



Application of Lineament Density Extraction Based on Digital Elevation Model for Geological Structures Control Analysis in Suwawa Geothermal Area

Intan Noviantari Manyoe^{1*}, Ronal Hutagalung¹

¹Geological Engineering Major, Faculty of Mathematics and Natural Science, Universitas Negeri Gorontalo, Bone Bolango Regency, Gorontalo, Indonesia.

* Corresponding author : intan.manyoe@ung.ac.id

Tel. : +62-812-8002-3410

Received: Oct 1, 2016; Accepted: Nov 20, 2016.

DOI: 10.24127/jgeet.v1i1.10000

Abstract

The tectonic condition of Gorontalo, which is located in the north of Sulawesi Island has implications for the spread of geothermal potential. The area in Gorontalo with the largest geothermal potential is the Suwawa area, Bone Bolango Regency. Therefore, this study aims to develop a model of lineament extraction from a digital elevation model and analyze the geological structure control based on the lineament distribution. This research is useful for the development of knowledge in the geothermal field, especially the study of permeability and structural control in geothermal areas. This research is beneficial for the community because it can detect the permeability zone in more detail which is the basis for the utilization of geothermal potential. The factors studied in this study are the geological lineament density and the geological structure of the study area. To achieve the research objectives, extraction methods and model analysis include analysis of permeable and control of geological structures. The lineament extraction model from the digital elevation model in the Suwawa geothermal area shows that there is a moderate to high agreement for lineament extraction from NATIONAL DEM data and low to moderate agreement for lineament extraction from SRTM data. The lineament distribution showing moderate to high density occupies the southern, eastern, and western parts of the Suwawa geothermal area. The presence of a lineament controls the circulation of geothermal fluids in the Suwawa geothermal area.

Keywords: Model, Geothermal, Geology, Lineament, Structure.

1. Introduction

Geothermal energy is energy that comes from the interior of the earth which is formed due to the heat content in the earth interior. This overview describes the mechanisms of heat transfer in the mantle and crust (Barbier, 2002). The sources of geothermal energy in the world are categorized into geothermal reservoirs with high enthalpy and geothermal reservoirs with low enthalpy (Kaczmarczyk et al., 2020; Martín-Gamboa et al., 2015). The use of geothermal in the world is used directly or indirectly and has been proven to be able to encourage economic progress (Glassley, 2010; Rybach, 2015).

Geothermal resources are closely related to regional tectonic conditions (Tzanis et al., 2020). Gorontalo, which is located in eastern Indonesia, is flanked by the Indo-Australian, Eurasian and Pacific macro plates (Advokaat et al., 2017) and the Philippine microplate (Hall et al., 1995) which has implications for geothermal spread (Manyoe and Hutagalung, 2020). Plate collisions cause magmatism,

The activity of magma and residual magma can cause heating of the accumulated subsurface water and become a geothermal reservoir (Manyoe and Hutagalung, 2020; Siahaan et al., 2005).

Gorontalo's geothermal potential is located in the areas of Suwawa, Pentadio, Bongongoayu, Dulangeya and Pohuwato. Gorontalo's geothermal potential has not been fully utilized as well as the world's geothermal potential. Geothermal utilization in Gorontalo is focused on direct use of the tourism sector. One of the areas that has the largest geothermal potential is the Suwawa geothermal area, Bone Bolango Regency.

The Suwawa Geothermal Working Area consists of Lombongo, Pangl, Libungo, Hungayono, and Tulabolo Timur. Research that has been carried out in the Suwawa geothermal area which provides a lineament extraction model for the Suwawa geothermal area has only been carried out in the Libungo area (Manyoe and Hutagalung, 2020).

Therefore, it is important to research the lineament density extraction model to determine the development of the extraction model and control of