

ANALISIS PENGARUH PERUBAHAN PENGGUNAAN LAHAN TERHADAP LAJU EROSI MENGGUNAKAN METODE RUSLE BERBASIS CITRA SENTINEL-2 DI SUB DAS GINTUNG DAN SUB DAS MONGO, KABUPATEN PURWOREJO

Alisa Sayidatina Fatimah

22/493469/GE/09817

INTISARI

Erosi tanah merupakan salah satu bentuk degradasi lahan di daerah aliran sungai tropis yang dipengaruhi oleh curah hujan, topografi, karakteristik tanah, dan lahan. Kabupaten Purworejo memiliki kerentanan erosi yang tinggi akibat kombinasi topografi berbukit, curah hujan tinggi, dan perubahan penggunaan lahan yang terus berlangsung, khususnya di wilayah Perbukitan Menoreh. Penelitian ini bertujuan untuk: (1) mengidentifikasi perubahan penggunaan lahan antara tahun 2016 dan 2025; (2) mengestimasi laju erosi tanah menggunakan model RUSLE; (3) serta menganalisis pengaruh perubahan penggunaan lahan terhadap laju erosi di Sub-DAS Gintung dan Sub-DAS Mongo.

Analisis spasial dilakukan menggunakan Citra Sentinel-2 Level-2A yang diinterpretasikan secara visual untuk menghasilkan peta penggunaan lahan tahun 2016 dan 2025. Akurasi hasil klasifikasi penggunaan lahan diuji menggunakan confusion matrix dan diverifikasi melalui survei lapangan. Laju erosi diestimasi menggunakan metode *Revised Universal Soil Loss Equation* (RUSLE) yang diintegrasikan dengan SIG, mencakup parameter topografi (faktor LS), erosivitas hujan (R), erodibilitas tanah (K), serta faktor pengelolaan tanaman dan konservasi tanah (CP).

Nilai Overall Accuracy mencapai $\geq 90,91\%$ dengan Indeks Kappa $\geq 0,88$ pada seluruh periode wilayah kajian. Perubahan penggunaan lahan selama periode penelitian relatif kecil, dengan peningkatan luas permukiman sebesar 1,48 ha di Sub-DAS Gintung dan 5,91 ha di Sub-DAS Mongo, dan disertai penurunan luas kebun campuran dan sawah. Rata-rata laju erosi meningkat dari 61,631 menjadi 90,261 ton/ha/tahun di Sub-DAS Gintung dan dari 51,860 menjadi 78,350 ton/ha/tahun di Sub-DAS Mongo. Sub-DAS Gintung menunjukkan peningkatan laju erosi yang lebih besar dibandingkan Sub-DAS Mongo. Analisis modifikasi kondisi menunjukkan ketika erosivitas hujan dibuat tetap, perubahan faktor CP hanya menghasilkan selisih 0,326–2,176 ton/ha/tahun. Meskipun perubahan lahan selama periode tersebut terjadi, peningkatan erosivitas hujan dari 505–636 menjadi 678–832 MJ.mm/ha/tahun memberikan pengaruh lebih besar terhadap peningkatan laju erosi dibandingkan perubahan penggunaan lahan. Temuan ini memberikan informasi penting bagi pengelolaan DAS dalam mengidentifikasi area prioritas konservasi tanah dan air di hulu DAS Bogowonto, khususnya di kawasan perbukitan Sub-DAS Gintung yang memiliki risiko erosi tertinggi.

Kata Kunci: Laju Erosi, RUSLE, Perubahan Penggunaan Lahan, Citra Sentinel-2, Sub-DAS Gintung, Sub-DAS Mongo

ANALYSIS OF THE EFFECT OF LAND USE CHANGE ON SOIL EROSION RATES USING THE RUSLE MODEL AND SENTINEL-2 IMAGERY IN THE GINTUNG AND MONGO SUB-WATERSHEDS, PURWOREJO REGENCY

Alisa Sayidatina Fatimah
22/493469/GE/09817

ABSTRACT

Soil erosion is one of the major forms of land degradation in tropical watersheds and is strongly influenced by rainfall, topography, soil characteristics, and land use. Purworejo Regency has high erosion vulnerability due to the combination of hilly topography, high rainfall, and ongoing land use changes, particularly in the Menoreh Hills. This study aimed to: (1) identify land use changes between 2016 and 2025; (2) estimate soil erosion rates using the RUSLE model; and (3) analyze the influence of land use changes on erosion rates in the Gintung and Mongo Sub-Watersheds.

Spatial analysis was conducted using Sentinel-2 Level-2A imagery, which was visually interpreted to produce land use maps for 2016 and 2025. The accuracy of the land use interpretation was evaluated using a confusion matrix and field verification. Soil erosion rates were estimated using the Revised Universal Soil Loss Equation (RUSLE) integrated with a Geographic Information System (GIS), incorporating topographic parameters (LS factor), rainfall erosivity (R factor), soil erodibility (K factor), and cover-management and conservation practices (CP factor).

The results overall accuracy reached $\geq 90.91\%$, with Kappa coefficients of ≥ 0.88 across all study areas and periods. Land use changes during the study period were relatively small, with settlement areas increasing by 1.48 ha in the Gintung Sub-Watershed and 5.91 ha in the Mongo Sub-Watershed, accompanied by decreases in mixed garden and paddy field areas. The average soil erosion rate increased from 61.631 to 90.261 $\text{ton ha}^{-1} \text{year}^{-1}$ in the Gintung Sub-Watershed and from 51.860 to 78.350 $\text{ton ha}^{-1} \text{year}^{-1}$ in the Mongo Sub-Watershed. The Gintung Sub-Watershed experienced a greater increase in the average soil erosion rate than the Mongo Sub-Watershed. Modified-condition analysis showed that when rainfall erosivity was held constant, changes in the CP factor resulted in differences of only 0.326–2.176 $\text{ton ha}^{-1} \text{year}^{-1}$. Although land use changes occurred during the study period, the increase in rainfall erosivity from 505–636 to 678–832 $\text{MJmm ha}^{-1} \text{year}^{-1}$ contributed more substantially to the increase in estimated soil erosion rates than land use changes. These findings provide important information for watershed management by identifying priority areas for soil and water conservation in the upper Bogowonto Watershed, particularly in the hilly terrain of the Gintung Sub-Watershed where erosion risk is highest.

Keywords: *Erosion Rate, RUSLE, Land-Use Change, Sentinel-2 Imagery, Gintung Sub-watershed, Mongo Sub-watershed*