

GIS and Remote Sensing Based Assessment of Hydro-Geomorphological Parameters of Lower Niger Basing in Nigeria

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Key words: Coastal Zone Management; Hydrography; Remote sensing; Spatial planning; Morphometric Analysis, River basin, Remote Sensing

SUMMARY

ABSTRACT

Conservation of natural resources is of prime importance for environmental protection and sustainable development therefore it requires the use of state-of-the-art technologies for effective management. Remote sensing and GIS have emerged as most powerful tools for development and management of regional hydrological models for solving various hydrological problems. Therefore, in this study, hydro-morphological assessment of lower Niger basin has been carried out to understand its hydrological, geological and topographical attributes by analyzing ASTER DEM in geographic information system environment. ASTER data was used for preparation of digital elevation model and GIS was used for evaluation of linear, areal and relief aspect of morphometric parameters. Basic terrain, hydrological models and quantitative attributes of the basin such as 3-D Landscape, 2.5-D surface, sub-catchments, flow direction, channel networks, drainage density, stream orders, stream frequency etc has been processed using the elevation raster in GIS environment. Ground truthing and accuracy assessment has been carried out to ensure the reliability of the result. Based on Strahler's method of stream ordering, the river basin is designated as 4th order basin, with 1st order streams mostly dominating. The overall stream network revealed a hierarchy of 1st, 2nd, 3rd order streams with river Niger positioned as 4th order streams in the hierarchy. This study reveals a total number of 188 streams draining an area of 70959.175square kilometers of land. Further investigation revealed that there are three (3) fourth order streams, thirteen (13) third order streams, twenty six (26) second order streams, and one hundred and thirty six (136) first order streams. Further morphometric assessments revealed that the basin has a drainage density of 0.0665km⁻¹, stream frequency of 2.452 x 10⁻³, circulatory ratio of 0.310, elongation ratio of 0.40, Form factor of 0.128 and basin length of 745.976km. These geometric attributes attest that the basin is drainage course textured, elongated in shape and of low discharge

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potential. These digital derivatives are invaluable for proper management of the river basin and also attest that Remote Sensing and GIS can be effectively utilized as a viable tool to study river basins and their associated morphometry.

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