

Modeling of a Greater-Zab River Watershed Using Arc SWAT for Stream Flow and Hydrologic Budget

Dr. Thair S. K

Building and Construction Engineering Department, University of Technology, Baghdad

Email: thshkhma@yahoo.com

Received on: 26/10/2015 & Accepted on: 21/4/2016

ABSTRACT

Soil Water Assessment Tool (ArcSWAT2009) model is applied on the Greater-Zab River catchment at north of Iraq. The model was calibrated from 1993-2002 and validated from 2003-2013. The calibrated model for hydrological conditions was used to assess the water quantity (monthly stream flows). The study identified optimum parameters and with widest ranges of variation for better rates simulation. The water balance components were correctly estimated. The results showed that the average simulated stream flow for the study period (1993-2013) was 363 m³/sec which is less than the average value of stream flow (417 m³/sec) for the period (1930-1992). The water shortage problem effects on the management of water resources. Based on statistical indicators, the evaluation indicates that the model had a good performance for both calibration and validation periods in Greater-Zab River watershed. The model can be used efficiently in semi-arid regions to support water management policies in Iraq. The model performance evaluation showed a good correlation between the observed and simulated monthly average stream flow for calibration and validation periods with R² (0.99, 0.87), E_{N,S} (0.99, 0.86) and D (2.76, 1.22) respectively. A sensitivity analysis was carried out on the major input parameters and the results showed that there are (11) out of (41) parameters sensitive. The most sensitive is the (CN2). Results of hydrologic budget show that the ratios of the annual base flow and the flow of the hydrograph shape to the total flow are 20 % (base flow index) and 42 % respectively. The lateral flow, computed as a percentage of average annual rainfall varies greatly from 4.8% to 38% and the actual evapotranspiration is much lower than potential evapotranspiration. The ratio between the average yearly precipitation and potential evapotranspiration was 45 %. In a future study, it is recommended to use land cover and climate change scenarios, their projected impacts and adaptation. The study results are helpful for the management and planner of water resources in Iraq which relate to the sustainability and water quantity.

Keywords: Greater-Zab River, ArcSWAT2009, Stream flow, Water balance.