

**OPTIMIZING SOLAR POTENTIAL: A COMPREHENSIVE SITE  
SELECTION ANALYSIS FOR SOLAR FARMS IN PENANG**

**MUHAMMAD HAKIMIN BIN KAMEL  
MUHAMMAD ZULHILMI BIN SYAHROL NEEZAM**

**FINAL YEAR PROJECT REPORT SUBMITTED IN  
PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE  
DIPLOMA IN GEOSPATIAL TECHNOLOGY  
IN THE COLLEGE OF BUILT ENVIRONMENT  
UNIVERSITI TEKNOLOGI MARA**

**JULY 2024**

## **ABSTRACT**

### **OPTIMIZING SOLAR POTENTIAL: A COMPREHENSIVE SITE SELECTION ANALYSIS FOR SOLAR FARMS IN PENANG**

This project utilized ArcGIS Pro's sophisticated spatial analytic tools to locate suitable areas for solar farm construction in Penang, Malaysia. Penang's Island region location near the equator provides excellent sun irradiation, making it an appealing location for solar energy installations. This project aims to identify the criteria for solar farm site selection in Penang Island region. The methodology consists of several key steps: data collection and preparation, data reclassification, supervise classification, Euclidean distance, kriging and weight overlay to reflect the relative importance of each criteria, and generation of a composite suitability map using the Weighted Overlay tool. The weighted overlay process will help to choose a suitable place to be a solar farm site in Penang Island region. The result is a manual result analysis for the places in Penang that are best suited for solar farm construction, considering both technical feasibility and environmental sustainability. We will choose 5 places that have the most suitable requirements based on a weighted overlay map. This project does not entail the installation of solar farms, but it does give a strong analytical framework and important insights to renewable energy players, regulators, and planners. By identifying prospective sites, this research hopes to help Penang promote sustainable energy solutions and optimize land usage for renewable energy infrastructure.

## **ACKNOWLEDGMENT**

First and foremost, our group give thanks and praise to God for his guidance and blessings throughout the entire time doing this project. To everyone who has helped and advised us along the way, we would like to extend our sincere gratitude. Firstly, I would want to express my sincere gratitude to Sr. Gs. Mohd Najib bin Husain for their consistent support, motivation, and perceptive criticism, all of which have been crucial to the successful completion of this project.

We wish to express our gratitude to him for his guidance and support throughout completing our Final Year Project in this semester. His knowledge is vital for the projects and everything that we are involved in.

Furthermore, a million thanks to Universiti Teknologi MARA and the Department of Built Environment for providing students with vital skills and great theoretical and practical work throughout their studies. Finally, we appreciated our parents

siblings

, and friends for their encouragement, inspiration, and constructive counsel. Thank you, and may Allah bless every one of you.

Thank you.

Muhammad Hakim Bin Kamel

Muhammad Zulhilmi Bin Syahrol Neezam

## **TABLE OF CONTENTS**

<b>CERTIFICATE OF APPROVAL</b>	<b>ii</b>
<b>ABSTRACT</b>	<b>iii</b>
<b>ABSTRAK</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>LIST OF FIGURES</b>	<b>ix</b>
<b>LIST OF TABLES</b>	<b>x</b>
<b>SYMBOL AND ABBREVIATIONS</b>	<b>xi</b>
<b>LIST OF APPENDICES</b>	<b>xii</b>
 <b>CHAPTER 1 INTRODUCTION</b>	
1.1 Background of study	1
1.2 Problem Statement	3
1.3 Significance of Study	4
1.4 Objectives of Study	5
 <b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Introduction	6
2.2 Geographic information systems (GIS)	6
2.3 Criteria of Choosing Solar Farm Site Selection	7
2.4 Criteria Needed for Solar Farm Site Selection	10
 <b>CHAPTER 3 METHODOLOGY</b>	
3.1 Overview	11
3.2 Study Area	12
3.3 Data Sources	13
3.4 Software Used	15

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background of study**

This report presents a comprehensive GIS-based analysis for identifying optimal sites for solar farm development in the Penang Island region. The study integrates solar irradiation data, land use classifications, topographic slope and the road to reach the destination of that site information to assess site suitability. Furthermore, utilizing ArcGIS Pro, to perform spatial analyses including reclassification, kriging, weighted overlay to generate a suitability map. Results indicate that areas with high solar potential, slope, and suitable land use types such as bare land are most favorable for solar farm installations. The analysis identified several high-potential sites, which were further validated through ground surveys.

In addition, the data that is needed to perform this project, such as Solar Irradiation that be collected from the website will be processed using Microsoft Excel and will be imported into ArcGIS Pro for the spatial analysis method. Other than that, slope data will be extracted from Google Earth Pro by drawing a path and then will be imported into ArcGIS Pro for the spatial analysis process. Thus, it's time to get the land use data by performing Supervised Classification in ArcGIS Pro.