RAINFALL VARIATION IMPACT ON IDENTIFICATION GROUNDWATER POTENTIAL AREA AT SELANGOR USING RANDOM FOREST (RF) MACHINE LEARNING METHOD

MUHAMMAD HAKIMI BIN MOHD ZAIN

2022494454.

SCHOOL OF GEOMATICS SCIENCE AND NATURAL RESOURCES

COLLEGE OF BUILT ENVIRONMENT

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MUHAMMAD HAKIMI BIN MOHD ZAIN
2022494454

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DECLARATION

I declare that the work on this project/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA (UiTM). This project/dissertation is original, and it is the result of my work, unless otherwise indicated or acknowledged as referenced work.

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Name of Student   : Muhammad Hakimi Bin Mohd Zain

Student's ID No   : 2022494454

Project/Dissertation Title   : Rainfall Variation Impact on Groundwater Potential Area at Selangor using Random Forest (RF) Machine Learning Method.

Signature and Date   :

Approved by:

I certify that I have examined the student's work and found that they are in accordance with the rules and regulations of the School and University and fulfils the requirements for the award of the degree of Bachelor of Surveying Science and Geomatics (Honours).

Name of Supervisor   : Sr Hajah Sharifah Norashikin Binti Bohari

Signature and Date   :

ABSTRACT

Groundwater plays a crucial role in providing water to a significant portion of the global population for drinking water and agricultural needs. As climate change leads to more extreme and unpredictable rainfall variation, understanding the dynamics between rainfall distribution and groundwater resources is paramount. The aim of this study is to analyse the rainfall distribution impact on identification groundwater potential area in Selangor. There are 16 conditioning parameters which consist of slope, elevation, geomorphology, drainage density, lineament density geology, lithology, aquifers, tube well distribution, rainfall, soil types, topographical witness index (TWI), aspect and land use. There are 2 difference monsoon of rainfall data which is Northeast and Southwest. The analysis is based on a combination of satellite imagery, geological and hydrogeological data and was determined by using Random Forest (RF) machine learning method to define relationship between dependent variables and independent variables. The total of 281 groundwater tube wells data were obtained from Department of Mineral and Geoscience (JMG). Further, these selected tube wells were randomly divided into a dataset 70% for training and the remaining 30% was applied for validation purposes. The groundwater potential map has been generated using ArcGIS Pro and RF machine learning method then illustrated the relationship between rainfall distribution and groundwater potential. The final maps of groundwater potential using RF were classified into three different classes which are high, medium and low and. It is found that the ROC(AUC) value for Northeast Monsoon were 83% and Southwest Monsoon were 88% respectively. This indicates that the effect of rainfall contributes to the determination of GWP area. The findings of this study are useful for authorities for water management for efficient planning and development as it is cost effective for the purpose of ensuring the sustainability of water resources in the future.

Keywords: Groundwater, Rainfall Variation, Random Forest (RF) Machine Learning, Area under the ROC Curve (AUC), Receiver Operating Characteristics (ROC)

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