

Geomorphometric Analysis of the Hydrologic and Topographic Parameters of the Katsina-Ala Drainage Basin, Benue State, Nigeria

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Abstract : Drainage basins are a central theme in the green economy. The rising challenges in flooding, erosion or sediment transport and sedimentation threaten the green economy. This has led to increasing emphasis on quantitative analysis of drainage basin parameters for better understanding, estimation and prediction of fluvial responses and, thus associated hazards or disasters. This can be achieved through direct measurement, characterization, parameterization, or modeling. This study applied the Remote Sensing and Geographic Information System approach of parameterization and characterization of the morphometric variables of Katsina - Ala basin using a 30 m resolution Shuttle Radar Topographic Mission (SRTM) Digital Elevation Model (DEM). This was complemented with topographic and hydrological maps of Katsina-Ala on a scale of 1:50,000. Linear, areal and relief parameters were characterized. The result of the study shows that Ala and Udene sub-watersheds are 4th and 5th order basins, respectively. The stream network shows a dendritic pattern, indicating homogeneity in texture and a lack of structural control in the study area. Ala and Udene sub-watersheds have the following values for elongation ratio, circularity ratio, form factor and relief ratio: 0.48 / 0.39 / 0.35/ 9.97 and 0.40 / 0.35 / 0.32 / 6.0. They also have the following values for drainage texture and ruggedness index of 0.86 / 0.011 and 1.57 / 0.016. The study concludes that the two sub-watersheds are elongated, suggesting that they are susceptible to erosion and, thus higher sediment load in the river channels, which will dispose the watersheds to higher flood peaks. The study also concludes that the sub-watersheds have a very coarse texture, with good permeability of subsurface materials and infiltration capacity, which significantly recharge the groundwater. The study recommends that efforts should be put in place by the Local and State Governments to reduce the size of paved surfaces in these sub-watersheds by implementing a robust agroforestry program at the grass root level.

Keywords : erosion, flood, mitigation, morphometry, watershed

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