PEMODELAN DINAMIKA KERAWANAN LONGSOR KOSEISMIK MENGGUNAKAN *MACHINE LEARNING*: (STUDI KASUS: RANGKAIAN GEMPA LOMBOK TAHUN 2018)

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INTISARI

Longsor koseismik merupakan salah satu bahaya turunan dari gempabumi yang dapat memperluas dampak bencana. Beberapa peristiwa gempa besar di dunia telah memicu banyak kejadian longsor, namun penilaian kerawanan masih belum memadai. Peta kerawanan longsor tersedia masih berskala regional dan tergantung dari subyektivitas penilaian ahli, sehingga variasi lokal belum tergambar baik. Studi longsor koseismik banyak berfokus pada seismologi atau prediksi sekunder jangka pendek, sehingga integrasi faktor pengontrol untuk kerawanan jangka menengah masih terbatas. Penelitian ini memodelkan dinamika dan kerawanan longsor koseismik Pulau Lombok berbasis inventori dan *machine learning*.

Inventori longsor disusun dari interpretasi citra Sentinel-2, PlanetScope, dan Google Earth Pro pascagempa 2018. Prediktor menggabungkan parameter seismik (PGA, MMI, jarak episenter), deformasi (DInSAR), serta faktor geologi, topografi serta tutupan dan penggunaan lahan. Dataset akhir berisi 7.823 titik (3.941 longsor; 3.882 non-longsor) dengan pembagian 70% latih dan 30% uji. Empat algoritma *machine learning* (LR, SVM, ANN, RF) dievaluasi memakai *confusion matrix* dan ROC–AUC serta analisis variabel penting.

Hasil penelitian menunjukkan bahwa longsor berkembang mengikuti rangkaian gempa dan mengindikasikan reaktivasi lereng di Utara. Performa model menunjukkan hasil yang baik (akurasi ~75% dan AUC >0,8), dengan model *Random Forest* paling unggul dan stabil. Zonasi kerawanan tinggi–sangat tinggi membentuk sabuk di Utara Lombok (khususnya Kabupaten Lombok Utara dan Lombok Timur), sedangkan bagian Selatan dominan rendah. Luaran ini mendukung prioritas mitigasi dan penataan ruang berbasis risiko longsor koseismik.

Kata kunci: Longsor koseismik, kerawanan longsor, *machine learning*, rangkaian gempa Lombok 2018

MODELING DYNAMICS OF COSEISMIC LANDLSLIDE SUSCEPTIBILITY USING MACHINE LEARNING: (CASE STUDY: 2018 LOMBOK EARTHQUAKE SEQUENCE)

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Coseismic landslides are one of the secondary hazards of earthquakes that can amplify and expand disaster impacts. Several major earthquakes worldwide have triggered numerous landslides, yet susceptibility assessment remains inadequate. Existing landslide susceptibility maps are generally available only at regional scales and often depend on the subjectivity of expert judgement, so local variations are not well captured. Many coseismic landslide studies focus on seismology or short-term secondary predictions, meaning that the integration of controlling factors for medium-term susceptibility is still limited. This research models the dynamics and susceptibility of coseismic landslides on Lombok Island based on an inventory and machine learning.

The landslide inventory was compiled through the interpretation of post-earthquake Sentinel-2, PlanetScope, and Google Earth Pro imagery. Predictors integrate seismic parameters (PGA, MMI, and distance to the epicenter), deformation (DInSAR), as well as geological, topographic, and land cover/land use factors. The final dataset comprises 7,833 points (3,951 landslide and 3,882 non-landslide samples), split into 70% training and 30% testing subsets. Four machine-learning algorithms (LR, SVM, ANN, and RF) were evaluated using confusion matrices and ROC–AUC, complemented by variable-importance analysis.

The results indicate that landslides evolved along the earthquake sequence and suggest slope reactivation in northern Lombok. Model performance is strong (accuracy ~75% and AUC > 0.8), with Random Forest being the most robust and consistently performing model. High to very high susceptibility zones form a belt across northern Lombok (particularly North Lombok and East Lombok regencies), whereas the southern part of the island is dominated by low susceptibility. These outputs support the prioritization of mitigation actions and risk-based spatial planning for coseismic landslides.

Keywords: *coseismic landslides, landslide susceptibility, machine learning, 2018 Lombok earthquake sequence*.