SWAT MODEL APPLICATION TO ESTIMATE STREAMFLOW IN ATTANAGALU OYA BASIN FOR SUSTAINABLE WATER RESOURCE MANAGEMENT

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DECLARATION

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ABSTRACT

Water crisis is prevailing as a result of the ever increasing population across the globe with advances in society and economy which significantly affects the ecosystems, environment and economy. Water resources are limited and needs to be efficiently managed by estimating streamflow. The Soil and Water Assessment Tool (SWAT) model is a physically based, continuous, computationally efficient, and distributed model considering similar slope, landuse and soil conditions as its smallest unit in the basin. It has been effectively applied at a wide range of watershed scales under different circumstances around the globe to estimate streamflow. Therefore, a process-based distributed model has to be defined and evaluated to estimate the streamflow in order to meet water demands for efficient watershed management.The objective is to evaluate the potential of process based distributed SWAT model for the estimation of streamflow in Attanagalu Oya Basin for sustainable water resource management.

In this study, the SWAT model has been applied over Dunamale watershed in Attanagalu Oya basin for a period of 10 years from 2008 to 2018 on a daily time scale basis. SWAT-CUP was used as calibration and validation tool with SUFI-2 as the optimization algorithm. The model was semi auto calibrated from 2008 to 2012 and validated from 2013 to 2018. Nine parameters were selected from literature review for calibration and validation. The calibrated and validated results are plotted in flow duration curve. A total of 34 iterations were carried out with each iteration having a total simulation of 200 numbers.

The process based distributed SWAT model can be developed for Attanagalu Oya Basin in Dunamale watershed to estimate streamflow with R^2 value of 0.77 during calibration and 0.58 during validation with hydrograph matching pattern. The model gives a better matching for medium flow when compared to high flow and low flow and hence it can be used for sustainable water resource management. Daily model results when accumulated into monthly time frame has higher accuracy in the outcome when compared to daily and can be used in efficient decision making for water planning and management. SWAT model has more parameters and is complex when applied but the results are generated in a detailed manner with HRU as its basic unit and can be used for a better understanding of the watershed.

Keywords: Process based hydrologic model, Water Crisis, HRU

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LIST OF ABRREVIATION

Abbreviation	Description
ALPHA_BF	Groundwater baseflow alpha factor
CN2	SCS runoff curve number
EPCO	Plant uptake compensation factor
ESCO	Soil Evaporation Compensation factor
FDC	Flow Duration Curve
GW_DELAY	Groundwater delay
GW_REVAP	Groundwater “revap” coefficient
R^2	The coefficient of determination
REVAPMN	Threshold depth of water in shallow aquifer required for return flow to occur
SOL_AWC	Available water capacity of the soil layer
SUFI-2	Sequential Uncertainty Fitting
SWAT	Soil Water and Assessment Tool
SWAT-CUP Procedures	SWAT Calibration and Uncertainty
SWRM	Sustainable Water Resource Management