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Validation of SWAT Model for Prediction of Water Yield and Water Balance: Case Study of Upstream Catchment of Jebba Dam in Nigeria

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Abstract : Estimation of water yield and water balance in a river catchment is critical to the sustainable management of water resources at watershed level in any country. Therefore, in the present study, Soil and Water Assessment Tool (SWAT) interfaced with Geographical Information System (GIS) was applied as a tool to predict water balance and water yield of a catchment area in Nigeria. The catchment area, which was 12,992km2, is located upstream Jebba hydropower dam in North central part of Nigeria. In this study, data on the observed flow were collected and compared with simulated flow using SWAT. The correlation between the two data sets was evaluated using statistical measures, such as, Nasch-Sucliffe Efficiency (NSE) and coefficient of determination (R2). The model output shows a good agreement between the observed flow and simulated flow as indicated by NSE and R2, which were greater than 0.7 for both calibration and validation period. A total of 42,733 mm of water was predicted by the calibrated model as the water yield potential of the basin for a simulation period 1985 to 2010. This interesting performance obtained with SWAT model suggests that SWAT model could be a promising tool to predict water balance and water yield in sustainable management of water resources. In addition, SWAT could be applied to other water resources in other basins in Nigeria as a decision support tool for sustainable water management in Nigeria.

Keywords : GIS, modeling, sensitivity analysis, SWAT, water yield, watershed level
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