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Soil Erosion Assessment Using RUSLE & ANN Models and Identifying the Correlation by Landslide Frequency Ratio Method: A Case Study of Kalu River Catchment of Sri Lanka

NMO Madushani[1#] and AKRN Ranasinghe[1]

[1]Faculty of Geomatics, Sabaragamuwa University, Belihuloya, Sri Lanka

[#]dolishiya96@gmail.com

Abstract

Soil erosion is a critical environmental concern with profound implications for agricultural productivity and natural resource sustainability. This research endeavors to evaluate soil erosion within the Kalu River catchment in Sri Lanka, spanning the period from 2000 to 2020, using the Revised Universal Soil Loss Equation (RUSLE) and Artificial Neural Network (ANN) models. The primary objectives are to quantify annual soil loss and delineate the spatial distribution of soil erosion risk. The study reveals that the K factor, LS factor, P factor, C factor, and R factor exert varying degrees of influence on soil erosion. Through the application of an ANN model, accurate predictions of soil erosion are achieved. However, for assessing soil erosion susceptibility in the specific study area, the RUSLE model emerges as more effective. Additionally, the research investigates disparities in soil erosion across sub-catchments within the Kalu River catchment. Results indicate that sub-catchment A10 experiences the highest soil erosion, while A4 exhibits the lowest erosion rates. Furthermore, the Landslide Frequency Ratio (LFR) method is employed to establish a correlation between soil erosion hazard classes and landslide frequency. By integrating LFR values, soil erosion rates, and land-use changes, high-priority regions requiring soil conservation measures are identified. This study underscores the significance of estimating soil erosion rates, creating hazard zonation maps, and prioritizing areas for sustainable land management and soil conservation practices. Additionally, it enhances soil erosion factor comprehension, offers valuable insights for further research, and empowers policymakers, land-use planners, and farmers in implementing Eco-friendly land-use practices.

Keywords: *ANN model, Kalu River catchment, LFR, Land-use changes, RUSLE model, Soil erosion*