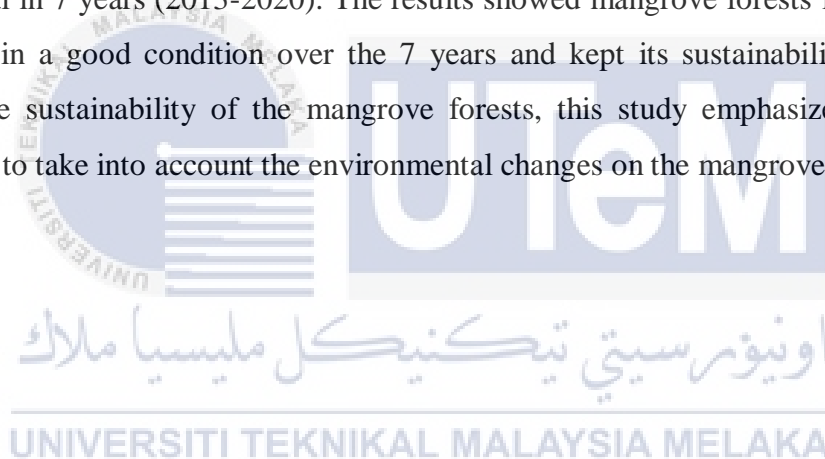
DEDICATION

I dedicate this thesis to my family members, and friends who always give big support to me by nursing me to finish this final year project smoothly. At the same time, i would like to dedicate this thesis to my supervisor, Madam Azien Binti Mohd Azize who always gives advises to me in order for me to reach a higher achievement in my PSM 1 and PSM 2. Thank you for supporting me during the process of completing this final year project. I really appreciate it.



ABSTRACT

Tanjung Piai is one of the capes under District of Pontian, Johor. It is located at the southernmost point of Peninsular Malaysia. Tanjung Piai is famous with the Tanjung Piai National Park, which is the smallest, but most visited among five national parks in Johor. This national park is surrounded by mangrove trees which maintain the ecosystem in good condition and provide services to the environment and the surroundings. This paper analyses the land cover of mangrove forests in Pontian District by using different satellite images. The analysis on the land cover of mangrove forests helps to maintain its sustainability and monitor its changes over the years. To observe the changes of the mangrove forests, we compared 9 satellite images from different places such as South Pontian, Pulau Kukup, and Tanjung Piai in 7 years (2013-2020). The results showed mangrove forests in Tanjung Piai maintained in a good condition over the 7 years and kept its sustainability. In order to maintain the sustainability of the mangrove forests, this study emphasizes the need or suggestions to take into account the environmental changes on the mangrove forests.



ABSTRAK

Tanjung Piai merupakan salah satu tanjung yang di bawah Daerah Pontian, Johor. Ia terletak di paling selatan di benua Asia. Tanjung Piai terkenal dengan Taman Negara Tanjung Piai. Taman Negara Tanjung Piai adalah yang terkecil tetapi paling banyak dikunjungi di antara lima taman nasional di Johor yang terletak di daerah Pontian, Johor. Taman negaraini dikelilingi oleh pokok bakau yang menjaga ekosistem dalam keadaan yang baik dan memberikan perkhidmatan kepada alam sekitar. Kertas penyelidikan ini menganalisis tutupan tanah hutan bakau di Daerah Pontian dengan menggunakan imej satelit yang berbeza. Analisis ke atas tutupan tanah hutan bakau membantu mengekalkan kemampuannya dan memantau perubahannya selama ini. Kami membandingkan 9 imej satelit dari tempat yang berbeza seperti Pontian Selatan, Pulau Kukup, dan Tanjung Piai dalam tempoh 7 tahun untuk melihat perubahan hutan bakau di Pontian. Hasil kajian menunjukkan hutan bakau di Tanjung Piai dikekalkan dalam keadaan baik sepanjang 7 tahun dan mengekalkan kelestariannya. Bagi mengekalkan kelestarian hutan bakau, kajian ini menekankan keperluan atau cadangan untuk mengambil kira perubahan persekitaran terhadap hutan bakau.

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LIST OF ABBREVIATIONS

ERDAS	Earth Resources Data Analysis System
ArcGIS	Aeronautical Reconnaissance Coverage Geographic Information System.
MYSA	Malaysia Space Agency
USGS	United States Geological Survey
TEV	Total Economic Value
MFP	Mangrove Forest Produce
SAR	Synthetic Aperture Radar
TM	Landsat-5 Thematic Mapper
ETM+	Landsat-7 Enhanced Thematic Mapper
OLI	Landsat-8 Operational Land Imager
LST	Land Surface Temperature
RMSE	Root Mean Square Error
CNN	Convolution Neura Network
IHOT	Haze-optimized Transformation
NDVI	Normalized Different Vegetation Index
SAVI	Soil-adjusted Vegetation Index
MMFR	Matang Mangrove Forest Reserve
NIR	Near-infrared Reflectance
GIS	Geographic Information System
Esri	Environmental System Research Institute
EE	Earth Explorer
MODIS	Moderate Resolution Imaging Spectroradiometer

NASA	National Aeronautics and Space Administration
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AOI	Areas of Interest
VNIR	Visible and Near-infrared
SWIR	Short Wave Infrared
LWIR	Long Wave Infrared



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CHAPTER 1

INTRODUCTION

1.1. Background

A process that is related to the detection and monitor of a certain area can be described as remote sensing. In remote sensing, a remote sensor can be used to collect or obtain data or information by detecting the energy that is reflected from the Earth. These sensors have a strong relationship with satellites or are mounted on aircraft. There are 2 main types of remote sensors. They are passive and active remote sensors. The sensor that will have a respond to extra stimuli is called a passive remote sensor. This sensor can be used to detect and record natural energy that is on the surface of the earth. Reflection of the sunlight is the source that is usually will be detected by the passive sensors. On the other hand, there is another type of sensor which is called active sensor which this sensor uses internal stimuli to obtain or collect data from the Earth. The camera that is specially built is used to collect.

1.2. Problem Statements

Mangrove forests play important roles in helping the environment in most of the countries in Southeast Asia. Malaysia is one of the countries that is dominated by large areas of mangrove forest especially at the West coast of Peninsular Malaysia. Mangrove forests contribute to not only humans but also the environment and marine animals. Mangrove forests provide nursery habitats for marine animals. Sources of seafood and shellfish species

are provided by the mangrove forests and support coastal fisheries for the locals. The environment of mangroves forest provides protection and places for coastal birds to have their nesting. Some of the dead mangroves are used by some species of bird as a roosting area. Protection and stabilization of coastlines are helped by the mangrove forests to prevent and reduce the impacts that are created by natural disasters such as tsunami and typhoons. Mangrove forests act as filters to enrich the quality of water. They avoid pollution that causes by stormwater runoff by absorbing them. Mangroves yield commercial forest products such as charcoals, firewood, furniture, boats and, sources for construction. People and the government of Malaysia should always concern about the sustainability of mangrove forests in Malaysia. Selfishness and development of the country have led to the destruction of mangrove forest. Remote sensors are used to keep the sustainability of mangroves in our country. Authorities will have a better understanding of the mangrove forests by using the images of remote sensing to observe and monitor the conditions of mangrove forests. Classification can be done when a map is used as data of baseline. This will help to classify a large area of mangrove forest into 3 types of zones such as preservation, conversation and, development zones. Remote sensor plays an important role in the afford to keep the sustainability of mangrove forests. Without them, we will need to face a lot of difficulties and problems. We need more time to collect data on a large area of mangrove forest. On the other hand, authorities will not be able to monitor the condition of a large area of mangrove forest. Authorities will need to take the dangerous task to collect the data of mangrove forests by going to the scene. Destruction or erosion of mangrove forests 3 will not be discovered intime and bring loss to the environment.

1.3. Objectives

1. To acquire the images of the remote sensors of the mangrove forest in Strait of Malacca from different remote sensing sources.
2. To compare the changes of the land cover of mangrove forests in the Strait of Malacca.
3. To analyse the images of mangrove forest in the Strait of Malacca.

1.4. Scope of Project

The scope of this project is to have deep research in keeping the sustainability of mangrove forests in Tanjung Piai of Johor which has a coordinate of 1.2681° N, 103.5095° E by using images of Landsat 8 from the Internet such USGS. The idea of this project is to learn how to keep the sustainability of the mangrove forest in Malaysia. The main aim that is needed to be achieved in this project is to study the terrain of the mangrove forest in Malaysia in the past 7 years or the most recent terrain of the mangrove forest. The mangrove forest that will be studied is the mangrove forest that is located in Strait of Malacca. The main source to be used in this project is images of remote sensing from different internet sources. Different images of remote sensing from different trustable sources such as images of remote sensing from USGS will be used for us to compare the 3 changes of the land cover of the mangrove forest in Malacca. The other source that will be used in this project is the USGS which is a website or platform that provided free images of remote sensing from the United States. Software that is called ERDAS Imaging will be used to process geospatial of the land cover of the mangrove forest. On the other hand, ArcGIS PRO is a software that is providing images of information that is related to geographic.