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**Karakteristik Sistem Gully dan Variasi Geometri Longsor Berbasis Data LiDAR Resolusi Tinggi di Sub
DAS Bompon, Kabupaten Magelang**
Jihan Dwi Islami, Prof. Dr.rer.nat. Junun Sartohadi, M.Sc.; Dr.rer.nat. Muhammad Anggri Setiawan, M.Si.
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KARAKTERISTIK SISTEM *GULLY* DAN VARIASI GEOMETRI LONGSOR BERBASIS DATA LiDAR RESOLUSI TINGGI DI SUB DAS BOMPON, KABUPATEN MAGELANG

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INTISARI

Erosi parit (*gully erosion*) dan longsor merupakan proses geomorfik yang sering berkembang bersamaan pada lereng vulkanik serta berkontribusi terhadap degradasi lahan dan ketidakstabilan lereng. Perkembangan kedua proses tersebut melibatkan dinamika bentanglahan yang berlangsung pada berbagai skala geomorfologi sehingga memerlukan pendekatan analisis yang terintegrasi. Penelitian ini bertujuan untuk mengevaluasi efektivitas domain analisis dalam inventarisasi sistem *gully*, menganalisis keterkaitan karakteristik geomorfologi *Landslide Morphological Unit* (LMU) dengan keberadaan sistem *gully*, serta menganalisis hubungan karakteristik morfometri *gully* dengan geometri longsor.

Penelitian dilakukan di Sub DAS Bompon, Kabupaten Magelang, menggunakan *Digital Terrain Model* (DTM) LiDAR resolusi 0,5 m. Inventarisasi sistem *gully* dilakukan melalui deteksi semi-otomatis pada domain Daerah Aliran Sungai (DAS) dan LMU, kemudian dievaluasi melalui validasi morfologi, validasi aktual, evaluasi kualitas representasi spasial, dan rekonstruksi inventori. Keterkaitan karakteristik geomorfologi LMU dengan keberadaan sistem *gully* dianalisis menggunakan regresi logistik biner, sedangkan hubungan karakteristik morfometri *gully* dengan geometri longsor dianalisis menggunakan uji *Chi-square* dan koefisien Cramer's V.

Inventarisasi sistem *gully* berbasis LMU menghasilkan inventaris yang lebih representatif dibandingkan pendekatan berbasis DAS. Relief lokal menjadi karakteristik geomorfologi utama yang berkaitan dengan keberadaan sistem *gully*, sedangkan gradien makro, elevasi minimum, proporsi medan konvergen, *Specific Catchment Area* (SCA) P90, dan *Topographic Wetness Index* (TWI) P90 tidak menunjukkan pola keterkaitan yang sama. Morfometri *gully* berubah secara sistematis dari *headcut* menuju *outlet*, tetapi tidak menunjukkan hubungan yang signifikan dengan geometri longsor. Secara keseluruhan, perkembangan sistem *gully* berkaitan dengan terbentuknya lingkungan geomorfologi yang mendukung ketidakstabilan lereng.

Kata kunci: DTM LiDAR; Geometri Longsor; Inventarisasi *Gully*; Landslide Morphological Unit; Morfometri *Gully*

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CHARACTERISTICS OF GULLY SYSTEMS AND VARIATIONS IN LANDSLIDE GEOMETRY BASED ON HIGH-RESOLUTION LiDAR DATA IN THE BOMPON SUB-WATERSHED, MAGELANG REGENCY

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Gully erosion and landslides are geomorphic processes that commonly co-occur on volcanic slopes and contribute to land degradation and slope instability. The development of these processes involves landscape dynamics operating across multiple geomorphic scales, requiring an integrated analytical approach. This study aimed to evaluate the effectiveness of analytical domains for gully system inventory, examine the relationship between the geomorphological characteristics of Landslide Morphological Units (LMUs) and the occurrence of gully systems, and investigate the relationship between gully morphometric characteristics and landslide geometry.

The study was conducted in the Bompon Sub-watershed, Magelang Regency, using a 0.5-m resolution LiDAR-derived Digital Terrain Model (DTM). Gully systems were inventoried through semi-automated detection within the Watershed (DAS) and LMU domains, followed by morphological validation, field validation, spatial representation quality assessment, and inventory reconstruction. The relationships between the geomorphological characteristics of LMUs and the occurrence of gully systems were analyzed using binary logistic regression, whereas the relationships between gully morphometric characteristics and landslide geometry were evaluated using the Chi-square test and Cramer's V coefficient.

LMU-based gully inventory produced a more representative inventory than the watershed-based approach. Local relief emerged as the primary geomorphological characteristic associated with the occurrence of gully systems, whereas macro-gradient, minimum elevation, the proportion of convergent terrain, the 90th percentile of Specific Catchment Area (SCA P90), and the 90th percentile of the Topographic Wetness Index (TWI P90) did not exhibit the same pattern of association. Gully morphometry changed systematically from the headcut to the outlet but showed no significant relationship with landslide geometry. Overall, the development of gully systems is associated with the formation of a geomorphic environment that promotes slope instability.

Keywords: *LiDAR-derived DTM; Landslide Geometry; Landslide Morphological Unit; Landslide; Gully Morphometry; Gully Systems*