GEOTHERMAL POTENTIAL MAPPING USING REMOTE SENSING AND AHP BASED MULTICRITERIA ANALYSIS IN SURIAN, SOLOK REGENCY, WEST SUMATERA

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ABSTRACT

This research was carried out in Surian, Solok Regency, West Sumatra, an area located in the active magmatic zone of the Barisan Mountains and believed to have geothermal potential. The main goal of this study is to identify areas that may have geothermal resources by using remote sensing data and a spatial analysis method. The parameters used in this study include the Normalized Difference Vegetation Index (NDVI) from Sentinel-2 images, Land Surface Temperature (LST) from Landsat-8 images, and Fault Fracture Density (FFD) from SRTM DEM data. The data was processed using Google Earth Engine (GEE) and QGIS 3.34 software, and the combination of the three parameters was done using the Analytical Hierarchy Process (AHP). The results show that NDVI values range between –0.1907 and 0.9117, LST between 13.4 °C and 32.9 °C, and FFD values range from 0.001 to 3.474. These values are predominantly concentrated along major faults, particularly in the northwest to southeast of the Sumatra Fault. A geothermal potential map was generated and classified into three categories: low, medium, and high. High-potential geothermal zones were identified from the northwest to the southeast, following the trace of the Sumatra Fault and the Solok Fault. These high-potential areas include regions near hot springs located on the right side of the fault, as well as areas on the left side of the fault where no visible geothermal manifestations are present. Such areas may represent latent geothermal anomalies that require further exploration. In conclusion, this study demonstrates that integrating NDVI, LST, and FFD through multicriteria analysis offers an alternative approach for mapping geothermal potential zones. This method can support early-stage exploration, particularly in areas with limited field access or insufficient geophysical data.

Keywords: Geothermal, NDVI, LST, FFD, AHP, GEE, QGIS, Surian