Annual soil erosion assessment using geographic information system and revised soil loss equation: A case study of district Nowshera Khyber-Pakhtunkhwa

Abid Sarwar[1]*, Muhammad Israr[1], Muhammad Yaseen[1], Shazia Gulzar[1], Muhammad Akmal Sardar Ali[1], Abdul Majid[1], Muhammad Ismail[1], Muhammad Ali[2], Amir Hayat[1], Muhammad Hamza[1], Palwasha Sanam[1]

[1]GIS Lab, Directorate General Soil & Water Conservation, Peshawar, Pakistan
[2]National Centre of Excellence in Geology, University of Peshawar, Pakistan
*syedabidsarwar@gmail.com

The erodibility of soils is a worldwide issue that is a big threat to all the reserves specifically in parched regions, which refers to surface debasement. A total of eighty percent of agrarian land is exposed to abrasion ranging from moderate to extreme, which eventually leads to a reduction in yield. The Revised Universal Soil Loss Equation (RUSLE) has been modified from the Universal Soil Loss Equation (USLE) that was made for the estimation of erosion phenomenon in the farming lands of the United States. District Nowshera was affected by floods in 2009, 10, 11, 14, and the most recent Monsoon flood in 2022. After the flood of 2018 and 2022 mostly the agricultural land was eroded by rivers. In this study total of six factors i.e., soil erodibility factor, cover management factor, length and slope factor, support practice factor and rainfall erosivity factor were analyzed. Required data on these factors were collected from different sources and analyzed in the ArcGIS environment. The weighted sum tool located inside the spatial analyst extension in ArcGIS 10.4 Software was used to combine all six factors for the results generation. The potential of soil erosion in the Study area varies from 0.27 to 69 tons/hectare/year. Results are categorized into four zones. They are low (0.273 tons/hectare/year), moderate (0.274–1.36tons/hectare/year) high (1.37 - 3.54 tons/hectare/year) and very high (3.55- 69.5 tons/hectare/year). The total area of district Nowshera is reported 1686985651.17 Hectares (416863.23 Acres), in which a total soil loss of 167002.2 tons/hectare/year was observed in this study. It was found that nearly 98% of the total area is lying in moderate and high erosion prone zone. Verification of the outcomes was done and a field survey was conducted to identify very prone areas to soil erosion. Hand-held GPS devices were used to mark the exposed areas to soil erosion. It is concluded that GIS and remote sensing is an efferent tool that provides results in less time with low cost and labor.

Keywords: GIS; Remote sensing; RUSLE; Prone; Weighted