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Title: Impact assessment of change in land use land cover and rainfall pattern on soil erosion potential of Irga river catchment (Jharkhand) using remote sensing and GIS techniques

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Abstract: Soil erosion is a major form of land degradation and has been recognized as a severe environmental problem. The present study was conducted in Irga catchment situated in Giridih district of Jharkhand. Image processing and soil erosion assessment is done using eCognition and ArcGIS softwares. The land use land cover map of 1997, 2007 and 2017 were prepared using LANDSAT images by object-based image classification technique having better accuracy than traditional pixel based image classification. The Land use land cover maps were classified into six classes viz. agricultural land, settlement, vegetation, waste land, water body and river. Using RUSLE integrated with RS and GIS, soil erosion map was prepared for the study area. For preparing soil erosion map, R factor was derived from TRMM rainfall data of ten years (2008 to 2017), K factor from DSMW prepared by UN FAO and LS factor from SRTM DEM. The C and P factor values were assigned according to LULC map based on reviewed works. The overall accuracy of classified images are computed to be 88%, 83% and 91 % while kappa coefficients are found to be 0.8455, 0.7706 and 0.8796 for year 1997, 2007 and 2017 respectively. The results indicate that waste land greatly reduced and converted into settlement and agricultural land. In application of RUSLE model for Irga catchment, R factor varied from 499.834 to 538.049 MJ mm h⁻¹ ha⁻¹ yr⁻¹ and K factor varied from 0.0159 to 0.0191 t ha h ha⁻¹ MJ⁻¹ mm⁻¹ for year 2017. The generated LS factor map of the study area showed that it varied from 0.03 to 41.09. C and P factor varied from 0 to 1. The estimated value of soil loss from the catchment varies from 0 to 36.1185 t /ha/yr with mean value as 0.2814 t/ha/yr. The results indicate that the study area has very slight and slight erosion class. Further, using 10 year rainfall data of 1998 to 2007 and LULC map of 2007, the soil erosion potential map for the year 2007 was also generated. The value of soil loss varies from 0 to 44.2149 t/ha/yr for this year with mean value as 0.3057 t/ha/yr. The mean value of the soil erosion potential has decreased by 8.6049 % over the period of 10 years (2007-2017) which reveals that the changes in LULC and rainfall pattern greatly affect the soil erosion potential. The results of the present study also reveal that object-based image classification technique gives higher accuracy for image classification as compared to pixel-based classification. Further, integrated use of RUSLE with RS and GIS technique is effective and powerful tool for estimation of soil erosion.

Subject: Soil and Water Engineering

Theme: Impact assessment of change in land use land cover and rainfall pattern on soil erosion potential of Irga river catchment (Jharkhand) using remote sensing and GIS techniques

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