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Assessment of an Existing Water Balance in a Medium Watershed in Myanmar

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Abstract

The research was carried out in the Bago River Basin upstream of Bago City with 2660 km² and it defined by a medium watershed. It encounters several floods and droughts over the basin. The authors examined an existing of available water supply from rainfall-runoff as hydrology and demand as water uses of various crops and other needs as for an assessment of current water balance using the Water Evaluation and Planning (WEAP) program. The annual average agricultural water demand for various crops and domestic uses including human consumption and industrial during 1999–2018 were 180 and 13 million m³, respectively. The available annual average surface water supply during such period was 179.2 million m³. The calibrated and validated results from WEAP hydrology fitted to the observed of the streamflow gauge in 2011–2018 with quantitative statistics (coefficient of determination, R^2 ; Nash-Sutcliffe efficiency, NSE and Root mean square error, RMSE). The monthly average calibrated results from two stations fitted to the observed data during 2011–2015 with $R^2 = 0.96$, $NSE = 0.79$, and $RMSE = 7.9 \text{ m}^3/\text{s}$, and validated in 2016–2018 with $R^2 = 0.99$, $NSE = 0.98$, and $RMSE = 1.4 \text{ m}^3/\text{s}$, respectively. The results showed the model developed through WEAP is highly capable and showed great performance to manage available water resources. The existing simulated results showed the water resources in this watershed are sufficient to meet the existing needs of the wet season, but water shortage has occurred in the dry periods especially in February, 2000 due to less rainfall in this year. By reducing Non-Revenue Water and proper demand site management, unmet demand able to reduce significantly. This study can assist water managers and local authorities of Bago Watershed in decision making in the improvement of water demand and supply system in the future.

Keywords: Bago river basin, hydrology, water balance, water management, WEAP