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Assessing Sediment Occurrence in the Shire River Basin: Implications to Water Resources Management

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Inadequate up-to-date information and measurement techniques on sediment load, soil erosion and land use/land cover (LULC) changes in poorly gauged watersheds makes the implementation of water resources management and planning difficult. Shire river basin is no exception in lack of comprehensive data on soil loss and sediment loads of its water bodies. Therefore, this study aimed at assessing the spatial and temporal dynamics of LULC in relation to sediment occurrence and its implication to water resources management.
LULC classification for the years 1984, 1994 and 2014 was done using clustering unsupervised classification. Confusion matrix was used to assess the precision of the classified images based on ground based data and the average overall accuracy obtained was 89.04%, 93.27% and 85.85% respectively. The analysis shows that settlements and cropland have increased by 12.29% and 5.98% respectively with a reduction in forest, grassland, bare land and water. ANOVA revealed that there is a significant change of LULC classes at p-value 0.000. Based on the LULC dynamics of the basin, SLEMSA model was used to assess the soil loss of the river basin using GIS spatial analysis tools and potential erosion risk areas based on LULC were identified.
The results shows that there has been a gradual increase in soil loss in the river basin from 0-1500tons/ha/annum in 1984 to 0- 4500tons /ha/annum in 1994 and 0-5000tons/ha/annum in 2014 with soil erodibility ratio of 0 – 20 tons /ha/annum, with few areas having 21-30tons/ha/annum. In terms of potential hazard areas, results shows the river basin is within the moderate to high risk zones but the lower Shire marshes which provides goods and services to the communities being in very high zone hence this has a high implication on water resources management in terms of availability of water in quantity and quality at the same time for ecological sustainability of different flora and fauna.
The findings of the study will be valuable to help water resources managers understand complex nature of soil erosion and determine the priorities to improve catchment and water resources management through appropriate management strategies and policies.