A Review Paper on the Study of Hydrological Parameters in Meerut Region

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Abstract : *Rainfall is a prime component in the hydrological parameters in Meerut region. Rainfall is an important factor for various studies like engineering, agriculture, weather, and many more. This article aims to review studies for rainfall trends and variability all over India. Rainfall trends vary at different places throughout the country. Precipitation analysis provides knowledge related to agricultural activities to assess the availability of water and to take proper measures for storage. Non-parametric tests such as Sen's Slope were used as estimator of trend magnitude which was supported by Mann-Kendall test. Regarding rainfall trend results of different studies shows variation which leads to an unclear picture of rainfall trend. In the study of monsoon of different locations in India some places showed increasing trends however there is signifying decrease in trend allover India. It was also mentioned that analysis can vary from for a location if done using different source or types of collection of data.*

1. Introduction :

Rainfall is one of the most important climatic variables and renewable natural source of water on the earth. The rainfall patterns have temporal and spatial variability due to seasonal atmospheric phenomenon and geographical factors respectively. The rainfall received maximum coverage area during south west monsoon season: June to September month (Attri & Tyagi, 2010). The variations in rainfall patterns are vital to understand the climate change variations. The variability in rainfall may affect the agriculture production, water supply, transportation, the entire economy of the region, and the existence of its people. The assessment of climate change is done through statistical analysis of certain meteorological parameters such as annual, seasonal rainfall. Climate change has become big threat for agriculture, livestock, and biodiversity environment. Meerut district has main season in a year (IMD's season). These are: the winter season (January- February.), Pre –Monsoon season (March- May), South West Monsoon season (June-September) and, the Post Monsoon Season (October- December). The south westerly wind flow occurring over most parts of India and Indian seas gives rise to south west monsoon over India from June to September. Southwest monsoon provides a major part of India's annual rainfall, and the quantum varies widely across space (GOI, 1999). In most places, growing crops require artificial provision of water during non monsoon season and in some places even during the monsoon. Weather parameters mainly rainfall, its distribution pattern and quantum play an important role in productivity crops. The prediction of rainfall further helps in planning the activities of agriculturists, water supply professionals or engineers, and others.

Meerut District is the part of Upper Ganga- Yamuna doaba which lies between 280 .98' & 290 .15' north latitude and between 770 .45' & 77 0 .07' east longitude (Abst. & Souv., 2016). The altitude / elevation (above sea level) of the city are 224.6 m. The district is spread across 2564 square kilometer .The land of district is very fertile which is known as alluvial soil or loamy soil deposits by Ganga. Meerut has humid subtropical type climate which is characterized by cool winters and very hot summers. The average annual rainfall of Meerut is about 805.98 mm (Kumar et al., 2009). About 80% of the rainfall is received during the south west monsoon (Jain &Kumar, 2012)). The monsoon begin by the end of June and last till the end of September.

LITERATURE REVIEW :

Dr. Kailas Vijay Karnewar (2018) [1] The aim of their study was to identify rainfall trends for the period of 1969 to 2010 over Nanded. Annual rainfall trends showed insignificant falling trends. Annual rainfall trends of first half years (1969-1989) shows increasing trends of about 12.35 mm/year. While second half (1990-2010) shows decreasing trend of about 2.16mm/year.

Vijay Kumar , Sharad K. Jain & Yatveer Singh (2010) [2] This study has examined trends in the monthly, seasonal and annual rainfall on the meteorological subdivision scale, the regional scale, and for the whole of India. A large data set was used, consisting of 306 stations with the length of data series of 135 years. The sub-divisional rainfall trends show a large variability – nearly half of the sub-divisions have shown an increasing trend in annual rainfall and the remainder have shown the opposite trend. The maximum increase was 2.37 mm/year and the maximum decrease was -0.76 mm/year.

Uzma Parveen (2017) [3] This study indicated that rainfall variability and trend has varied significantly in the region. During pre-monsoon and post-monsoon season rainfall has perturbed considerably. During monsoon season, however, rainfall has mostly remained persistent. However, no significant trend of rainfall has appeared in the region during 1961-2010. Rainfall variability during non-monsoon months can also affect the country and its population adversely.

Prosenjit Mitra , Prosenjit Pramanick, Pardis Fazli and Abhijit Mitra (2017) [4] It has been reported by researchers that changing salinity also affects the levels of conservative pollutants in the estuarine system. Sixteen input values collected from the selected stations were analysed for variations at two different tidal conditions using Duncan's Multiple Range Test in this study during May 2017. The oscillation of different variables (except sea water temperature and potassium) with the semi-diurnal tide of the estuary proves the dynamic nature of the system, on which the marine and estuarine life of the region is sustained.

S. Nandargi, A. Gaur & S.S. Mulye (2016) [5] The analysis revealed that the maximum frequency of extreme 1-day rainfall was recorded in the month of October (75) and lowest frequency in the month of November (2). Most of the stations recorded 1-day extreme rainfall during May–October in the range of 100–300 mm, except Khadrala station (Dist. Mahasu) which recorded 1-day extreme rainfall of more than 700 mm.

P Guhathakurta, O P Sreejith and P A Menon (2017) [6] This study reveals the noticeable changes in the extreme rainfall events that occurred over India in the past century. The country experienced large spatial variations in annual normal rainy days. Annual normal rainy days varied from 10 days over extreme western parts of Rajasthan to the high frequency of 130 days over northeastern parts of the country.

Surinder kaur, Sumant Kumar Diwakar and Ashok Kumar Da (2017) [7] This paper gives the information on the districts of India giving significant increasing, decreasing and no trend in rainfall which is useful for the state government officials working in the field of management of water resources, agriculture, flood management etc.

Pramod Kumar Meena, Deepak Khare, Rituraj Shukla and P. K. Mishra (2015) [8] The current study is based n long term trend analysis by Mann-Kendall test using monthly rainfall data (1901–2011). Out of 17 mega cities, 10 recoded the significant increasing trend mof rainfall such as Jaipur, Jodhpur, Faridabad, Meerut, haziabad, Delhi, Chandigarh, Ludhiana, Amritsar, Srinagar while 6 mega cities such as Allahabad, Varanasi, Patna, Kanpur, Gwalior, Agra recorded the decreasing trend. Only one mega city Kota of northern India shows the null trend.

Hamza Varikoden, K. Krishna Kumar and C. A. Babu (2012) [9] This paper tried to bring out the different trends of seasonal, monthly rainfall during the summer monsoon season over different topographical regions of Indian subcontinent. The analysis of the mean daily rainfall shows that the trend and the intensity has some non linear relationship in certain stations, where more intense daily rainfall has been registered.

Avadhesh Kumar Koshal, Prafull Kumar and Ankita Trivedi (2017) [10] The rainfall data analysis of Meerut District for a period of 100 years (1916 to 2015) reveals variation in the rainfall amount and points out a negative trend of rainfall in future. The District experienced irregular pattern rainfall which adversely affected the agriculture production and yield. There is increase in annual and South-west Monsoon season CV for all the decades during 1915-2016 periods ranging between 27.5 for annual and 12.6 for monsoon rainfall.

Shabib Aftab, Munir Ahmad, Noureen Hameed, Muhammad Salman Bashir, Iftikhar Ali, Zahid Nawaz (2018) [11] This research provided a comprehensive systematic mapping as well as the critical review of latest research from 2013 till 2017 in the area of rainfall prediction by focusing on data mining techniques. In this research a list of significant research questions was identified and then a systematic research process was followed to extract and shortlist the most relevant research articles from renowned digital search libraries.

ARVIND KUMAR, P. TRIPATHI, AKHILESH GUPTA, K. K. SINGH, P. K. SINGH, RANJIT SINGH, R. S. SINGH and AMITABH TRIPATHI (2017) [12] On the basis of long term data analysis (1981- 2012) of Uttar Pradesh it was observed that after 1996 the rate of decrease of total quantum of annual rainfall was more in Uttar Pradesh as compare to before 1996. The decadal rainfall variability was in an alternate trend. In recent decade (2001-2010), the rainfall trend was depicted to have decreasing trend in Uttar Pradesh. The seasonal rainfall was also observed in decreasing trend in the order of monsoon rainfall > summer rainfall > winter rainfall > post-monsoon rainfall in Uttar Pradesh.

Pankaj Garg, Gopal Krishan*, M.S. Rao, C.P. Kumar and Rajesh Aggarwal (2012) [13] The rainfall data analysis of Saharanpur region for a period of 30 years (1982 to 2011) reveals variation in the rainfall amount and points out a negative trend of rainfall in future. It is suggested that optimum development of rainwater harvesting and other water resource development projects that depend on surface water as well as groundwater sources will provide remedial solution to the prevailing problem of depleting groundwater level of the Saharanpur region.

Mangalekar S. B. (2015) [14] Thus in order to understand the unforeseen and uncertain rainfall events in the district leading to damage of property and life, an attempt was made to study the data on the magnitudes of extreme and less rainfall events in recent decade in different tahsils in Kolhapur district. It is expected that this study on spatial variability of the events may help to identify the zones of high and low value of rainfall events. The annual average rainfall pattern in Kolhapur district is supposed to greatly differ year to year and from tahsils to tahsils and has direct impact on human life in the river basins in the district. A detailed regionalized study in this regard is useful for the disaster planners and managers.

KAUSHIK BHAGAWATI, AMIT SEN, HOMESWAR KALITA, RUPANKAR BHAGAWATI and KSHITIZ K SHUKLA (2018) [15] The study has shown that there is no statistically significant annual and seasonal rainfall trend over subtropical hills of Basar, though they are inclined towards increasing trend except during post monsoon season.

T.Subramani1, K.A.Niasi (2018) [16] The outcomes demonstrate that the absolute best groundwater recharge potential zone is arranged in the Nelliampathy slope. In this locale, the gravelly stratum and the centralization of drainage likewise encourages the stream flow to recharge the groundwater system.

Mohd Asim, Satyendra Nath (2015) [17] The present study concluded that the data of thirty four years (1980-2013) is sufficient to obtain annual maximum rainfall (mm) distribution of Allahabad region. The most suitable probability distribution function to represent the observed data may depend on rainfall pattern of the place. As rainfall pattern varies from place to place. The statistical comparison at 2.9, 11.4, 20.0, 40.0, 51.4, 60.0, 80.0 and 97.1 percentage probabilities were done by Chi-square test (Hogg and Tannis, 1977) for goodness of fit. The predicted rainfalls are fairly close to the observed rainfall. It shows that the Gumbel distribution has the least value as compared to Log Normal distribution method. Therefore prediction by Gumbel distribution method was found to be best model for Allahabad region.

G N Mohapatra1 , A Rafega Beham2 , Kavyashree C3 , Kavya Shree 4 , Likhitha Singh M5 , Vaishnavi J (2018) [18] From the present study, it is concluded that based on the analysis of past 113 years of gridded data, there is a statistically significant decreasing trend in all India ISM rainfall. Northeast India is one big cluster having hhighly decreasing trend. The recent period mean seasonal rainfall of India as whole is decreased from the mean rainfall based on the period 1901-2013. However, change in mean rainfall is not statistically significant. Also, mean seasonal rainfall of Central Northeast India and Northeast India for the recent period is significantly reduced from the period 1901-1980. In addition to the trend analysis we have computed the number of occurrence of excess/deficit monsoon for all India.

T. Subramani, K.A. Niasi (2018) [19] The outcomes show that utilization of GIS methods help for groundwater exploration in narrowing down the objective regions for leading itemized hydrogeological overviews on the ground. The outcomes demonstrate that the absolute best groundwater recharge potential zone is arranged in the Nelliampathy slope.

V. Ramakrishna, S. Chandrika, O. Charmini, G. Sandhyarani and K. Ravalika (2020) [20] In this study the water level fluctuations of two open wells in Nuzividu and Tiruvuru are studied from Dec 2018 to March 2019. The water level dropped due to the dry season prevailed during this period. study revealed the following: (i) groundwater depth and quality is affected due to dry and wet periods of the season (ii) the hydrological movement of rainwater depends upon the infiltration and soil properties and the obtained values are consistent irrespective of approaches used for the purpose.

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