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Application of Index Flood based Regional Frequency Analysis in Nepalese River Basins

○Binaya Kumar MISHRA, Kaoru TAKARA, Yosuke YAMASHIKI, Yasuto TACHIKAWA

Design flood, which is defined as the maximum likely peak discharge for a specific return period, needs to be estimated for planning, design and management of various water-related works. At-site flood frequency analysis is carried out for estimation of design flood at the gauged locations with long observation data. However, in most cases, the design flood estimation is required at the sites having either no observation data or inadequate record length. In this situation, regional flood frequency is applied by transferring regional (spatial) physiographic/hydro-climatic information to the ungauged or inadequate observation data stations.

Direct-regression and index-flood based techniques are the two major methods of regional flood frequency analysis that are found in the literature. While the former method has been widely used in the real practice, the latter method is limited among the researchers. In our previous study, index-flood based regional flood frequency relationships were developed by dividing the Nepalese river basins into five hydrologic regions. In this study, for assessing the design floods estimates of regional method, the relationships were employed at 11 gauged stations (409.5, 417, 428, 430, 446.8, 447.9, 448, 460, 465, 470 and 620) for 2, 5, 10, 20, 50, 100 and 200 years return period.

The assessment of regional flood estimates were made by comparing the at-site flood estimates. For illustration, comparison of design flood estimates of 50 years return periods at the 11 hydrometric stations has been presented in **Fig. 1**. Jackknife technique was employed for assessing the design flood estimates at each of the test stations. In this technique the station, at which assessment is to be performed, is excluded in deriving the regional flood-frequency relationships.

Relative absolute error in the regional flood estimates were computed by considering the at-site flood estimates as true estimates. Average relative absolute error (%) for the different return periods has been presented in **Table 1**. Values of 28.46% and 21.23% were found as mean and median absolute error respectively. The maximum absolute percentage error between the at-site flood-frequency analysis estimates and the index-flood based regional estimates at any stations was found to be 72.72%. Such error is considered as small error in the field of flood estimation.

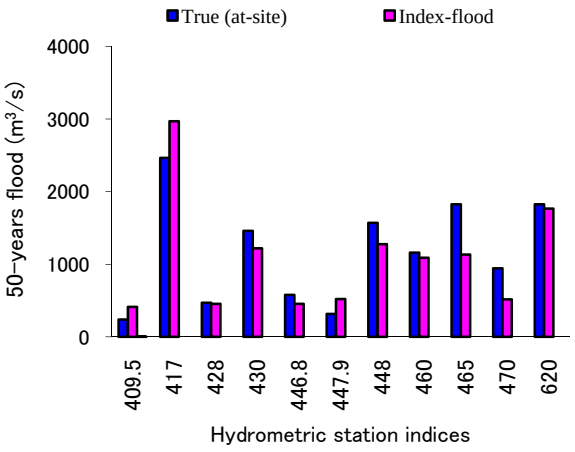

Fig. 1 Comparison of design flood estimates for 50-years return period at 11 hydrometric stations.

Table 1 Average design flood estimation error

Return period, T yrs	Mean error (%)	Median error (%)
2	24.75	16.15
5	26.90	19.19
10	28.14	20.32
20	30.80	20.89
50	28.25	20.44
100	29.06	29.06
200	31.28	22.55
Average	28.46	21.23