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Pemetaan Multirawan Bencana Geologi Sekunder (Likuifaksi, Co-Seismic Landslide, dan Rockfall) Berbasis Karakteristik Geomorfologi di Kecamatan Imogiri
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PEMETAAN MULTIRAWAN BENCANA GEOLOGI SEKUNDER (LIKUIFAKSI, CO-SEISMIC LANDSLIDE, DAN ROCKFALL) BERBASIS KARAKTERISTIK GEOMORFOLOGI DI KECAMATAN IMOGIRI

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INTISARI

Kecamatan Imogiri, Kabupaten Bantul, Daerah Istimewa Yogyakarta merupakan wilayah yang berada pada zona transisional antara Pegunungan Selatan, Dataran Fluvio-Vulkanik Merapi, dan sistem sesar kompleks yang berpusat pada Sesar Opak, dengan peristiwa gempa bumi 27 Mei 2006 berkekuatan Mw 6,3 Mw. Gempa bumi sebagai bencana primer berpotensi memicu bencana geologi sekunder berupa likuifaksi, *co-seismic landslide*, dan *rockfall* yang dampaknya seringkali lebih katastropik. Meskipun demikian, kajian multirawan bencana geologi sekunder pada skala semi - detail di tingkat kecamatan masih sangat terbatas, khususnya di Kecamatan Imogiri. Penelitian ini bertujuan untuk: (1) mengidentifikasi karakteristik geomorfologi dan variasi bentuklahan; (2) menganalisis distribusi potensi kerawanan bencana likuifaksi, *co-seismic landslide*, dan *rockfall*; serta (3) menganalisis distribusi potensi multirawan bencana geologi sekunder berbasis karakteristik geomorfologi di wilayah kajian.

Metode yang digunakan adalah pemetaan geomorfologi yang diintegrasikan dengan *Analytical Hierarchy Process* (AHP) dan *Spatial Multi-Criteria Evaluation* (SMCE) berbasis SIG, dengan parameter *Peak Ground Acceleration* (PGA) sebagai *triggering factor* seismisitas. Hasil pemetaan mengidentifikasi 12 satuan bentuklahan dari genesis fluvial, struktural - tektonik, dan karst.

Kerawanan likuifaksi tinggi terkonsentrasi pada Lembah Sungai Opak, Oyo, dan Celeng yang didominasi material pasir dengan muka air tanah dangkal, kerawanan *co-seismic landslide* tinggi terpusat pada *Escarpment* dan Perbukitan Zona Sesar di tenggara dengan kemiringan > 40° dan material breksi - andesit rapuh, sedangkan kerawanan *rockfall* tinggi mengikuti jalur sesar tenggara pada *Escarpment* breksi - andesit masif dengan rekahan intensif. Peta multirawan bencana geologi sekunder menunjukkan dominasi kelas kerawanan rendah dengan satu jenis bencana, kelas sedang (253,54 ha) pada zona perbukitan dengan kombinasi *co-seismic landslide* dan *rockfall*, serta kelas tinggi (153,40 ha) yang terkonsentrasi di tenggara Kecamatan Imogiri pada zona transisi Dataran Aluvial dan *Escarpment* yang secara bersamaan rawan terhadap ketiga bencana geologi sekunder.

Kata kunci : AHP, Bencana Geologi Sekunder, *Co-Seismic Landslide*, Geomorfologi, Kecamatan Imogiri, Likuifaksi, Multirawan, *Rockfall*, SMCE.

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MULTI - SUSCEPTIBILITY MAPPING OF SECONDARY GEOLOGICAL DISASTERS (LIQUEFACTION, CO-SEISMIC LANDSLIDE, AND ROCKFALL) BASED ON GEOMORPHOLOGICAL CHARACTERISTICS IN IMOGIRI SUB-DISTRICT

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ABSTRACT

Imogiri District, Bantul Regency, Special Region of Yogyakarta, is situated in a transitional zone between the Southern Mountains, the Merapi Fluvio - Volcanic Plain, and a complex fault system centered on the Opak Fault, with the Mw 6.3 earthquake of 27 May 2006 serving as a critical seismic reference event. Earthquakes as primary disasters can trigger secondary geological disasters, namely liquefaction, co-seismic landslide, and rockfall, whose impacts are often more catastrophic. Nevertheless, multi - susceptibility studies of secondary geological disasters at the semi - detailed scale at the district level remain highly limited, particularly in Imogiri District. These conditions render Imogiri highly susceptible to secondary geological disasters triggered by seismic events. This study aims to: (1) identify the geomorphological characteristics and landform variations; (2) analyze the spatial distribution of liquefaction, co-seismic landslide, and rockfall susceptibility; and (3) analyze the spatial distribution of secondary geological multi - susceptibility based on geomorphological characteristics within the study area.

The method employed was geomorphological mapping integrated with the Analytical Hierarchy Process (AHP) and Spatial Multi - Criteria Evaluation (SMCE) within a GIS framework, using Peak Ground Acceleration (PGA) as the seismic triggering factor. Mapping results identified 12 landform units derived from fluvial, structural - tectonic, and karst genesis.

High liquefaction susceptibility is concentrated along the Opak, Oyo, and Celeng river valleys, dominated by sandy materials with shallow groundwater tables; high co-seismic landslide susceptibility is concentrated on escarpments and fault-zone hills in the southeastern part of the district, characterized by slopes exceeding 40° and highly fractured andesitic breccia; while high rockfall susceptibility follows the southeastern fault lineament on escarpments composed of massive andesitic breccia with intensive fracturing. The secondary geological multi - susceptibility map reveals a dominance of low - susceptibility zones characterized by exposure to only a single type of disaster, a moderate - susceptibility zone (253.54 ha) within hilly terrain exhibiting a combination of co-seismic landslide and rockfall susceptibilities, and a high-susceptibility zone (153.40 ha) concentrated in the southeastern part of Imogiri District at the transitional zone between the Alluvial Plain and Escarpment, where the area is simultaneously susceptible to all three secondary geological disasters.

Keyword : AHP, Co-Seismic Landslide, Geomorphology, Imogiri District, Liquefaction, Multi-Susceptibility, Rockfall, Secondary Geological Disasters, SMCE.