

Evaluation of groundwater recharge based on climate change: a case study at Baung's Watershed, Kota Bharu, Kelantan

ABSTRACT

The soil water assessment tool (SWAT) is a continuous and distributed hydrologic model created to simulate the effect of land management practices on water in the watershed. Understanding relationship of water extraction of groundwater can lead to better watershed management. The main problem in this study is the complexity of recharge processes and limited observations in groundwater recharge in Malaysia makes it difficult to quantify. This study was done at Baung's watershed (BW) which can be considered as an ungauged watershed. The estimation of groundwater recharge in BW was done using SWAT. However, BW cannot be calibrated due to lack of streams station availability but the uncalibrated SWAT able to provide satisfactory predictions on hydrologic budget. A framework for SWAT input data including hydrography, terrain, land-use, soil, and weather for BW was then focused in order to achieve the model simulation for ungauged basins. The results emphasize the importance and prospects of using accurate spatial input data for the physically based SWAT model. Normal condition, extreme-low precipitation and future in land-use development represented as scenarios 1, 2, and 3 were evaluated in this study. These conditions give different groundwater recharge rate as different scenarios give different impact to groundwater. Model was found to produce a reliable estimation of groundwater recharge of 405 mm/year (14.6%), 194.12 mm/year (11.1%), and 214.23 mm/year (7.7%) for scenarios 1, 2, and 3, respectively. In conclusion, it suggested that groundwater recharge should not be assumed always 6% of annual rainfall in Malaysia as the factors influencing groundwater recharge need to be took into consideration in assisting groundwater exploration and management.

Keyword: Geophysical; Groundwater recharge; Soil and water assessment tools; Soil investigation; Ungauged watershed