

Use of index-flood approach with catchment characteristics in flood frequency analysis

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An important practical application of hydrology is the estimation of extreme flood events, especially because the planning and design of water resource projects and flood-plain management depend on the frequency and magnitude of peak discharges. Flood frequency analysis is concerned with the estimation of flood quantile magnitudes for different return periods at a station or at a number of stations in a river system. A difficulty associated with flood frequency analysis is the lack of sufficient data. Large standard errors of estimate result because of small sample sizes.

If a catchment has no record of flow then an index flood, such as \bar{Q} must be estimated from a relation between \bar{Q} and measurable physical catchment characteristics of the gauged catchments in the region. In addition, growth factors Q_T / \bar{Q} must be obtained regionally.

Flood records from 65 gauging sites in Sri Lanka with record length ranging from 10 to 54 years annual maximum discharges were used for this study. Multiple linear regression was used to analyse the relationship between index flood and catchment characteristics such as catchment area, elevation, latitude, and longitude of the gauging station. It was found that only catchment area was significantly related to index flood of the catchments selected as given by the equation $\bar{Q} = 13.0617 Area^{0.552}$.

The L-moment ratios as well as their regional averages were calculated for the selected sites and used to calculate the parameters of the regional distribution of Generalized Logistic, Generalized Extreme Value, Generalized Normal, Pearson Type III, and Generalized Pareto to evaluate the relation between Q_T / \bar{Q} and return period. This analysis revealed that if the region is to be considered as a single unit Generalized Logistic distribution seems to be the best choice.

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