MULTITEMPORAL ANALYSIS OF LAND COVER CHANGE FOR FLOOD DISCHARGE STUDIES IN THE NYANDO RIVER BASIN USING LANDSAT IMAGES

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Many basins today continue to undergo significant land cover changes arising from various socio-economic reasons. In data scarce areas, the application of remote sensing techniques can provide a platform to quantify these changes to provide the useful information required for water resource management. This paper presents a methodology to (i) analyze and quantify land cover changes (ii) estimate the effects of these changes on flood discharge characteristics, in the Nyando river basin of Kenya. This current study therefore is a positive contribution towards the conference theme on prediction of hydrologic response based on different quality measurement data beginning with the lack of reliable reference data for image classification and accuracy assessment, to the existence of poor hydro meteorological data for hydrological response estimation. Three Landsat scenes from 1973 to 2000 were selected to detail the land cover changes. Seven land cover classes were identified based on their hydrological characteristics within the basin and a post classification criterion using guided clustering procedure was applied to classify the images. Classification accuracies were assessed from the available reference data obtained and upgraded using historical ground information. Overall image classification accuracies obtained varied between 76-83% with *Kappa* values of between 67-79% obtained for the respective periods. In summary, forest coverage declined by 488km^2 representing a 20% reduction over the study period. Agricultural fields expanded by 581 km^2 representing a 16% increase over the same period of time. To investigate the spatio-temporal change, ecological zones known to influence agricultural dynamics within the basin were used. Results indicate continued encroachment of agriculture towards the upland forested zones climatically favorable for increased production. At sub catchment levels, significant land cover conversions were noted in the lowland zones. Hydrological effects, in terms of changes in flood discharge characteristics, are currently being examined using the Hydrologic modeling system (HEC-HMS) model within selected sub catchments. Preliminary results indicate a shift in the curve number values towards reduced infiltration rates and higher runoff values. Shifts in time to peak have also been identified in the initial results. This study is still on going and we expect to estimate the discharge characteristics using at least 30 flood events. We further intend to postulate and test land use management scenarios aimed at improving the flood characteristics in the catchment.