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A REVIEW ON IMPACT OF CLIMATE CHANGE ON WATER RESOURCES IN A RIVER BASIN

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Abstract - Late years have seen an expansion in worldwide normal air temperatures just as sea temperatures, as archived by the Intergovernmental Panel on Climate Change (IPCC). The ascent in temperature is viewed as obvious proof of environmental change, and this has just begun to have genuine ramifications for water assets and will have considerably more critical results later on. Aggravating these outcomes are populace development, land-use changes and urbanization, expanding requests for water and vitality, rising standardsof living, changing dietary propensities, changing agrarian works on, expanding modern exercises, expanded contamination, and changing financial exercises. All these will probably effectsly affect water assets. This article quickly examines environmental change and its causes and effects on water assets.

Key Words: Climate change, Extreme events ,Ecosystem ,Water quality , Groundwater

I. INTRODUCTION

Global warming due to the enhanced greenhouse effect is expected to cause major changes in various climatic variables, such as precipitation, absolute humidity, net terrestrial, solar radiation and temperature **(IPCC 2007).** These climatic variations will have unexpected consequences with respect to frequency and intensity of precipitation and temperature variability for many regions of the Earth.

Air temperature and precipitation are principle element of weather systems, so that examination of their behaviour is important for understanding of climate variability because both are highly variable spatially and temporarily at different local, regional and global scales. For the prediction of future climate conditions, level of variability of these two weather elements must be examined and understood. Therefore, recently, the focus on climate variability bases mostly on the detection of trends in instrumental records of precipitation and temperature. Several researches of climatic trends have recently been conducted on rainfall and temperature data at different periods of records throughout the world**.**

1.1 Climate of Chitrakoot , Allahbad Region

Climate change is one of many dynamic processes impacting water resources management. Other processes (for example, change in population size and location, economic tinued improvement in the understanding of climate change, its impacts, and the effectiveness of adaptation or mitigation actions requires continued operation of existing long-term monitoring networks and improved sensors deployed in space, in the atmosphere, in the oceans, and on the Earth's surface.

Mandakini river basin has the unique topography, geology, climate, and agricultural activities in the study area, the major concern and warrants attention of groundwater problems in Bundelkhand region. Hence, the abundance, pathways and sourcing of various ground water potential zones should be systematically looked into for their suitability for water supply of drinking and irrigational purposes.

The aim of this study is to evaluate precipitation and temperature trends in Chitrakoot. To be able achieve our goals we conduct a thorough examination of climatic data from 1990 to 2014 in order to identify seasonality, variability, trends and other characteristics of precipitation and temperature at different time scales. The main purpose of this study is the detection of significant trends or fluctuations in the annual and seasonal climatic conditions.

1.2 Evaluation Information and Researches on Rainfall Trend Analysis

Statistics analysis from observations data show the changes in weather pattern over the decades can be used to identify climate change. Rainfall and temperature are often used as important climate parameters to determine changes in global climate.

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Based upon the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4), global temperatures have risen by about 0.74°C since the beginning of the 20th century. The global averaged temperature is the parameter that most clearly defines global warming. Rising sea level and decrease in snow and ice extent during summer are indications of global warming. There is a direct influence of global warming on changes in precipitation and heavy rain. From the Clausius-Clapeyron relation, water-holding capacity of atmosphere increase by about 7% per 1°C warming. This shows that the occurrence of global warming contributed to intensify extreme rainfall as well as the rainfall event.

II. METHODS

The statistical analysis is used to determine the measure of central tendency (mean) and dispersion (range, standard deviation, skewness, kurtosis and coefficient of variation) for rainfall and temperature data of Chitrakoot region. For identifying the trend in the rainfall data, the statistical analysis of linear regression method is used. The results obtained are further verified by using a non-parametric Mann-Kendall test. Figure 2 shows the procedure of the analysis being applied in this study.

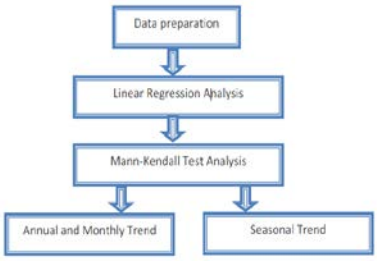

Fig- 2.1 Procedure of the analysis applied in this study

III. LITERATURE REVIEW

Urama et al 2010 Evaluated the climate change having a multitude of immediate and long-term impacts on water resources in African countries. These include flooding, drought, sea-level rise in estuaries, drying up of rivers, poor water quality in surface and groundwater systems, precipitation and water vapour pattern distortions, and snow and land ice mal-distribution. These effects when compounded together have devastating impacts on ecosystems and communities, ranging from economic and social impacts to health and food insecurity, all of which threaten the continued existence of many regions in Africa. Vulnerability varies according to individual countries, geographical positioning and the capacity to mitigate or adapt to the changes. Coping, adapting and building the resilience capacities of African countries towards the impacts of climate change on water resources requires an holistic approach involving systems thinking and risk management strategies. Solutions pivot on taking urgent action to utilize science technology and innovation, policies relevant to water audit and management, and engagement of private, civil and international sectors if a major crisis is to be averted.[1]

(Dindang *et al.*, 2013). Carried out statistical and trend analysis of rainfall data in kuching, sarawak from 1968-2010. This study is an attempt to analyze and determine the monthly, annual and seasonal trends of rainfall in Kuching based on the recorded rainfall data from the Kuching observation station in 1968 to 2010. The trend is obtained using regression linear analysis while the significance of the observed trend is calculated using Mann Kendall test. The statistical analysis was also carried out to determine the measure of central tendency and dispersion. The results showed an overall no statistical significant trend for annual and monthly long term rainfall data. All monsoon seasons showed insignificant statistical trend even though the Oct inter monsoon leans in the negative while the other monsoon favoured a positive trend.[2]

Nayak et al. 2005 Forecasting the ground water level fluctuations is an important requirement for planning conjunctive use in any basin. This paper reports a research study that investigates the potential of artificial neural network technique in forecasting the groundwater level fluctuations in an unconfined coastal aquifer in India. The most appropriate set of input variables to the model are selected through combination of domain knowledge and statistical analysis of the available data series. Several ANN models are developed that forecasts the water level of two observation wells. The results suggest that the model predictions are reasonably accurate as evaluated by various statistical indices. An input sensitivity analysis suggested that exclusion of antecedent values of the water level time series may not help the model to capture the recharge time for the aquifer and may result in poorer performance of the models. gradient to protect seawater intrusion or water logging condition.[3]

Jenkins *et al.*, 2016 Studied and recognized the flooding is the costliest natural disaster worldwide. In the UK flooding is listed as a major risk on the National Risk Register with surface water flooding the most likely cause of damage to properties. Climate change and increasing urbanization are both projected to result in an increase in surface water flood events and their associated damages in the future. In this paper we present an Agent Based Model (ABM), applied to a London case study of surface water flood risk, designed

to assess the interplay between different adaptation options; how risk reduction could be achieved by homeowners and government; and the role of flood insurance and the recently launched flood insurance pool, Flood Re, in the context of climate change. The ABM is novel in its coverage of different combinations of flood risk management options, insurance, and Flood Re, and its ability to model changing behavior, decision making, surface water flood events, and surface water flood risk in a dynamic manner.[4]

Dubey *et al.*, 2017 Studied and made to characterize the spatial and temporal variability of precipitation in 13 districts of the Bundelkhand region spreading in Uttar Pradesh and Madhya Pradesh of India in the during 1901–2002. The Bundelkhand region receives an average annual rainfall of 1,071.7 mm. The highest annual rainfall of 1,190.6 mm has been recorded in Sagar district, whereas the lowest annual rainfall of 902 mm has been recorded in Jalaun district. On the basis of rainfall records, the Bundelkhand region can be classified into two groups, namely, districts with high rainfall, namely, Panna, Tikamgarh, Lalitpur and Sagar receiving an average annual rainfall of 1,138 mm and low rainfall districts, namely, Jhansi, Jalaun, Hamirpur, Banda, Mahoba, Chitrakut, Datia, Chhatarpur and Damoh receiving an annual average rainfall of 1,011 mm. Standardized Precipitation Index indicates that 5 drought years were observed during 1901–1950 and 12 drought years were noticed during 1951–2000. This indicated a rising trend in the occurrence of drought in the region. Also indicates that the first half of the century was slightly wetter that the second half.[5]

Thomas *et al.*, 2015 Evaluated the of meteorological and hydrological drought characteristics including the dry spell analysis for planning of supplemental irrigation has been carried out for Bearma basin in Bundelkhand region of Central India. The Bundelkhand region has been under a spell of recurrent droughts. In the last decade, widespread droughts were felt during 2002–2003 and 2007–2008. The drought frequency varies between 1 in 3 years in Rehli and Deori and 1 in 5 years in Hatta. Rehli and Deori blocks falling in Sagar district have been identified to be drought prone. The meteorological drought characteristics evaluated by standardized precipitation index (SPI) indicated that drought severity has increased greatly with the drought intensity varying between −1.22 in Deori and −0.97 in Rehli. The streamflow drought characteristics have been evaluated using streamflow drought index (SDI), whereas the groundwater drought characteristics evaluated by groundwater drought index (GDI). The maximum groundwater drought intensity is observed in Rehli (−0.44). Two critical dry spells (CDS) of 14–18 days invariably occur during the principal rainy months of July and August, for which provision of life-saving supplementary irrigation is essential for the rain-fed agriculture. A drought management plan (DMP) has been developed, based on basin relevant drought indicators and drought triggers, designed and fined tuned to actual drought conditions in the basin. Based on the supply and demand scenario during droughts, an appropriate drought response plan linked to prevailing drought levels has been developed, to effectively manage the scarce water resources during persistent drought scenario. Results of the study are quite promising and the concept of DMP can be replicated to other basins in the region taking into account the basin relevant indicators as necessary.[6]

IV. CONCLUSION

In this study various researchers were studies about rainfall and temperature data from 1990-2014 where used to identify seasonally, variability, trends in Chitrakoot, Allahbad etc . From analysis of annual seasonal and monthly rainfalls data series it can be concluded that rainfall characteristics of the area is changing even though results of trend analysis of annual rainfall data show no statistically significant trend for period of record considered

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