

Runoff Modeling of a Wet Zone Watershed in Sri Lanka Using HEC-HMS Model

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Flows of the world's rivers are increasingly being modified through impoundments to conserve and develop water resources and therefore estimation of river flow and their variations are vital. Information on rainfall and resulted stream flow patterns are essential for sustainable exploitation of river resources, but stream flows are not available at locations of interest. HEC-HMS is a reliable model developed by the US Army Corps of Engineers that could be used for hydrological simulations, but this model is not calibrated and validated for Sri Lankan watersheds. This study employed three different approaches to calibrate and validate the HEC-HMS 3.4 model to Attanagalu Oya catchment and generate long term flow data for the river and its tributaries.

Daily rainfall data from five rain gauging stations (Vincit, Chesterford, Kirindiwela, Nittambuwa Pasyala and Henarathgoda) for past 20 years scattered in upper and middle Attanagalu Oya catchment, 50 year daily rainfall data and 20 year monthly evaporation data for agro meteorological station Henarathgoda in the lower catchment jointly with daily flow data at Dunamale from 2005 to 2010 were used in the study. GIS layers that were needed as input data for the model were prepared using Arc GIS 9.2 software. Three methods were selected for the model calibration process, soil conservation service (SCS) curve number loss method, deficit constant loss method (Snyder unit hydrograph method and Clark unit hydrograph method). Calibration was carried out for Dunamale sub catchment using daily flow data from 2005-2007. Validation was achieved with a new set of daily rainfall and flow data (2008 – 2010).

As the loss method, the SCS curve number method did not perform well even though it is used widely for flow simulation in Sri Lanka. Instead of SCS curve number method, deficit constant method was employed with reasonable accuracy. According to the results Snyder unit hydrograph method could be recommended as the best transformation method for the Attanagalu Oya basin compared to Clark unit hydrograph method. It is concluded that combination of these two methods can reliably be applied in order to simulate river flows in the country since there are ample of un-gauged rivers located in the wet zone of Sri Lanka.