Integrated GIS-Based Assessment of Soil Erosion Using the Gavrilovic Model (EPM) in the Amizmiz Watershed, Western High Atlas (Morocco)

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Abstract

This study aims to assess soil erosion in the Amizmiz watershed (Western High Atlas, Morocco) using the Gavrilovic empirical model (EPM) integrated with Geographic Information Systems (GIS). A database was developed from key erosion conditioning factors, including slope, lithology, precipitation, temperature, land use, and vegetation cover derived from remote sensing and field observations. The dataset was analyzed within a GIS framework to estimate soil loss and evaluate the influence of each factor.

The results indicate that moderate soil loss (500–1000 m^3/km^2/year) dominates the watershed, covering 51.95% of the total area, followed by higher erosion classes (1000–3000 m^3/km^2/year) representing 18.49%. Areas with very high erosion (>6000 m^3/km^2/year) account for 20.54%, mainly located in upstream and downstream zones characterized by steep slopes, friable lithology, and low vegetation cover. In contrast, low erosion zones are associated with resistant geological formations and dense vegetation.

The integration of the EPM model with GIS proved effective in identifying and ranking erosion-prone areas. This approach provides a reliable tool for soil erosion assessment and supports sustainable land management in mountainous environments.

Keywords

Soil erosion; EPM model; GIS; Watershed; Remote sensing; Soil loss; Morocco