

GEOMORPHOLOGICAL CHARACTERISTICS OF SELECTED WATERSHEDS

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ABSTRACT

Watershed is the basic hydrological unit considered in understanding the mechanisms of the hydrological cycle. It is necessary to express the characteristics of watersheds in quantitative terms to understand the interrelationships in morphological behavior in watershed response systems. The empirical quantitative description of river network geometry has provided hydrologist with fundamental physical basis to analyze the mode of response of the watershed to rainfall input at large scales. The system of land forms evolving from the same geologic process and materials possess a high degree of geometrical similarity. Therefore, the characteristics of the watersheds having the same geometry can be compared. Accordingly, geomorphological characteristics of *Walawe ganga*, *Manik ganga*, *Kirindi oya* and *Gin ganga* were computed in this study. The four watersheds were selected to represent different climatic conditions of the country.

The stream segments, length of each segment and sub watershed area of each stream segments were calculated based on the topographical maps of 1: 50,000 scale. Digital data layers were prepared using *ILWIS* software. Bifurcation ratio, length ratio, area ratio and the drainage density of selected watersheds were calculated using above information. Geomorphological instantaneous unit hydrographs and the geomorphoclimatic instantaneous unit hydrographs of the selected watersheds were calculated to study the effect of geomorphological factors to the flow of river.

The selected watersheds show similar relationship between the stream order and the number of stream segments, which shows an decreasing trend at a decreasing rate. Relationships of mean lengths and mean sub watershed area against stream order show gradual increase at initial stream orders and sudden increase towards the final orders.

The bifurcation ratio, length ratio and the area ratio of selected watersheds do not show much variation. *Gin ganga* shows the highest values indicating higher branching pattern due to its location in the Wet zone. *Gin ganga* and *Walawe ganga* shows higher drainage density values than that of other two watersheds even though it receives higher rainfall throughout the year and having good stand of vegetation. This is due to low water

holding capacity with high amount of precipitation under mountainous, steeply dissected hilly terrain, which cause severe soil erosion.

Effect of geomorphological factors to peak flow of geomorphologic instantaneous unit hydrograph of the selected watersheds is almost same. However, the effect of geomorphological factors on time to peak is varying. Effect of geomorphological, topographical and vegetational factors to the peak flow and the time to peak of geomorphoclimatic instantaneous unit hydrograph are almost same. Effects are very similar in *Walawe ganga* and *Menik ganga*.

The overall results of the study proved that the geomorphological and topographical factors of the selected watersheds do not show much variation due to geomorphological similarity. However, slight deviations can be observed due to the difference in climatic, and vegetation characteristics. It is recommended to study the measured rainfall and flow conditions of the above watersheds to see the effect of the calculated indices to the actual hydrological conditions of the watersheds.