

ABSTRAK

PENGARUH KONDISI GEOLOGI GUNUNGAPI DIENG TERHADAP DISTRIBUSI LOGAM BERAT PADA TANAH DAN TANAMAN SERTA IMPLIKASI RISIKO GEOMEDIS.

Oleh
Annisah Nur Istiqamah
NIM: 111220129
(Program Studi Sarjana Teknik Geologi)

Kawasan Gunungapi Dieng merupakan sistem hidrotermal aktif yang berpotensi menjadi sumber alami logam berat. Penelitian ini bertujuan mengevaluasi pengaruh kondisi geologi terhadap sebaran logam berat, pencemaran lingkungan, dan risiko geomedis di Daerah Kepakisan, Kabupaten Banjarnegara, Jawa Tengah.

Karakteristik mineralogi pada batuan dan tanah dianalisis melalui analisis petrografi dan *X-Ray Diffraction* (XRD). Untuk konsentrasi sembilan unsur logam berat (Mn, Zn, Cd, Cu, Fe, Cr, Pb, As, dan Hg) pada 6 sampel tanah dan 10 sampel tanaman dianalisis menggunakan *Atomic Absorption Spectrophotometry* (AAS) dan *X-Ray Fluorescence* (XRF). Sebaran spasial dipetakan dengan interpolasi *Inverse Distance Weighting* (IDW), untuk zonasi lingkungan menggunakan *overlay* zonasi pencemaran lingkungan dan geologi tentatif dimana peta zonasi lingkungan dievaluasi melalui *overlay Metal Pollution Index* (MPI) pada tanaman dan *Risk Index* (RI) pada tanah.

Hasil menunjukkan tiga pola sebaran yaitu As dan Pb tertinggi di S6 (Kawah Sileri) akibat *enrichment* hidrotermal, kemudian Mn, Zn, dan Fe tertinggi di area pertanian S4-S5 akibat pelapukan batuan vulkanik, dan Hg menunjukkan akumulasi tinggi pada S1 akibat deposisi atmosferik. Peta zonasi pencemaran lingkungan tercemar tinggi pada S6, sedangkan risiko geomedis menunjukkan risiko rendah pada non-karsinogenik. Pada karsinogenik untuk As, Cd, dan Cr dengan anak-anak sebagai kelompok paling rentan. Pola risiko mengindikasikan bahwa distribusi logam dikendalikan oleh faktor geologi dan aktivitas antropogenik. Rekomendasi mitigasi meliputi fitoremediasi, pengelolaan pupuk fosfat, dan monitoring partisipatif berbasis zonasi risiko.

Kata kunci: Fitoremediasi, Gunungapi Dieng, logam berat, risiko geomedis.

ABSTRACT

THE EFFECTS OF GEOLOGICAL CONDITIONS OF THE DIENG VOLCANO ON THE DISTRIBUTION OF HEAVY METALS IN SOIL AND PLANTS, AND THEIR IMPLICATIONS FOR GEOMEDICAL RISKS.

By

Annisah Nur Istiqamah

NIM: 111220129

(Geological Engineering Undergraduate Program)

The Dieng Volcano area is an active hydrothermal system with the potential to be a natural source of heavy metals. This study aims to evaluate the influence of geological conditions on the distribution of heavy metals, environmental pollution, and geomedical risk in the Kepakisan area, Banjarnegara Regency, Central Java.

The mineralogical characteristics of the rocks and soils were analyzed using petrographic analysis and X-Ray Diffraction (XRD). The concentrations of nine heavy metal elements (Mn, Zn, Cd, Cu, Fe, Cr, Pb, As, and Hg) in 6 soil samples and 10 plant samples were analyzed using Atomic Absorption Spectrophotometry (AAS) and X-Ray Fluorescence (XRF). Spatial distribution was mapped using Inverse distance Weighting (IDW) interpolation for environmental zoning, employing an overlay of environmental pollution zoning and tentative geological maps, where the environmental zoning map was evaluated through an overlay of the Metal Pollution Index (MPI) for plants and the Risk Index (RI) for soil.

The results revealed three distribution patterns: the highest levels of As and Pb in S6 (Sileri Crater) due to hydrothermal enrichment; the highest levels of Mn, Zn, and Fe in the agricultural areas of S4-S5 due to the weathering of volcanic rocks; and high accumulation of Hg in S1 due to atmospheric deposition. The environmental pollution zoning map indicates high contamination levels in S6, while the geomedical risk assessment shows a low risk for non-carcinogenic substances. For carcinogenic substances specifically As, Cd, and Cr children are the most vulnerable group. Risk patterns indicate that metal distribution is controlled by geological factors and anthropogenic activities. Mitigation recommendations include phytoremediation, phosphate fertilizer management, and participatory monitoring based on risk zoning.

Keywords: Phytoremediation, Dieng Volcano, heavy metals, geomedical risk.