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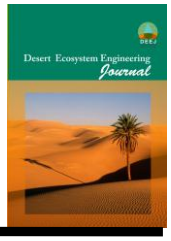

Simulating the Effects of Land-use Changes on Soil Erosion Via RUSLE Model in Ilam province's Doiraj Basin

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Expanded abstracts

Introduction: changes in land use and land cover (LULC) could affect natural processes such as soil erosion, and sedimentation, flooding, and soil's physical and chemical properties. One of the essential impacts of land cover type on processes in watersheds is its role in soil erosion rate. Therefore, this study sought to investigate the effect of LULC changes on soil erosion in Ilam province's Doiraj watershed using Geographic information system (GIS), remote sensing (RS), and Revised Universal Soil Loss Equation (RUSLE) model.

Materials and methods: The study area is the Doiraj watershed located in the southeast of Ilam province. The RUSLE model is a function of five input factors: rainfall erosivity, soil erodibility, length and slope steepness, vegetation management, and support practice factor. Soil erosion is estimated through the following equation using the RUSLE model:

A = R * K * LS * P * C

Where A stands for Soil erosion (ton/ha. y), R stands for rainfall erosivity factor, K stands for erodibility factor, LS stands for Topographic factor, C stands for Cover management factor, and P is the support practice factor. The required RUSLE model inputs were obtained from a regional digital elevation model (DEM), and the rainfall data regarding six meteorological stations inside and near the study area were collected from the website of the Iranian Meteorological Organization (www.irimo.ir). Due to non-compliance of data in all stations, a similar statistical period was selected from 2002 to 2018. Information about the soil parameters of the area was obtained from Ebrahimi (2011). Also, the land-use and NDVI data for 1995, 2006, and 2015 were obtained from Balouei (2018) and used to prepare support practice and cover management factors.

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Result: The value of the R factor varied from 53.22 to 1704.81. In this regard, the maximum rainfall intensity was found in the watershed's northern and western parts, while the intensity of the rainfall erosivity factor

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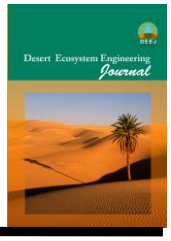

decreased in the east and south of the watershed. Furthermore, the value of the erodibility factor ranged from 0.026 to 0.077. It was also found that the soil erosion was directly related to the amount of silt so that the soil classes whose silt content was more than 60% had the highest soil sensitivity to degradation. Also, the LS factor was prepared using the DEM layer, whose value varied from 0.093 to 3743. The P factor ranged between 0 and 1 under the 1995, 2006, and 2015 periods. In 1995, the NDVI index was in better conditions than what was observed in 2006 and 2015.

Furthermore, the interpretation of the results showed that most of the observed changes were related to forest and rangeland degradation and increasing barren lands. Also, the average rates of soil erosion under LULC change scenarios suggested that the rate of soil loss varied from 77.04 tons per hectare annually in 1995 to 91.51 tons per hectare annually in 2006, and 108.94 tons per hectare annually in 2015. Therefore, the highest rate of soil loss was observed in the third period, and the extent of soil erosion showed an increasing trend in the last two decades, indication a very high impact of LULC changes on soil erosion in the Doiraj watershed.

Discussion and Conclusions: This study sought to evaluate the role of LULC changes in the Doiraj watershed's soil erosion. According to the results, it can be argued that the destruction of forests and pastures and the increase of barren lands during the study period had increased the rate of soil erosion. The results' analysis showed that most of the changes were related to deforestation and an increase in barren lands. Therefore, the percentage of forest type area in 1995, 2006, and 2015 were 51.17, 42.8, and 38.91, respectively, and the percentage of pastures area was equal to 12.79, 8.9, and 6.4, and the percentage of barren lands area was 11.21, 23.27, and 28.57, respectively. Soil conservation scenarios suggested that with some constant factors (K, R, LS), soil conservation with a correlation coefficient of 0.46% followed topography with a correlation coefficient of 0.81% in terms of importance in determining the extent of soil erosion. The highest soil erosion under the soil conservation scenario occurred in 2015, with an average of 108.94 tons/ha. The study's findings concerning the soil erosion's critical segments presented in this research allow for prioritizing those parts of the watershed that require the immediate application of improved management interventions and informed decision-making processes.

Keywords: Land Use Change, Soil Loss, Remote Sensing, Landsat.