ABSTRAK

ANALISIS PERUBAHAN TUTUPAN LAHAN TERHADAP LIMPASAN AIR PERMUKAAN DI DAS CILIWUNG HULU

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Daerah Aliran Sungai (DAS) Ciliwung Hulu berperan penting sebagai daerah tangkapan air dan penyangga wilayah hilir. Namun, meningkatnya konversi tutupan lahan dari kawasan hutan menjadi lahan terbangun dan budidaya menyebabkan penurunan kemampuan infiltrasi tanah, yang berdampak pada peningkatan limpasan air permukaan dan risiko banjir di wilayah hilir. Penelitian ini bertujuan untuk menganalisis perubahan tutupan lahan periode 2013–2023, mengestimasi tinggi limpasan air permukaan, serta mengkaji pengaruh perubahan tutupan lahan terhadap limpasan air permukaan di DAS Ciliwung Hulu.

Penelitian ini menggunakan pendekatan penginderaan jauh dan Sistem Informasi Geografis (SIG). Klasifikasi tutupan lahan dilakukan menggunakan metode *Maximum Likelihood Classification* pada citra satelit Landsat 8 OLI/TIRS tahun 2013 dan 2023, yang divalidasi melalui uji akurasi *Overall Accuracy* dan *Kappa Coefficient*. Estimasi limpasan air permukaan dilakukan dengan metode *Soil Conservation Service–Curve Number* (SCS-CN) melalui integrasi data tutupan lahan, jenis tanah, dan curah hujan. Selanjutnya, pengaruh perubahan tutupan lahan terhadap limpasan air permukaan dianalisis menggunakan regresi linier sederhana.

Hasil penelitian menunjukkan penurunan luas hutan sebesar 3.001 ha (32,66%), disertai peningkatan lahan pertanian, padang rumput, dan perumahan. Wilayah DAS Ciliwung Hulu didominasi tanah Humic Andosols dengan curah hujan sangat lebat (>2.500 mm/tahun). Luas area dengan limpasan tinggi meningkat dari 1.088 ha (7%) menjadi 2.342 ha (15%), sedangkan limpasan sangat tinggi meningkat dari 689 ha (5%) menjadi 880 ha (6%). Nilai *Overall Accuracy* mencapai 91% (2013) dan 93% (2023). Analisis regresi menunjukkan perubahan tutupan lahan berpengaruh signifikan terhadap limpasan air permukaan (Sig. 0,086 < 0,10), di mana setiap penambahan 1 ha perubahan tutupan lahan meningkatkan tinggi limpasan sebesar 167,93 mm.

Kata kunci: Tutupan lahan, limpasan permukaan, DAS Ciliwung Hulu, SCS-CN, penginderaan jauh, Sistem Informasi Geografis, Regresi Linier.

ABSTRACT

ANALYSIS OF LAND COVER CHANGES ON SURFACE WATER RUNOFF IN THE CILIWUNG HULU WATERSHED

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The Upper Ciliwung Watershed plays a critical role as a water catchment area and a buffer for downstream regions. However, rapid land cover conversion from forested areas to built-up and cultivated land has reduced soil infiltration capacity, leading to increased surface runoff and a higher risk of flooding in downstream areas. This study aims to analyze land cover changes from 2013 to 2023, estimate surface runoff depth, and assess the influence of land cover change on surface runoff in the Upper Ciliwung Watershed. This research employs an integrated approach using remote sensing and Geographic Information Systems (GIS). Land cover classification was conducted using the Maximum Likelihood Classification method applied to Landsat 8 OLI/TIRS imagery from 2013 and 2023, with classification accuracy evaluated using Overall Accuracy and the Kappa Coefficient. Surface runoff was estimated using the Soil Conservation Service–Curve Number (SCS-CN) method by integrating land cover, soil type, and rainfall data. Furthermore, the relationship between land cover change and surface runoff was examined using simple linear regression analysis. The results indicate a substantial decrease in forest area by 3,001 ha (32.66%), accompanied by an expansion of agricultural land, grassland, and residential areas. The watershed is predominantly characterized by Humic Andosols and very high annual rainfall (>2,500 mm). Areas classified as high runoff increased from 1,088 ha (7%) to 2,342 ha (15%), while very high runoff areas expanded from 689 ha (5%) to 880 ha (6%). Classification accuracy reached 91% (2013) and 93% (2023). Linear regression analysis confirms that land cover change has a significant effect on surface runoff (Sig. 0.086 < 0.10), with each additional hectare of land cover change increasing runoff depth by 167.93 mm.

Keywords: Land cover, surface runoff, Ciliwung Hulu watershed, SCS-CN, remote sensing, linear regression.