SNOWMELT RUNOFF ESTIMATION FROM A HIMALAYAN CATCHMENT USING THE SRM MODEL

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Knowledge of runoff from mountainous watersheds is useful for planning eco-friendly micro- and mini-hydropower schemes. Such power plants not only augment the power supply but also help in employment generation in remote hill areas. In such an attempt, the Central Electricity Authority, India, has identified, besides other mountainous areas, the middle Himalayan region for the implementation of new hydropower projects. But, the general feature of the middle Himalayan region is that the major portion of the catchments located in this region are above 4,200masl and under permanent snow cover, and other parts of these catchments, below 4,200m, experience seasonal variations of snow cover. As a result of this, during periods of hot weather and rainfall, large quantities of additional flow take place in the mountainous streams. Therefore, proper planning and design of hydraulic structures across such streams would need a reliable estimation of snowmelt runoff.

From amongst several models available in literature, an attempt has been made to use a simple concept so that reliable flow estimation together with easy implementation of the model can be achieved. The SRM model of NASA, USA is one such model and is primarily based on the use of the degree-day concept. Besides, this model does not require elaborate data as do many other models, and hence is easily implementable.

The model has been used for snowmelt runoff estimation from a middle Himalayan catchment, namely the Goriganga catchment, which originates from the Milam glacier at an elevation of 3,600masl . The snow depletion rate estimation needed by the model has been carried out using actual snow cover data and LANDSAT-1 imagery. This, along with other hydro-meteorological data such as stream flow, rainfall, and maximum and minimum air temperature data for the same year, has been used to calibrate the model's

parameters, which in turn have been used to estimate snowmelt runoff values for the year 1988.

A comparison of observed and simulated flows, in general, showed a good agreement and the Nash-Sutcliffe Goodness-of-Fit Index was found to be 0.76. Based on the results, the model can be implemented for other snow-bound catchments, too, for reliable snowmelt runoff estimation. However, as the SRM model is very sensitive to lapse rates and degree-day factors, these should be determined very carefully. Even the snow cover depletion curves used in the model are established based on the number of satellite images for improvement in estimation.