Evaluation of decadal land degradation dynamics in old coal-mines of Central India

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Abstract

The present study attempts to understand land use dynamics in an area subjected to opencast and underground coal mining for the last few decades in Kotma Coalmines of Anuppur district in Madhya Pradesh, India through geospatial techniques. Land Use and Land Cover (LULC) change detection analysis was performed digitally classifying Landsat 5 (2001) as well as Landsat 8 (2020) satellite data using maximum likelihood algorithm. Results revealed that area under Dense native vegetation decreased drastically (13.74 sq. km) with the gradual and consistent expansion in the activities of coal mines which showed the highest increase in area over time (15.84 sq. km). Bivariate regression analysis showed the positive empirical relationships between vegetation indices and soil physico-chemical parameters. Studies suggested soil and vegetation is degraded over the large mining areas consistently over a long time period. Despite the continuous reforestation activities on mined areas, the decline area under dense vegetation and sparse vegetation over the twenty-year time-scale indicates that the reclamation activities are still in its' infancy. Land Degradation Vulnerability Index (LDVI) map was generated to understand the extent of decadal land degradation trends and it shows that 8.60 % of the area is highly vulnerable to degradation. The LDI inputs will help the planners to develop alternate strategies to tackle vulnerability zones for safe mining. Monthly estimation of various meteorological parameters was also recorded to generate heat plots for the period 2001-2020. The study concludes that monitoring and assessment of fragile ecosystems are indispensable for holistic environmental management.

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