

NRCS Curve Number based Hydrologic Regionalization of Nepalese River Basins for Flood Frequency Analysis

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1. Introduction

Reliable estimation of maximum flood for a specified return period is required while designing various hydraulic structures like reservoirs, levees, culverts, bridges, drainage works, irrigation structures etc. Regional flood frequency analysis is widely considered an effective and easily applicable method for estimation of such maximum flood. Identification of hydrological homogeneous regions is key step to success of this method.

This study attempts to identify hydrological homogeneous regions for Nepalese territory using physiographic/climatic attributes soil type, land cover, land relief and rainfall pattern which are mainly responsible for flood generation. NRCS runoff curve number is employed for interpretation of soil type and land cover. The NRCS curve number, which is mainly function of soil type and land cover, is an index to represent the potential for storm water runoff within a drainage area.

2. Methodology

The study starts with generation of sample river basins representing all part of the country from GTOPO30 digital elevation model (DEM). Since large river basins possess chances of lying in two hydrological regions, river basins having drainage area larger than 250 Km² were excluded while selecting sample river basins.

Hydrologic soil group and land cover type need to be determined for NRCS runoff curve number estimation. Hydrologic soil groups (B, C & D in the present study), which indicates amount of infiltration the soil allow, was determined based on widely defined

physiographic regions' general characteristics. Land cover information is based on AVHRR satellite imagery. NRCS runoff curve number map was prepared for the combination of soil group and land cover information using Arc CN extension of Arc GIS. Area weighted runoff curve number for each sample basin was obtained by superimposing the sample basins over NRCS runoff curve number map.

Monsoon rainfall map was considered to take care of rainfall pattern whereas physiographic region map was taken for land relief consideration. On superimposing sample basins integrated with runoff CN over monsoon rainfall pattern and land relief information map, initial hydrological homogeneous regions were proposed. The L-moment based hydrological homogeneity test led to final regionalization.

3. Results and Conclusion

Five hydrological homogeneous regions (**Fig. 1**) were obtained. All the delineated regions were found acceptable in terms of homogeneity test values. This study concludes NRCS runoff curve number integrated approach as an effective way of hydrologic regionalization.

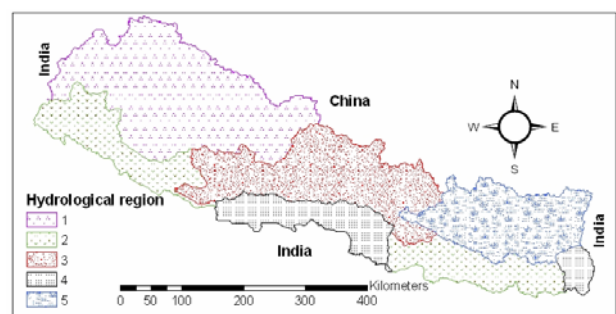


Fig. 1 Hydrological homogeneous regions of Nepal