

## **The Impact of Land Cover Change on Stream Discharges and Water Resources in Luvuvhu River Catchment, Vhembe District, Limpopo Province, South Africa**

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**Abstract :** Luvuvhu River catchment in South Africa experiences floods resulting from heavy rainfall of intensities exceeding 15 mm per hour associated with the Inter-tropical Convergence Zone (ITCZ). The generation of runoff is triggered by the rainfall intensity and soil moisture status. In this study, remote sensing and GIS techniques were used to analyze the hydrologic response to land cover changes. Runoff was calculated as a product of the net precipitation and a curve number coefficient. It was then routed using the Muskingum-Cunge method using a diffusive wave transfer model that enabled the calculation of response functions between start and end point. Flood frequency analysis was determined using theoretical probability distributions. Spatial data on land cover was obtained from multi-temporal Landsat images while data on rainfall, soil type, runoff and stream discharges was obtained by direct measurements in the field and from the Department of Water. A digital elevation model was generated from contour maps available at <http://www.ngi.gov.za>. The results showed that land cover changes had impacted negatively to the hydrology of the catchment. Peak discharges in the whole catchment were noted to have increased by at least 17% over the period while flood volumes were noted to have increased by at least 11% over the same period. The flood time to peak indicated a decreasing trend, in the range of 0.5 to 1 hour within the years. The synergism between remotely sensed digital data and GIS for land surface analysis and modeling was realized, and it was therefore concluded that hydrologic modeling has potential for determining the influence of changes in land cover on the hydrologic response of the catchment.

**Keywords :** catchment, digital elevation model, hydrological model, routing, runoff

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