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PRIORITIZATION OF WATERSHEDS IN UVA PROVINCE, SRI LANKA, BASED ON SOIL EROSION HAZARD

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Uva Province in Sri Lanka is most significant in terms of its hydrological contributions since it consists of ten major river basins including source areas of three tributaries of Mahaweli River. The Province is affected by human-induced soil erosion by water. Hence, identification of soil erosion hazards and prioritizing them based on watersheds are crucial for improving soil conservation and water management plans. This study assessed the mean annual soil loss from the Province and watersheds separately using the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) Sediment Delivery Ratio (SDR) model introduced by the Stanford University, USA, using ArcGIS 10.4 environment. To cover the spatial extent of the Uva Province, the raster maps of Digital Elevation Model (DEM), rainfall erosivity factor (R), soil erodibility factor (K), and land use land cover (LULC) maps were prepared using ArcGIS 10.4. A biophysical table was formulated as a .csv (Comma Separated Value) table containing crop management (C) and support practice (P) factors corresponding to each land use classes in the LULC raster. Ultimately, all the raster data layers and parameters were integrated into the InVEST SDR to obtain model outputs. The estimated mean annual soil loss from the Uva Province, 25.6 t ha^{-1} year^{-1}, is ~ 3 times faster than the soil loss tolerance in Sri Lanka. The mean soil loss rates of major watersheds in the Province range from 0.9 and 117.8 t ha^{-1} year^{-1} with the highest by Badulu Oya (117.8 t ha^{-1} year^{-1}) and the lowest by Walawe River (0.9 t ha^{-1} year^{-1}). The watersheds were further classified into five soil erosion hazard classes as low (< 5 t ha^{-1} year^{-1}), moderate (5 - 12 t ha^{-1} year^{-1}), high (12 - 25 t ha^{-1} year^{-1}), very high (25 - 60 t ha^{-1} year^{-1}), and extremely high (> 60 t ha^{-1} year^{-1}). The study revealed that under the existing land use scenario, Uma Oya, Badulu Oya and Loggal Oya watersheds fall into extremely high class; Menik River and Kirindi Oya watersheds fall into high class; Gal Oya, Kumbukkan Oya and Ulhitiya Oya watersheds fall into moderate class; Heda Oya and Walawe River watersheds fall into low class in Uva Province. Moreover, watersheds with the high, very high and extremely high soil erosion hazards are related to high mean annual rainfall (900 - 2500 mm), steeper slopes, high erodible soil types and the effect of seasonal soil erosion-induced agricultural practices. The findings of this study would help in formulating new watershed management policies in the Uva Province.

Keywords: GIS, InVEST SDR model, Soil erosion, Uva Province, Watersheds