Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF REMOTE SENSING SYSTEM IN LAND OBSERVATION AND SUSTAINABILITY OF PUTRA JAYA USING ERDAS AND ARCGIS

MUHD ALIFF NAJMI BIN AFIFFUDIN

Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

2023

DEVELOPMENT OF REMOTE SENSING SYSTEM IN LAND OBSERVATION AND SUSTAINABILITY OF PUTRA JAYA USING ERDAS AND ARCGIS

MUHD ALIFF NAJMI BIN AFIFFUDIN

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

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2023

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : Development of remote sensing system in land observation and Sustainability of Putrajaya using ERDAS and ArcGIS

Sesi Pengajian : 2-2022/2023

Saya Muhd Aliff Najmi Bin Afiffudin mengaku membenarkan laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (✓):

☐	**SULIT***	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
☑	**TERHAD**	(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☐	**TIDAK TERHAD**	

Disahkan oleh:

(TANDATANGAN PENULIS)
Alamat Tetap:

(COP DAN TANDATANGAN PENYELIA)
Ir. Dr. Mohd Muzafar bin Ismail
Senior Lecturer
Faculty of Engineering Technology
Electrical and Electronics
Universiti Teknikal Malaysia Melaka

Tarikh: 15/1/2023

Tarikh: 15/1/2023

*CATATAN: Jika laporan ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh laporan ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I declare that this project report entitled **"**Development of remote sensing system in land observation and sustainability of Putra jaya using ERDAS and ArcGIS" 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.

Signature : 

Student Name : MUHD ALIFF NAJMI BIN AFIFFUDIN

Date : 13/1/2023

APPROVAL

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 Electrical Engineering Technology with Honours.

Signature : 

Supervisor Name : Ir. Dr. Mohd Muzafar Bin Ismail

Date : 13/1/2023

DEDICATION

I dedicate this thesis to my friends and family who have always supported me greatly and helped me to successfully complete my senior project. In addition, I'd like to dedicate this thesis to my mentor, Ir. Dr. Mohd Muzafar Bin Ismail, who is constantly offering advice to help me improve in my PSM 2. I appreciate your assistance in helping me finish this project. I genuinely value it.

ABSTRACT

The administrative heart of the Malaysian government is located at Putrajaya. It can be found in the state of Selangor in Malaysia. Putrajaya is well-known not just for its distinctive structures but also for the park that it contains. This location is bounded on all sides by other buildings, including a hotel and a government facility.The main purpose of this project is to analyze the changes that happen in Putrajaya specially in term of urbanization. The study of the land cover of an urban region is useful for ensuring the area's continued viability and tracking the ways in which it has changed throughout the years. Several different satellite photos are used in this study to conduct an analysis of the land cover of the urban area of Putrajaya. We compared three different satellite photos taken in Putrajaya for different years which is 2014, 2016 and 2021 so that we could track the progression of urbanisation. According to the findings, the urban area was able to keep its sustainable status and keep up its good state over the course of seven years. This study highlights the necessity or makes ideas regarding the need to take into account the effects of environmental changes on the metropolitan area in order to keep Putrajaya's capacity for sustainability intact.

ABSTRAK

Pusat pentadbiran kerajaan Malaysia terletak di Putrajaya. Ia boleh didapati di negeri Selangor di Malaysia. Putrajaya terkenal bukan sahaja dengan strukturnya yang tersendiri tetapi juga dengan taman yang terdapat di dalamnya. Lokasi ini bersempadan di semua sisi dengan bangunan lain, termasuk hotel dan kemudahan kerajaan. Tujuan utama projek ini adalah untuk menganalisis perubahan yang berlaku di Putrajaya khususnya dari segi urbanisasi. Kajian litupan tanah kawasan bandar berguna untuk memastikan daya maju berterusan kawasan itu dan menjejak cara ia telah berubah sepanjang tahun. Beberapa foto satelit yang berbeza digunakan dalam kajian ini untuk menjalankan analisis litupan tanah kawasan bandar Putrajaya. Kami membandingkan tiga gambar satelit berbeza yang diambil di Putrajaya untuk tahun berbeza iaitu 2014, 2016 dan 2021 supaya kami dapat menjejaki perkembangan urbanisasi. Menurut penemuan, kawasan bandar dapat mengekalkan status mampan dan mengekalkan keadaan baiknya dalam tempoh tujuh tahun. Kajian ini mengetengahkan keperluan atau membuat idea mengenai keperluan untuk mengambil kira kesan perubahan alam sekitar ke atas kawasan metropolitan bagi memastikan kapasiti Putrajaya untuk kelestarian utuh.

ACKNOWLEDGEMENTS

First of all, I want to express my gratitude to my supervisor, Ir. Dr. Mohd Muzafar Bin Ismail of the Faculty of Electrical and Electronic Engineering Technology (FTKEE) at University Teknikal Malaysia Melaka, for his efforts in providing me with additional support and direction throughout the project. I'd also like to express my gratitude to Ir. Dr. Mohd Muzafar Bin Ismail for taking the time out of his day to talk to me about his experiences. I would like to take this opportunity to express my gratitude for each and every contribution he has made. I also want to express my gratitude to Universiti Teknikal Malaysia Malaysia Melaka (UTEM), which has provided me with the financial assistance necessary for me to finish my project. On the other hand, my parents, Afiffudin bin Hj Daud and Norazizah binti Ahmad, deserve the highest praise for their unwavering support while I was working on my project. Honorable mention should also go to Kelvin ong, who explains remote sensing to me in great detail. Finally, I want to express my gratitude to the faculty and staff at Universiti Teknikal Malaysia Malaysia Melaka (UTEM), who have provided me with a lot of support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Putrajaya is becoming increasingly crowded because of its rapid expansion. Aside from that, the government has also expressed its position on the matter. For this reason, a technique for monitoring changes in density in Putrajaya over a period of 5–10 years has been developed to help solve the problem. There has been a reliance on remote sensing as a method. It is the method of detecting and monitoring the physical features of an area from a distance by measuring the reflected and emitted radiation from that location (typically from satellite or aircraft). Remotely sensed photos are collected by special cameras, which allow researchers to "feel" many aspects of the Earth.In this project, remote sensing specially use for land observation and sustainability in Putrajaya. Land use monitoring is the phrase that is used in remote sensing for land observation.

Land use refers to the purpose the land serves, for example, recreation, wildlife habitat, or agriculture. Land use applications entail both baseline mapping and subsequent monitoring, since timely information is required to determine what current quantity of land is in what type of use and to identify the land use changes from year to year. This knowledge will help design solutions to balance conservation, conflicting usage, and developmental pressures. Issues driving land use research include the removal or disruption of productive land, urban encroachment, and depletion of forests**.** Putrajaya is the administrative capital of Malaysia, and it serves as the country's administrative hub. An incredible amount of progress has occurred in the last 5-10 years. Apart from the construction of government buildings,

Putrajaya has developed into a popular tourist destination and residential area as a result of the large number of government employees that work in the city. It is critical for us to keep track of land density and sustainability in Putrajaya because it is one of the important places in Malaysia. The results of this study will be compared with those gained from studies conducted in the last 5-10 years, which will be completed at the conclusion of the study.

1.2 PROBLEM STATEMENT

Land observation has evolved into a technique that can be used to monitor the long-term viability of land, agriculture, and other resources. This strategy, on the other hand has certain drawbacks including a high cost, a broad study region, and a lengthy time frame. As a researcher, such events will make the study more difficult to conduct and will have an indirect impact on the study's outcomes

In recent years, the country's deteriorating economic situation, combined with the global increase in inflation, has even become a highly essential component in virtually every research study. The majority of businesses in the country have also implemented cost-cutting strategies to minimize their operating expenses. This situation demonstrates that the rising economic conditions are worse. In the framework of this study, several expenses have been highlighted because of the failure to adopt technology such as remote sensing. There are a variety of charges that have been identified, including those for transportation, equipment, lodging, and food and beverage expenses. Because of the availability of remote sensing, these expenditures can be lowered, if not entirely removed.

Putrajaya is a city having a total land area of 49 square kilometers. It is virtually impossible to collect data in this area within a specified time frame. Furthermore, it is probable that the workforce will rise as a result of this area, which will indirectly increase

the cost of the study. Furthermore, as a large amount of data is collected, the likelihood of errors increases.

Covering a large area of study will take a lot of times to take a data. In addition, the trip to the research site will be costly.However,researchers have a tendency to take on too much work for the time and resources they have. A common blunder is defining a study location that is too large. The optimal size of a study area is determined by the amount of time and money available, the number of people available to work in the field, the time required to collect data in the field, and the mode of travel available in the field.For example, agricultural areas typically have many roads, whereas wilderness areas will necessitate some walking. Each of these variables should be carefully considered and may need to be adjusted as the precise techniques for observation and data gathering become clearer. A larger study area does not always imply a better project. Rather than dispersing effort over a vast area with fewer data points, the quality of project outputs can be increased by focusing on a smaller area and working more intensively.

1.3 PROJECT OBJECTIVE

i) To observe the sustainability the land of Putrajaya

ii) To determine the changes of the environmental and geographical of Putrajaya for land management purpose

iii) To analyze the variation and changes that happen In Putrajaya land due to its development.

1.4 SCOPES

The scope of this project is mainly to observe the changes of condition of environment and density of building in Putrajaya and its sustainability. The software used to accomplish this task is ERDAS and ArcGIS. Next, the study area of this project is in Putrajaya. Remote sensing image between 5-10 years back will use as a comparison to the new remote sensing image. Using the application of remote sensing for urban planning, land mapping, land management and land use/land change purpose.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Remote sensing is a scientific discipline that incorporates a wide range of information and technology used for the observation, analysis, and interpretation of terrestrial and atmospheric events. Its primary information sources are measurements and photographs collected from aerial and space platforms. As for my project we use remote sensing application for land observation and observing the sustainability of land in Putrajaya. This section focuses mostly on the background, facts, and theory, past study, and relationship between the researcher's methodologies. In addition, this section will present the relevant research from journals, publications, research papers, and other sources. The scope of the literature review will be related to the history of remote sensing, type of remote sensing, method use to collect data and all obtained data will be summarized. Before beginning examination work, the literature study entails perusing the works of others to gather crucial data and knowledge, as well as similar projects completed by others. The sources include the prior thesis, journal, conference paper, books, and the Internet. This chapter collects and discusses all pertinent subjects.

2.2 HISTORY OF REMOTE SENSING

The advent of flight gave rise to the contemporary field of remote sensing. In 1858, G. Tourna chon (alias Nadar) photographed Paris from his balloon[1]. Also utilised for early photographs were carrier pigeons, kites, rockets, and unmanned balloons. Except for

balloons, these initial individual photos were not particularly useful for mapmaking or scientific purposes. Beginning with World War I, schematic aerial photography was developed for military surveillance and reconnaissanceescalating during the Cold War with the deployment of modified combat aircraft such as the P-51, P-38, RB-66, and F-4C, or specially developed collection platforms such as the U2/TR-1, SR-71, A-5, and OV-1 series for both overhead and stand-off collection. Increasingly compact sensor pods, such as those employed by law enforcement and the military on both manned and unmanned vehicles, are a more recent innovation. This strategy has the advantage of requiring little modifications to an existing aircraft. Later imaging methods will include infrared, conventional, Doppler, and synthetic aperture radar. While the term of remote sensing was developed in the late 1950s, Evelyn Pruitt, a scientist at the Office of Naval Research, invented the phrase remote sensing[2]. Her definition includes aerial photography and the imagery acquired by modern sensor systems. This phrase has come to denote the process of viewing, measuring, and recognising objects without having physical touch with them.

2.3 TYPES OF REMOTE SENSING

2.3.1 PASSIVE REMOTE SENSING

Passive remote sensing in the optical regime (visible through thermal) relies on two sources of radiation. A remote sensing device collects energy from the sun in the visible to shortwave infrared spectrum. A portion of the radiation received by a sensor has been reflected at the earth's surface and another portion has been scattered by the atmosphere without ever reaching the earth. In the thermal infrared, thermal radiation released directly by materials on the earth interacts with self-emitted thermal radiation in the atmosphere as it propagates higher[3].

2.3.2 ACTIVE REMOTE SENSING

Active remote sensing needs emitting a coherent electromagnetic wave at a target, which can range from astronomical objects to the earth. The time it takes for the sent EM wave to return (or arrive if the receiver and transmitter are at different places) to the receiver, and the phase information of the returning EM wave. In some applications, both active and passive antennas are interested in polarization, but radar obtains additional information from the Doppler shift. Since EM waves travel at the speed of light, the time between the transmission and reception of the EM wave can determine the range, with the altimeter being an integral component of this sort of radar (Radio Detection and Ranging but is no longer capitalized). Scatter meters detect the strength and polarisation of the returning electromagnetic wave, which interacts with the target by scattering (and not absorption/emission). The fourth category consists of imaging radars that are meant to utilise Doppler shift to significantly improve ground resolution[3].

2.4 HISTORY OF URBAN PLANNING

In this article,[4] the author highlighting the history of urban planning, which is started in the cities of Harappa, Lothal and in the Mohenjo-Daro which the first civilization in Indus valley now called north-western India and Pakistan. Archaeologists have concluded that these sites are the first examples of cities that were purposefully built and governed. Alexander the Great commissioned Hippodamus to lay out his new city of Alexandria, the grandest example of idealised urban planning in the ancient Mediterranean world, where the city's regularity was facilitated by its level site near the mouth of the Nile. Hippodamus was born in Greece around the year 407 BC and is known as the "Father of City Planning" for

his design of Miletus. Hippodamus is credited with being the "Father of City Planning". The Hippodamian, often known as the grid design, served as the foundation for future Greek and Roman city planning. For city planning, the ancient Romans adopted a unified system that had been created for both military defense and civil comfort. The fundamental layout called for a central plaza to house municipal services this was to be encircled by a dense, rectilinear grid of streets, finally, a wall would encircle the entire structure to provide protection. Two streets running perpendicular to each other crossed the square grid and went through the centre plaza in order to cut down on travel times. In most cases, the city was traversed by a river, which served as a source of water, a means of transportation, and an outlet for sewage. The Romans used a method that was highly logical when they constructed their cities, and the traces of these projects may be found in a few European cities, including Turin[4].

2.5 URBANIZATION IN MALAYSIA

According to an article written by [5] In comparison to other countries, such as Argentina or Brazil, Malaysia, for instance, has only seen a minor increase in its urban population. In 1975, there were 3.76 million people living in Malaysia's cities, which represented 37.6 percent of the country's overall population. Malaysia's population was estimated to be 22.3 million people in 2000, with metropolitan areas housing more than 57 percent of the population[5].

Table 2-1:Urbanization trends,size and growth of urban areas 1975-2025 of selected developing nations

Country	1975		2000		2025	
	Total in Thousands (0000)	%Urban Dwellers	Total in Thousands (0000)	%Urban in Dwellers	Total In Thousands (0000)	%Urban Dwellers
Argentina	21029	80.73	32762	89.94	43083	93.39
Brazil	66065	61.65	141979	81.21	204791	88.94
Indonesia	26259	19.36	85819	40.34	167393	60.74
Malaysia	4616	37.65	12820	57.49	22942	72.65
Mexico	36948	62.76	79580	77.71	117222	85.82
Philippines	15294	35.56	44005	59.01	77622	74.26
South Africa	12314	47.79	24550	53.12	48673	68.60
Thailand	6244	15.10	13555	21.90	28756	60.74

In this paper, the author also emphasized the importance of controlling or managing urban development by focusing on supporting or directing urban expansion towards existing conurbations, including Kuala Lumpur, Georgetown, and Johor Bahru. The biggest metropolitan locations in peninsular Malaysia that have a population of more than 10,000 people are displayed in Figure 1.