MODELING THE IMPACT OF CHANGES IN LAND USE, CLIMATE AND RESERVOIR STORAGE ON FLOODING IN THE NYANDO BASIN

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ABSTRACT

Soil and Water Assessment Tool (SWAT) was used to simulate streamflow in the flood prone Nyando basin in Western Kenya. The objective of this study was to evaluate the impact of changes in land cover, climate and reservoir storage on flooding in the basin. Calibration of SWAT against streamflow in the Nyando basin attained a coefficient of determination (R^2) values ranging from 0.45 to 0.72. From scenario simulation it was observed that 100% forest cover reduced the simulated peak flow from 111 m^3/s (base simulation) to 69 m^3/s at river gauging station 1GD03. On the other hand, 0% forest increased peak simulated flow from 111 m^3/s to 121 m^3/s at 1GD03. Rainfall increase by 15% would increase peak flow from 111 m^3/s to 159 m^3/s. Change in temperature was associated with reduced peak flow and lower dry season flow; however, the effect of the expected change was less than the change associated with rainfall. The proposed reservoirs would significantly alter the streamflow characteristics. For instance, the proposed reservoirs would reduce the peak flow from 60 m^3/s (base simulation) to 34 m^3/s at 1GD07. However, in Ainabng'etuny tributary the only proposed reservoir would not be effective, since it reduces the peak flow by 1 m^3/s only at 1GB03. It was therefore concluded that the current trend of land use change aggravates flooding in the basin and should be controlled. Also, the proposed four reservoirs are immediate solution to the flooding problem, while other alternatives such as pan storage could be considered for the Ainabng'etuny tributary.