ANALISIS AMBANG BATAS AMAN HUJAN DAN KESTABILAN LERENG UNTUK PERINGATAN DINI LONGSOR DI DAS BOMPON

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ABSTRAK

Zona transisi antara morfologi Jawa Bagian Tengah dan Jawa Bagian Selatan dicirikan dengan lereng yang terjal dan tanah yang tebal. Curah hujan yang tinggi di area tersebut menyebabkan potensi ancaman bahaya longsor menjadi tinggi. Penelitian ini berlokasi di DAS Bompon yang terletak di zona transisi antara Gunung Sumbing dan Pegunungan Menoreh. Pemotongan lereng tanpa perancangan yang tepat menimbulkan ketidak stabilan pada lereng. Tujuan dari penelitian ini adalah membandingkan efek intensitas dan durasi hujan melalui ambang batas hujan serta memetakan area bahaya longsor berdasarkan nilai *Factor of Safety* (FS).

Data yang digunakan untuk membuat model ambang batas hujan adalah data perekaman hujan dan data kejadian longsor dalam kurun waktu 2018-2022. Model ambang batas dibuat dengan membuat grafik intensitas vs durasi hujan yang di plot menggunakan persamaan *power law*. Pemodelan kestabilan lereng dihitung menggunakan data *Digital Terrain Model* (DTM), sudut friksi, kohesi, densitas, ketebalan tanah dan kedalaman muka air tanah. Nilai kestabilan lereng merupakan perbandingan antara gaya penahan dan pendorong lereng. Nilai kestabilan lereng diwakili oleh *Factor of Safety* (FS).

Hasil penelitian memberikan persamaan empirik I = 340.11D^(-1,308) merepresentasikan intensitas dan durasi hujan yang dapat menyebabkan longsor. Model spasial kestabilan lereng menunjukkan 2 longsor alami Tubansari dan Kalisari masih dalam kondisi aktif. Area bekas pemotongan lereng di Kalisari memiliki lereng yang tidak stabil. Model sayatan kestabilan lereng menunjukkan bahwa hujan dengan durasi panjang menyebabkan penurunan kestabilan lereng. Perancangan peringatan dini hujan bisa dibuat berdasarkan hasil perhitungan model intensitas vs durasi. Rekomendasi penanganan longsor di area pemotongan lereng dapat dilakukan dengan evaluasi pemotongan lereng, pembuatan drainase permukaan, dan penanaman tanaman pada zona zona erosi.

Kata kunci: Longsor, *rainfall threshold*, DAS Bompon, kestabilan lereng, hujan

RAINFALL THRESHOLD AND SLOPE STABILITY ANALYSIS FOR LANDSLIDES EARLY WARNING IN BOMPON WATERSHED

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ABSTRACT

Transition zone between middle and southern Java morphology is characterized by steep slopes relief with thick soil. High rainfall in this area leads to trigger potential for landslides. This research is located in the Bompon watershed which is located in the transition zone between Mount Sumbing and the Menoreh Mountains. Slope-cutting without proper design triggers the instability of slopes. This research aims to compare the effects of rainfall intensity and duration using rainfall threshold, and also map landslide hazard areas based on the Factor of Safety (FS).

Rainfall threshold model was built using rainfall observation and landslide occurrence data during 2018-2022. The rainfall threshold model is built by visualizing rainfall intensity vs. duration using a power-law equation. Slope stability modeling is generated using Digital Terrain Model (DTM), friction angle, cohesion, density, soil thickness, and groundwater depth. The slope stability value represents the balance between resisting and driving forces on the slope, with the stability index represented by the Factor of Safety (FS).

Results of the study is an empirical equation I = 340.11D^(-1,308) that represents the intensity and duration of rain that can induce landslides. According to the spatial model of slope stability, two natural landslides in Tubansari and Kalisari are still active. Slope cutting area on kalisari has an unstable slope. Slope stability slice model shows that long-duration rainfall reduces slope stability. The intensity vs. duration model can be used to determine the role of early warning system. Landslides in slope cutting areas can be handled by optimizing slope cutting, providing surface drainage, and planting plants in erosion zones.

Keywords: Landslide, rainfall threshold, Bompon Watershed, slope stability, rainfall