

GIS-based hydrological modelling for watershed analysis and flood control in Mokwa, Niger State, Nigeria

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Key words: Hydrography; Remote sensing; Risk management

SUMMARY

The Recent flooding in Mokwa in Niger State, Nigeria, is the worst in the history of the state, as over 120 lives were lost, communities were displaced, and properties worth millions were destroyed. This devastating incident calls for urgent, proactive measures to mitigate future occurrences, hence the need for scientific watershed analysis for flood control in Mokwa, Niger State, Nigeria. Despite the increasing growth in flood risk, limited studies have efficiently integrated geospatial and hydrologic methodologies to evaluate and mitigate flood risk across a watershed. This study employs the combination of remote sensing, hydrological parameters, and geographical information systems (GIS) for geospatial delineation of the watershed in Mokwa Community, identifies drainage patterns, land use, and land cover characteristics, and produces vulnerability maps for proactive decision making to prevent future occurrences. Hydrological parameters, including elevation, slope, drainage network, flow accumulation pattern, stream order, and runoff potential of the study area, were extracted using the digital elevation model (DEM) data. A vulnerability map of the study area was produced using the combination of Hydrology Engineering Center -Hydrology Modelling System (HEC-HMS) and Hydrology Engineering Center-River Analysis System (HEC-RAS) to determine flood-prone areas and recommend strategic interventions for flood mitigation structures, such as retention basins, improved drainage systems, stoppage of building on possible waterways, check dams, and improved drainage systems. These study findings provide a vital insight into the efficiency of using remote sensing tools to offer firsthand knowledge for the mitigation of flooding and disaster management, which can be adopted for urban and regional planning and policy making. Finally, the study gives an understanding of piloting an early warning system, awareness, and environmental protection.

Keywords: Flood, Vulnerability, and Watershed