

**From:** [K Srinivasa Raju](#)

**Date:** 2/18/2013 8:32:12 PM

**To:** [T Thomas](#); [rkjaiswal\\_sagar@yahoo.com](mailto:rkjaiswal_sagar@yahoo.com); [ncq@nih.ernet.in](mailto:ncq@nih.ernet.in)

**Subject:** National conference on Sustainable Water Resources Planning, Management and Impact of Climate Change during April 5-6, 2013 at BITS, Pilani Hyderabad Campus

Title of the paper : Changing Climate and Persistent Drought Scenario in Bundelkhand Region of Central India (reference number : A15 )

Authors : T. Thomas, R. K. Jaiswal, N. C. Ghosh

Dear Authors

Thank you for submitting above mentioned abstract. Your Abstract has been accepted for presentation and inclusion in the conference proceedings of National Conference on “Sustainable Water Resources Planning, Management and Impact of Climate Change” to be held at BITS-Pilani, Hyderabad Campus on April 5-6, 2013. **Please inform your co-authors regarding the acceptance. Please refer your reference number in all future correspondence** along with other details.

**Registration:** Please send filled up **Registration form** (enclosed as attachment) and **Registration fees** at your earliest as confirmation of your participation but not later than March 15, 2013. Registration fee covers proceedings, lunch and dinner during the conference days only. Your early response in this regard is highly appreciable. Demand Draft must be drawn in favour of Birla Institute of Technology and Science-Pilani, Hyderabad campus payable at State Bank of Hyderabad (Code 21092).

**Presentation:** Power point presentation facilities will be made available for presentation. Maximum time for each presentation is **8 minutes**. Inaugural function of the conference is scheduled on April 5, 2013 at 9.30 A.M. The conference is expected to be over by 5 P.M on 6<sup>th</sup> April 2013. Thus you are requested to make your travel plans.

**Invited lectures from eminent experts are also scheduled during the conference** <http://sites.bits-hyderabad.ac.in/swrm2013/speakers.php>  
Conference website will be updated from time to time. It is suggested to go through the same from time to time.

Please make it convenient to attend the conference. Hoping to see you all at BITS, Pilani-Hyderabad campus.

Thanking you once again for your interest.

Kindly acknowledge this mail preferably with your mobile number for further contact.

With warm regards

Srinivasa Raju

Organizing Secretary

Encl: Copy right form, Registration form, Hotel Tariff Information

## **Changing Climate and Persistent Drought Scenario in Bundelkhand Region of Central India**

*T. Thomas<sup>1</sup>*

*R. K. Jaiswal<sup>2</sup>*

*N. C. Ghosh<sup>3</sup>*

Water resources management in arid and semiarid areas is a complex proposition, which involves consideration of a large number of hydrologic, environmental and management factors to ensure supply of sufficient water and minimum levels of environmental protection. For quite some times from now the Bundelkhand region is under limelight because of the continuous drought situation resulting in acute water shortage and large-scale migration of location population elsewhere in search of livelihood. The region is under constant water stress and facing severe scarcity of water for agricultural and domestic use. More than 80% of the population is dependent on rain-fed agriculture with only 20% of the net sown area being irrigated. Management of water on scientific principles by adoption of appropriate drought management strategies is therefore imperative for the sustainable development of Bundelkhand. The various components analyzed for detection of climate change signals and drought characteristics include departure analysis and probability analysis of annual and seasonal rainfall, trend analysis of climatic variables, dry spell analysis including the onset and duration of critical dry spells, supplemental irrigation requirement planning during critical dry spells, and detection of trend in critical dry spells lengths and frequencies.

The Bundelkhand region had a drought frequency of one in 16 years in 18<sup>th</sup> and 19<sup>th</sup> centuries which increased by three times during the period 1968 to 1992. A substantial variation in the drought frequency between 1 in 3 years and 1 in 6 years is observed in the region based on the block-wise analysis of long-term rainfall of the thirteen districts falling in the Bundelkhand region. The situation has further deteriorated during the last decade with regular and continuous drought lasting four years. Based on the probability analysis of annual and seasonal rainfall, several blocks have been identified to be drought prone namely, 6 blocks in Sagar district; 3 blocks in Chattarpur district; 6 blocks in Tikamgarh district; 3 blocks in Panna district and both blocks in Datia district for the region falling in Madhya Pradesh, and 5 blocks in Hamirpur district; 6 blocks in Banda district and all blocks in the remaining districts of Lalitpur, Mahoba, Jalaun, Chitrakoot and Jhansi districts for the region falling in Uttar Pradesh.

The annual rainfall deficit found to vary between 20% and 72.6% of the average annual rainfall. Drought years have been identified and classified into severity classes based on the departure analysis of annual and seasonal rainfall. The frequency of drought is found to vary between 1 in 2.5 years at Lalitpur to 1 in 7 years at Manikpur in Banda district. Relative departure index (RDI) - a weighting scheme developed on the basis of drought severity and frequency of drought occurrence- has been used to assess the drought proneness of various blocks to suggest drought management measures based on these priority rankings. The dry spell analysis has helped identification of two critical dry spells (CDS) invariably in all blocks in Bundelkhand region, for which provision of life saving supplementary irrigation is essential for survival of the rainfed agriculture.

Looking into the increased occurrence of droughts in the region, analysis of the climate variables to detect signal for climate change has been carried out. The non-parametric Mann-Kendall test has been applied to identify the trend in the climatic variables. No significant trend at 95% significance level in the seasonal rainfall in most of the blocks have been observed except Karbi in Chitrakoot district, Naraini in Tikamgarh district, Moth in Jhansi district, Mahrouni in Lalitpur district, and Mahoba and Charkhari in Mahoba district where significant falling trends in the annual number of rainy days have been observed. The monthly rainfall analysis revealed that the number of rainy days in August, which is one of the principal rainy months in Bundelkhand, showed a significant falling trend at Karbi and Mau in Chitrakoot district; Banda and Baberu in Banda district; Bijawar and Buxwaha in Chhatarpur district; Mahrouni in Lalitpur district; Charkhari in Mahoba district; Panna and Ajaygarh in Panna district and Tikamgarh, Niwadi and Jatara in Tikamgarh district.

The variability in the temporal pattern of dry spell characteristics including the dry spell lengths and its frequency has been carried out to determine its relation with the climate change. The analysis has also been carried out to identify regions facing more critical dry spells and increased dry spell lengths. An increasing trend in the duration of the critical dry spell length and frequency though not significant at 95% significance level has been observed in the region. This paper helps to gain useful insights from the historical drought events, and also reveals the fact that the change in the climatic pattern may be one of reasons among many others contributing to the increased drought susceptibility of the region, for which effective water resources management strategies under drought scenario is necessary. Further it is found that the rainfed agriculture in the region is difficult to promote without provision of supplemental irrigation through the development of small and medium irrigation projects and conjunctive use practices.

**Key words:** climate change, meteorological drought, critical dry spell, trend, frequency.

**Author details:**

1: Scientist-C & **Corresponding author**, National Institute of Hydrology, Ganga Plains South Regional Centre, WALMI Campus, Near Kaliasote Dam, Bhopal.

**Ph. +919893686808**; e-mail: [thomas\\_nih@yahoo.com](mailto:thomas_nih@yahoo.com)

2: Scientist-C, National Institute of Hydrology, Ganga Plains South Regional Centre, WALMI Campus, Near Kaliasote Dam, Bhopal. [rkjaiswal\\_sagar@yahoo.com](mailto:rkjaiswal_sagar@yahoo.com) **Ph. 07582-237943**

3: Scientist-F, & Head, Groundwater Hydrology Division, National Institute of Hydrology, Jalvigyan Bhavan, Roorkee & Coordinator, National Institute of Hydrology, Ganga Plains South Regional Centre, Bhopal. [ncg@nih.ernet.in](mailto:ncg@nih.ernet.in) **Ph. 01332-272718**