Prediction of drought – risk zones in Tamil Nadu using historical and global climate model data

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Global climate change has increased the events and intensity of extreme events. Tamil Nadu is located in the southern peninsula region of India, which has benefitted both from the south-west monsoon (SWM) and the north-east monsoon (NEM). Although variations in the monsoon pattern increased events of drought. The IMD gridded (1991–2020) and projected global climate model data (EC_Earth3_Veg_LR) were used to anticipate the drought-risk-prone zones over Tamil Nadu by using the standardized precipitation index. During both the SSP245 and SSP585 scenarios of the near (2021–2050) and mid (2051–2080) century periods, an increase in rainfall amount was expected with a high coefficient of variation (CV) across the region. The CVs of the future SWM and NEM seasons were expected to range from 20% to 60% and 25% to 50% respectively. Increased variability often leads to an increase in number of drought events. Regardless of scenarios, the southern zone was expected to experience more drought events, followed by the northwestern zone during SWM. Drought events during the NEM were expected to increase in northeastern zone districts. Changes in cropping patterns and policymaking for future risk-prone areas were undertaken as a proactive response to mitigate potential agricultural challenges.

Keywords: Drought events, drought forecast, Indian Meteorological Department, standardized precipitation index.

droughts affect 55 million people worldwide each year, with 40% of the world's population experiencing water scarcity as a result.

Several indices have been used to indicate drought over the years[8]. Standardized precipitation index (SPI) is a global measure for drought assessment and a standard drought-monitoring index of the World Meteorological Organization (WMO)[9,10]. Characterizing droughts allows for analysis of drought risks, drought early warning and drought preparedness[11,12]. The present study uses SPI to investigate the spatio-temporal characteristics of drought intensity and number of events for various agro-climatic zones (ACZs) of Tamil Nadu (TN) in India.

Materials and methods

Study area

The study region includes agro-climatic zones of Tamil Nadu, which are located between 76°E to 80°E long. and 8°N to 13°N lat. (Table 1 and Figure 1). The state was benefitted by both the south-west monsoon (SWM) and the north-east monsoon (NEM), which receives an annual average rainfall of 945.9 mm. The contribution of precipitation quantity in winter (January–February), summer (March–May), SWM (June–September) and NEM (October–December) is 3.4%, 13.9%, 34.9% and 47.8% respec-