F.NO.COE/Ph.D. (Notification)/536/2023

Dated: 18/04/2023

Name of the Research Scholar: Md Masroor

Name of the Supervisor: Prof. Haroon Sajjad

Name of the Department: Department of Geography

Topic of Research: Climate Change Induced Drought in Godavari Middle Sub-basin: Impact, Vulnerability and Adaptation

Keywords: Drought; Climate change; Natural resources; Vulnerability; Adaptation; Godavari Middle Sub-basin

Findings

Significant trends were observed in meteorological variables. Rainfall have shown that month of March experienced increasing trend at 0.05 level of significance. Increasing trend in maximum temperature was observed during the winter season in the Sub-basin at 0.05 level of significance. Months of November and December have also experienced increasing trend at 0.05 and 0.01 level of significance respectively. Monsoon season experienced decreasing trend in mean evaporation at 0.01 level of significance. A decreasing trend in wind speed was observed for all the months and seasons at 0.01 level of significance. Monsoon season has shown low wind speed in comparison to summer season. However, it has increased in last few years. Relative humidity has increasing trend for the months of February, March, April, June, October and December while other months has no trend.

Spatial pattern of rainfall revealed that watersheds (CO3GDM50, 52, 53 and 56) located in south-eastern part of the Sub-basin have decreasing trend of total monthly rainfall. Watersheds (CO3GDM05-09) located in northern part of the Sub-basin have increasing trend in mean maximum temperature while watersheds (CO3GDM44-49 and 54) have decreasing trend. Spatial analysis revealed that largest area under extreme drought for one-month was observed in September 1987 (13 watersheds in central west part having 10.55 % area) followed by August 1984 (9 watersheds in northern part having 10.18 % area), August 1985 (5 watersheds located in north-western part of Sub-basin having 8.54 % area), July 2015 (3 watersheds located in eastern part of Sub-basin having 1.94 % area), and July 2002 (2 watersheds located in western part of Sub-basin having 1.34 % area).

Five classes of groundwater potential were identified from the analysis namely very high, high, medium, low and very low (Fig.3.6). Very high groundwater potential zone (GWPZ) was found in the south-eastern and central eastern parts of the Sub-basin where slope gradient ranged between 0^o and 5^o and covered 6.2 per cent of the total area. Very low GWPZ are mostly found in the periphery of Sub-basin in the north-west, south-west and western parts and covered 16.7 per cent area.

The ensemble ANFIS models were implemented using the normalized weights of the FR model. Largest area for one-month drought was observed under moderate category (44.70 %) followed by high (36.58 %), low (14.71 %) and very high (4.01 %) categories. No area was observed in very low category. Largest area for six-months drought was under high category (47.14 %) followed by moderate (26.66 %), very high (16.14 %) and low (10.06 %). Very low category has less than one per cent area. Largest area for twelve-months drought was under high category (40.12 %) followed by moderate (39.52 %), low (12.37 %), very high (7.80 %) and very low (0.19 %).

Analysis of composite vulnerability revealed that very high drought vulnerability was found in Tajnapur (0.33) village followed by Saikheda (0.31), T. Adgaon (0.30). High socio-environmental vulnerability and moderate adaptation strategies were major causes for moderate vulnerability in Pingali. Gundaram (0.2) and Sindhi (0.16) have low composite vulnerability. Gundaram has low climate change vulnerability and moderately efficient adaptation strategies while Sindhi has lowest composite vulnerability due to low climate change and ecological vulnerability.

Analysis of households' level survey revealed that the Sub-basin has low adaptive capacity in terms of drought management and planning. Lack of community-based training drought preparedness has led to high vulnerability in the Sub-basin. The survey data revealed that the local administration and communities often lack capacity to deal with the drought conditions.

Participation of local communities can help in drought preparedness planning, identification of drought prone areas and preparing drought management plans. Monitoring of drought, drought impact analysis, provision of irrigation facilities, construction of ponds and canals, restoration of waterbodies, creation of employment opportunities, minimum support price for crops, suitable cropping pattern, crop insurance, effective early warning systems, quick response mechanism and early decision are suggested for lessening the impact of drought in the Sub-basin.