

Estimation of Soil Erosion Potential in Herat Province, Afghanistan

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Abstract : Estimation of soil erosion is economically and environmentally important in Herat, Afghanistan. Degradation of soil has negative impact (decreased soil fertility, destroyed soil structure, and consequently soil sealing and crusting) on life of Herat residents. Water and wind are the main erosive factors causing soil erosion in Herat. Furthermore, scarce vegetation cover, exacerbated by socioeconomic constraint, and steep slopes accelerate soil erosion. To sustain soil productivity and reduce soil erosion impact on human life, due to sustaining agricultural production and auditing the environment, it is needed to quantify the magnitude and extent of soil erosion in a spatial domain. Thus, this study aims to estimate soil loss potential and its spatial distribution in Herat, Afghanistan by applying RUSLE in GIS environment. The rainfall erosivity factor ranged between values of 125 and 612 (MJ mm ha⁻¹ h⁻¹ year⁻¹). Soil erodibility factor varied from 0.036 to 0.073 (Mg h MJ⁻¹ mm⁻¹). Slope length and steepness factor (LS) values were between 0.03 and 31.4. The vegetation cover factor (C), derived from NDVI analysis of Landsat-8 OLI scenes, resulting in range of 0.03 to 1. Support practice factor (P) were assigned to a value of 1, since there is not significant mitigation practices in the study area. Soil erosion potential map was the product of these factors. Mean soil erosion rate of Herat Province was 29 Mg ha⁻¹ year⁻¹ that ranged from 0.024 Mg ha⁻¹ year⁻¹ in flat areas with dense vegetation cover to 778 Mg ha⁻¹ year⁻¹ in sharp slopes with high rainfall but least vegetation cover. Based on land cover map of Afghanistan, areas with soil loss rate higher than soil loss tolerance (8 Mg ha⁻¹ year⁻¹) occupies 98% of Forests, 81% rangelands, 64% barren lands, 60% rainfed lands, 28% urban area and 18% irrigated Lands.

Keywords : Afghanistan, erosion, GIS, Herat, RUSLE

Conference Title : ICSMGE 2016 : International Conference on Soil Mechanics and Geotechnical Engineering

Conference Location : Paris, France

Conference Dates : February 22-23, 2016