

**ANALISIS SPASIAL PERUBAHAN MORFOLOGI GUNUNG ANAK
KRAKATAU PASCA ERUPSI 22 DESEMBER 2018 DAN
KARAKTERISTIK GEOKIMIA TEPHRA**

TESIS



**PROGRAM STUDI MAGISTER ILMU TANAH
FAKULTAS PERTANIAN
UNIVERSITAS ANDALAS
PADANG
2021**

ANALISIS SPASIAL PERUBAHAN MORFOLOGI GUNUNG ANAK KRAKATAU PASCA ERUPSI 22 DESEMBER 2018 DAN KARAKTERISTIK GEOKIMIA TEPHRA

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ABSTRAK

Lereng Barat Daya gunung Anak Krakatau yang runtuh setelah erupsi pada 22 Desember 2018 berdampak terbentuknya lanskap baru pulau vulkanik. Penelitian ini mengkaji perubahan morfologi gunung Anak Krakatau sebelum dan sesudah letusan, karakterisasi geokimia dan penentuan indeks pelapukan material vulkanis. Sebanyak 60 sampel lapili dan 23 abu vulkanis diambil dari gunung Anak Krakatau dan pulau Panjang pada 23 Februari 2019 dan 14 Maret 2019. Aktifitas intensif gunung Anak Krakatau dipantau oleh data citra satelit multi-sensor, sensor optik, thermal, dan synthetic aperture radar (SAR). Material vulkanis gunung Anak Krakatau tergolong baru, sehingga penentuan indeks pelapukan memberikan informasi nilai awal indeks pelapukan material vulkanis. Eksperimen pelarutan kation basa material vulkanis dengan menggunakan aquades, air hujan, dan air laut selama 90 hari pada suhu 10 dan 27°C. Hasil penelitian menunjukkan pasca erupsi Desember 2018, ketinggian Anak Krakatau berkurang dari 338 menjadi 136 m d.p.l dan sekitar $7,6 \times 10^7 \text{ m}^3$ material masuk ke laut. Luas pulau Anak Krakatau berubah dari 288 ha menjadi 309 ha setelah erupsi. Setelah erupsi gunung Anak Krakatau tertutup oleh material vulkanis lepas. Dapat diidentifikasi 214 aliran drainase kecil (panjang 380 sampai 851 m dan lebar 30 sampai 100 cm) dan 35 aliran drainase besar (panjang 150 sampai 841 m dan lebar 0,5 sampai 13 m) membentang dari puncak tertinggi ke garis pantai. Dari ketinggian 870 m, satelit merekam setelah aktivitas vulkanis Anak Krakatau dan setelah dianalisis didapatkan pada saat erupsi suhunya 195°C. Material vulkanis bersifat basaltik, basalt-andesitik, dan andesitik yang memiliki kadar total elemental oksida yaitu $\text{CaO} > \text{MgO} > \text{SO}_4 > \text{P}_2\text{O}_5 > \text{K}_2\text{O}$. Nilai pH bervariasi dari 4,52 sampai 7,32. Nilai kation basa material vulkanis berturut-turut $\text{Mg} > \text{Ca} > \text{Na} > \text{K}$, tetapi nilai KTK masih sangat rendah. Sedangkan unsur terlarut dari material piroklastik berturut-turut $\text{Mg} > \text{Ca} > \text{K} > \text{P}$. Indeks pelapukan material vulkanis tergolong sangat baru (Ruxton = 3,68), (PWI = 68,61), (DI = 2,18). Cadangan hara makro dari material vulkanis Anak Krakatau dapat bertahan 4.778 hingga 1.033.199 tahun. Diharapkan dari hasil penelitian ini dapat dipedomani untuk memantau aktifitas gunung berapi sebelum, saat dan sesudah erupsi serta dampak positif material vulkanis erupsi gunung berapi untuk lingkungan.

Kata kunci : penginderaan jauh, material vulkanis, XRF, cadangan hara, indeks pelapukan.

SPATIAL ANALYSIS OF CHANGES IN LANDSCAPE OF ANAK KRAKATAU AFTER ERUPTION 22 DECEMBER 2018 AND GEOCHEMICAL CHARACTERISTICS OF TEPHRA

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ABSTRACT

The South-western slope of Anak Krakatau collapsed after the eruption on December 22nd, 2018, resulting on the formation of a new landscape in the volcanic island. This work focused on determining the morphological changes Mt. Anak Krakatau before and after the eruption, geochemical characterization and determination of the weathering indices of volcanic materials. A total of 60 lapilli samples and 23 volcanic ash were taken from Anak Krakatau and Panjang island on February 23, 2019, and March 14, 2019. The intensive activities of Mount Anak Krakatau were monitored by multi-sensor satellite imagery, including optical, thermal and synthetic aperture radar (SAR) sensors. The volcanic materials Mt. Anak Krakatau are fresh, the determination of weathering indices provides information on the initial stage of weathering of the volcanic material. Dissolution experiments of volcanic material were performed by leaching with de-ionized water, rainwater, and seawater for 90 days at temperatures of 10 and 27°C. Results showed that after the December 2018 eruption, the height of Anak Krakatau was reduced from 338 to 148 m and about $7,6 \times 10^7 \text{ m}^3$ of materials were collapsed to the sea. The Anak Krakatau area enlarged from 288 ha to 309 ha. By using satellite images 214 rills (length from 380 to 851 m and width from 30 to 100 cm) and 35 of the gully features (length from 150 to 841 m and width from 0.5 to 13 m) run from the highest peak to the coastline were identified. The temperature of lava 195°C was detected by using MODIS satellite which orbit at 830 to 870 km above the earth surface. The geochemical characteristics of the volcanic material are basaltic, basalt-andesitic and andesitic which have a total elemental oxide content $\text{CaO} > \text{MgO} > \text{SO}_4 > \text{P}_2\text{O}_5 > \text{K}_2\text{O}$. The pH values are range from 4.52 to 7.32. The value of cations was in the decreasing order of $\text{Mg} > \text{Ca} > \text{Na} > \text{K}$, but the CEC value is very low. Whereas the release of dissolved cations from pyroclastic materials was in the decreasing order of $\text{Mg} > \text{Ca} > \text{K} > \text{P}$. The Ruxton weathering index of volcanic materials were low = 3,68, Parker Weathering Index = 68,61, and Disilication Index = 2,18. Macronutrient reserves from the volcanic material of Anak Krakatau are predicted to last from 4.778 to 1.033.199 years. The results of this study can be used to monitor volcanic activity before, during, and after the eruption and the positive impact of volcanic materials on the environment are overcome the negative impacts.

Keywords : remote sensing, volcanic materials, XRF, nutrient reserves, weathering index