

Soil Erosion Estimation of the Samanalawewa Watershed in Sri Lanka: Implication of InVEST SDR Model

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Ecosystem services (ES) are the benefits that humans gain from natural systems, either directly or indirectly. The ES approach generally covers soil erosion as soil retention. Soil erosion is one of the most crucial environmental problems confronting the globe today affecting the fate of human societies and the achievement of sustainable development goals that promote human and environmental well-being. Assessing soil erosion is crucial for watershed management. Thus, this study estimated and mapped the soil erosion, using the Integrated Valuation of Ecosystem Services and Trade-offs (InVEST 3.9.2) Sediment Delivery Ratio (SDR) model, in the Samanalawewa watershed (SW) in Sri Lanka, during 20 years (2000-2020) with five-year time intervals. Several models have been used to assess soil erosion rates in watersheds. Due to its various advantages, including high-accuracy predictions, the option to incorporate more input variables for prediction, and flexibility for utilization, the InVEST SDR model is a frequently used model for the assessment of soil erosion rates. Input data were obtained from the Meteorological Department, Survey Department, USGS website, as secondary data sources. According to the obtained results, the estimated mean annual soil erosion rates were 53.2, 52.9, 69.7, 87.7, and 70.2 t ha⁻¹ year⁻¹, respectively for years 2000, 2005, 2010, 2015, and 2020. The resulting soil loss values of SW are 10 to 18 times higher than the soil erosion tolerance (5 t ha⁻¹ year⁻¹) in Sri Lanka. The results show that the years 2015 and 2005 had the highest and the lowest total soil loss values, respectively. The upper part of the watershed has the highest soil loss values, while the remaining parts of the SW have relatively moderate soil loss values. Furthermore, the soil erosion distribution of SW reveals that soil erosion is directly related to high precipitation values and inappropriate land use practices (Chena and Tea cultivations). These results would support in the development of watershed management policies and in the implementation of proper soil and water conservation measures to mitigate soil erosion.

Keywords: Ecosystem Services, GIS, InVEST SDR Model, Samanalawewa Watershed, Soil Erosion