

Integrating Hydro-meteorological and Physiographic Factors for Assessment of Vulnerability to Drought

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ABSTRACT

This study has been carried out for Sonar basin of Ken River system in the Madhya Pradesh. The study was aimed at devising a suitable method for assessment of vulnerability to drought. Analysis of annual and seasonal rainfall records for the period from 1901–2007 revealed that the study basin had faced drought condition with an average frequency of once in every 5 years. The maximum rainfall deficiency recorded in the basin was of the order of –68% in 1979. Recently, drought conditions prevailed in the study basin in the years 2006 and 2007 with annual rainfall deficiency of –35% and –43%, and Standardized Precipitation Index (SPI) values as –1.14 and –1.24 respectively. The paper presents a method for spatially representative depiction of vulnerability to drought using multiple indicators in Sonar basin. These indicators include topography characteristics, land-use types, soil types, relative availability of surface water and groundwater, water demand and utilization and the rainfall departures from corresponding mean values. Spatial information of above indicators was categorized in to various sub classes and maps were prepared in spatial domain using Geographic Information system (GIS). Different layers of above independent indicators and rainfall deficiency have been integrated using a weighing scheme. Thus, the integrated values of weights of various indicators have been computed on 100 × 100 m grid scale in spatial domain and maps have been prepared to represent integrated vulnerability to drought. For rationalization of the approach drought vulnerability Index (DVI) for each grid has been calculated. The DVI has been defined as the ratio of sum of the weights of factors to the sum of their maximum weight values. The results have been validated with intensive field surveys. The proposed method represented drought vulnerability scenarios in the Sonar basin appropriately. It is hoped that this method may set a better direction for the studies on drought monitoring and mitigation.