

Modeling and Mapping of Soil Erosion Risk Using Geographic Information Systems, Remote Sensing, and Deep Learning Algorithms: Case of the Oued Mikkes Watershed, Morocco

Authors : My Hachem Aouragh, Hind Ragraoui, Abdellah El-Hmaidi, Ali Essahlaoui, Abdelhadi El Ouali

Abstract : This study investigates soil erosion susceptibility in the Oued Mikkes watershed, located in the Meknes-Fez region of northern Morocco, utilizing advanced techniques such as deep learning algorithms and remote sensing integrated within Geographic Information Systems (GIS). Spanning approximately 1,920 km², the watershed is characterized by a semi-arid Mediterranean climate with irregular rainfall and limited water resources. The waterways within the watershed, especially the Oued Mikkes, are vital for agricultural irrigation and potable water supply. The research assesses the extent of erosion risk upstream of the Sidi Chahed dam while developing a spatial model of soil loss. Several important factors, including topography, land use/land cover, and climate, were analyzed, with data on slope, NDVI, and rainfall erosivity processed using deep learning models (DLNN, CNN, RNN). The results demonstrated excellent predictive performance, with AUC values of 0.92, 0.90, and 0.88 for DLNN, CNN, and RNN, respectively. The resulting susceptibility maps provide critical insights for soil management and conservation strategies, identifying regions at high risk for erosion across 24% of the study area. The most high-risk areas are concentrated on steep slopes, particularly near the Ifrane district and the surrounding mountains, while low-risk areas are located in flatter regions with less rugged topography. The combined use of remote sensing and deep learning offers a powerful tool for accurate erosion risk assessment and resource management in the Mikkes watershed, highlighting the implications of soil erosion on dam siltation and operational efficiency.

Keywords : soil erosion, GIS, remote sensing, deep learning, Mikkes Watershed, Morocco

Conference Title : ICGES 2024 : International Conference on Geological and Earth Sciences

Conference Location : Cairo, Egypt

Conference Dates : December 16-17, 2024