Mapping of Inundation Extent along River - Kaduna from Spaceborne Optical Sensor

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Key words: Access to land; Geoinformation/GI; Hydrography; Informal settlements; Remote sensing; Inundation Mapping; mNDWI; River Metrics; Flow Direction; Profile and Cross-section of River

SUMMARY

Mapping of areas inundated by flood is crucial for determining the flood extent, deployment of emergency response teams, and assessment of damages and casualties. River-Kaduna, which spread over a wide area cut across certain neighborhoods, often inundates its banks predominantly during heavy rainfall and resulting in an urban flood. However, to map the extent of inundation without river gauge data is impossible. Therefore, the study presented a simple, logical, and effective method of mapping the extent of the 2018 inundation along River-Kaduna. It processed two sets of Landsat OLI and TIRS images – one as pre-flood and the other as during-flood. Waterbody was extracted using the modified Normalized Difference Water Index (mNDWI). With the unavailability of river gauge data, a DEM was incorporated into the analysis to define the water level based on the mNDWI; derive a Triangulated Irregular Network (TIN), flow direction, profile, and cross-section of the River. The study revealed that the water of the regular channel of the river before the flood covered an area of 2,748.16Km2 with a volume of 17,804,379.17m3. The floodwater during the flood covered 15,603.37Km2 with a volume of 218,565,875.21m3. The extent of the inundation was 12,855.22m3 beyond the its bank and the volume of the floodwater was about 200,761,496.04m3. Also, the flow direction showed that the direction to the west was 24%; to the north was 13.6%; and to the east was 11.2%. The southwesterly was 9.6%; followed by southeasterly, northeasterly, and northwesterly with values of 6.4%, 5.6%, and 4.8% respectively. Some of the findings of this study are in agreement with similar related studies. This study contributes to the strategy for mapping of extent of inundation in the absence of a river gauge data using RS and GIS techniques. Based on the findings of the study, it suggested that dredging should be carried out to allow the river to accommodate more volume of water during heavy rainfall and freely flow through its natural channel.