Regional Flood Frequency Analysis in Narmada Basin: A Case Study

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Abstract : Flood and drought are two main features of hydrology which affect the human life. Floods are natural disasters which cause millions of rupees' worth of damage each year in India and the whole world. Flood causes destruction in form of life and property. An accurate estimate of the flood damage potential is a key element to an effective, nationwide flood damage abatement program. Also, the increase in demand of water due to increase in population, industrial and agricultural growth, has let us know that though being a renewable resource it cannot be taken for granted. We have to optimize the use of water according to circumstances and conditions and need to harness it which can be done by construction of hydraulic structures. For their safe and proper functioning of hydraulic structures, we need to predict the flood magnitude and its impact. Hydraulic structures play a key role in harnessing and optimization of flood water which in turn results in safe and maximum use of water available. Mainly hydraulic structures are constructed on ungauged sites. There are two methods by which we can estimate flood viz. generation of Unit Hydrographs and Flood Frequency Analysis. In this study, Regional Flood Frequency Analysis has been employed. There are many methods for estimating the 'Regional Flood Frequency Analysis' viz. Index Flood Method. National Environmental and Research Council (NERC Methods), Multiple Regression Method, etc. However, none of the methods can be considered universal for every situation and location. The Narmada basin is located in Central India. It is drained by most of the tributaries, most of which are ungauged. Therefore it is very difficult to estimate flood on these tributaries and in the main river. As mentioned above Artificial Neural Network (ANN)s and Multiple Regression Method is used for determination of Regional flood Frequency. The annual peak flood data of 20 sites gauging sites of Narmada Basin is used in the present study to determine the Regional Flood relationships. Homogeneity of the considered sites is determined by using the Index Flood Method. Flood relationships obtained by both the methods are compared with each other, and it is found that ANN is more reliable than Multiple Regression Method for the present study area.

Keywords : artificial neural network, index flood method, multi layer perceptrons, multiple regression, Narmada basin, regional flood frequency