

Environmental Flow Assessment in Godavari Basin Using SPI

Surendra Kumar Mishra (1), Kumar Amrit (1), and Rajendra Prasad Pandey (2)

(1) Water Resources Development and Management, Indian Institute of Technology Roorkee, India (skm61fwt@gmail.com),
(2) National Institute of Hydrology, Roorkee

Environmental flow (EF) is necessary to maintain ecosystem healthy and for sustainability of aquatic lives as well. Its assessment is thus aimed at quantifying the minimum flow of water required for sustainability of the ecosystem. In the present study an effort has been made to describe the environmental flow condition of a watershed with the help of Standardized Precipitation Index (SPI), an index often used in drought prediction using precipitation. Among the various drought indices SPI is very popular and widely used for drought monitoring. SPI has some advantages over other indices as, for example, it requires only easily available rainfall data and enables drought monitoring at different time scales, viz., monthly, seasonal, annual etc. On the other hand, Tennant method requires flow data, which are too scarce in ungauged catchments. This study couples both the concepts of Tennant and SPI to predict environmental flow condition using rainfall. Five watersheds of Godavari Basin namely Hivra, Kumhari, Nandgaon, Ramakona, and Satrapur have been taken for the analysis. Rainfall and runoff data for the period of 1990-2000 of these watersheds were used in the analysis. SPI at 9-month time scale for the month of June has been evaluated and the percentage of average annual flow was calculated for the same period for respective watersheds. The percentage of average annual flow is plotted against the corresponding values of SPI and the value of coefficient of determination is found to be greater than 0.74 for 4 (out of 5) catchments which suggests very good fitting. For each of the five watersheds the percentage of average annual flow increases with the increase in SPI, exhibiting a remarkable dependence of environmental flow on SPI. This relationship can be used for deriving the EF condition for a watershed/gauging site based on SPI, which can be easily derived from the available rainfall data.