

ABSTRAK

VALIDASI MODEL KESTABILAN LERENG GUNUNG BATU TERHADAP MONITORING PERGERAKAN LERENG, KECAMATAN LEMBANG, KABUPATEN BANDUNG BARAT, PROVINSI JAWA BARAT

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Pulau Jawa memiliki potensi tinggi terhadap aktivitas tektonik, seperti gempa bumi dan pergerakan lereng akibat sesar. Salah satu sesar aktif yang memiliki pengaruh signifikan terhadap kestabilan wilayah penelitian adalah Sesar Lembang. Sesar Lembang, sesar aktif sepanjang ± 29 km di utara Bandung, secara langsung meningkatkan potensi ketidakstabilan dan risiko pergerakan lereng akibat aktivitas tektonik. Aktivitas tektonik pada sesar ini telah membentuk gawir terjal seperti pada lokasi penelitian yaitu Gunung Batu, lereng Gunung Batu yang tersusun atas batuan beku andesit, pelapukan tuff, dan breksi gunung api. Penelitian ini didasarkan pada pentingnya kajian kestabilan lereng di wilayah yang dekat dengan pemukiman penduduk, mengingat tingginya risiko longsor dan minimnya analisis geoteknik yang tersedia. Penelitian ini bertujuan untuk memvalidasi kestabilan lereng Gunung Batu melalui pendekatan numerik dan data *monitoring* deformasi lereng. Metode yang digunakan adalah analisis numerik berupa *Finite Element Method* (FEM) melalui perangkat lunak RS2, divalidasi dengan data deformasi lereng, serta didukung analisis geologi dan geoteknik. Analisis geologi meliputi geomorfologi, petrografi, dan struktur geologi. Analisis geoteknik meliputi sifat fisik mekanik tanah maupun batuan dan klasifikasi masa batuan. Hasil penelitian menunjukkan keberadaan empat satuan bentuklahan dan empat satuan batuan, dengan struktur kekar gerus dominan berarah timur laut - barat daya. Kualitas massa batuan tergolong sangat baik dengan nilai RQD 95,89–99,75%, RMR 72,5–78,25, dan GSI 67,5–73,25. Jenis tanah didominasi oleh lempung-lanauan organik (OL), lempung organik (ML), dan lempung anorganik (MH). Analisis numerik menunjukkan *total displacement* yang sesuai, *total displacement* model (63,7–72,8 mm) mendekati dengan data *monitoring* lapangan (57,8 mm), yang mengindikasikan validitas model. Model tersebut menghasilkan nilai SRF atau Faktor Keamanan (FK) sebesar 1,89. Nilai FK yang signifikan di atas ambang batas kritis ($FK > 1,5$) menurut (Bowles, 1989) mengindikasikan bahwa lereng Gunung Batu berada dalam kondisi sangat stabil dan tidak rawan longsor.

Kata kunci: Faktor Keamanan, *Finite Element Method*, Geologi Teknik, Kestabilan Lereng, Validasi.

ABSTRACT

VALIDATION OF STONE MOUNTAIN SLOP STABILITY MODEL AGAINST SLOPE MONITORING, LEMBANG DISTRICT, WEST BANDUNG REGENCY, WEST JAVA PROVINCE

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Java Island has a high potential for tectonic activity, such as earthquakes and slope movement due to faults. One active fault that has a significant influence on the stability of the study area is the Lembang Fault. The Lembang Fault, an active fault along ± 29 km north of Bandung, directly increases the potential for instability and the risk of slope movement due to tectonic activity. Tectonic activity on this fault has formed steep escarpments such as those at the study site, namely Gunung Batu, the slopes of Gunung Batu are composed of andesite igneous rocks, weathered tuff, and volcanic breccia. This research is based on the importance of slope stability studies in areas close to residential areas, considering the high risk of landslides and the limited available geotechnical analysis. This study aims to validate the slope stability of Gunung Batu through a numerical approach and slope deformation monitoring data. The method used is a numerical analysis in the form of the Finite Element Method (FEM) through RS2 software, validated with slope deformation data, and supported by geological and geotechnical analysis. Geological analysis includes geomorphology, petrography, and geological structure. Geotechnical analysis includes the physical and mechanical properties of soil and rock and rock mass classification. The results indicate the presence of four landform units and four rock units, with a dominant shear fracture structure trending northeast-southwest. The quality of the rock mass is classified as very good with RQD values of 95.89–99.75%, RMR of 72.5–78.25, and GSI of 67.5–73.25. The soil type is dominated by organic silty clay (OL), organic clay (ML), and inorganic clay (MH). Numerical analysis shows a suitable total displacement, the total displacement model (63.7–72.8 mm) is close to the field monitoring data (57.8 mm), which indicates the validity of the model. The model produces an SRF or Safety Factor (SRF) value of 1.89. The SRF value is significantly above the critical threshold ($SRF > 1.5$) according to (Bowles, 1989) indicating that the slopes of Mount Batu are in a very stable condition and are not prone to landslides.

Keywords: Safety Factor, Finite Element Method, Engineering Geology, Slope Stability, Validation