Estimation of Runoff from Bewas Basin using SCS Curve Number Model

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ABSTRACT

Runoff is one of the most important hydrologic variables used in most of the water resources applications. Direct measurement of runoff provides excellent and timely data but it is limited in use to the exact location where it was collected. Conventional models for prediction of river discharge require considerable data for several hydro meteorological parameters. Remote sensing technology can augment the conventional methods to a great extent in rainfall-runoff studies. The role of remote sensing in runoff calculation is generally to provide a source of input data or to aid estimation of equation coefficients and model parameters. Geographical Information System (GIS) provides efficient tools for data input into data base, retrieval of selected data items for further processing and software modules which can analyse/manipulate the retrieved data in order to generate desired information on specific form.

The United States Soil Conservation Service, SCS runoff curve number method is the most commonly used runoff model, which is based on a non-linear rainfall-runoff relation that includes a parameter called runoff curve number. This model involves relationship between land use/land cover, hydrologic soil class (A,B,C and D) and runoff curve number of hydrologic soil cover complex, which is a function of soil type, land cover and antecedent moisture condition (AMC - I, II and III).

The Sagar city is facing acute shortage of municipal water supply especially during summer months, therefore, the Public Health Engineering Department (Govt. of M.P.), Sagar has undertaken a project to augment the municipal water supply of the Sagar city by constructing a dam near Salaiya village in the Sager block across Bewas river. The project envisages to construct a 1860 m long and 25.5 m high earthen dam to store 96 MCM water (gross). Therefore, a part of the Bewas river basin having outlet at dam site was selected for this study.

In the present study SCS curve number method is used to predict runoff volume at dam site resulting from the daily rainfall occurred in the Bewas basin. The ancillary data on land use/land cover was interpreted from IRS 1B, LISS II imageries of the catchment area.

ARC/INFO GIS package has been used as the core of the spatial database. The general relationships between the direct runoff and rainfall recorded at the four rain gauge stations in the Bewas catchment area were also developed for all the three antecedent moisture conditions.

The discharge measured by the Public Health Engineering Department, Sagar and the direct runoff volume estimated using SCS curve number method was compared and monthly correlation was found between the measured and estimated runoff volumes. The seasonal correlation coefficient vary between 0.92 to 0.94.