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Climatic Conditions Of Flood In The River Rapti: A Special Reference Of October 2022

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Abstract

Floods are the most widespread climate-related hazards in the world than any other type of natural disasters. It is a phenomenon in which an expansion of water that overflow and submerged all the land. Flood result caused from the enrichment of excess volume of water within water body,for example lake or river etc. , which overflows or breaks its levees, with the result that some of the water escapes its usual boundaries and causes flood. It is only responsible for two - thirds of people affected by natural disasters. India has continuously suffered by too many flood events which responsible for huge loss of life and claimed damage economic conditions. By seeing trends it is found that the incidences of the flood are increasing very rapidly. So this research paper is an analysis of climatic conditions that are responsible for the flood in the River Rapti during the month of October 2022 which breakdown all the previous flood record in the state Uttar Pradesh of India.

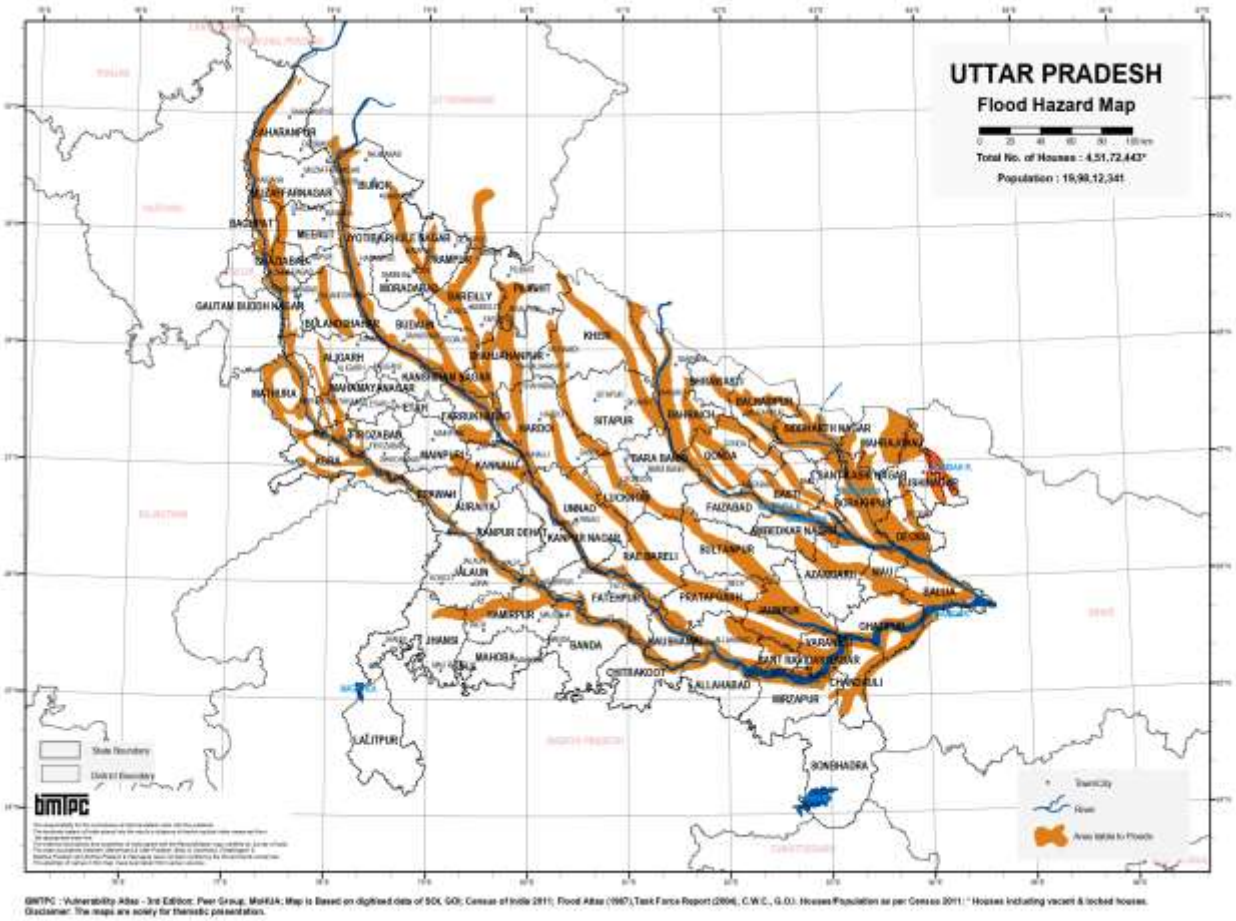
Keywords : Disaster, Flood, River Rapti, Uttar Pradesh.

Introduction :

Flood is a natural phenomenon which is the most prevalent and costliest natural disaster in the world which devastates both life and economy at a large extent that occurs when the volume of water flowing in system exceeds its total water holding capacity i.e. it is high level stages throughout which the water of the river overflows its natural or artificial banks over the normally dry land, such as the river inundating its floodplain after overflow. It not only effected human being and infrastructure but also causes a negative and brutal impact over the natural environment. This usually local and short term event comes with little or no alarming.

When the hazards, imposed by flood, exceed the fighting capabilities of the affected population it becomes a symbol of the disaster. As per the report only in India an average, over 1,500 Indians have lost their lives because of floods every year between 2011and 2020.In the previous decade, the average was slightly over than 1,200 according to " The International Disasters Database". The devastating floods not only the result in loss of precious and priceless human and animal lives but also damage to public and private property instead of it create a fear and sense of insecurity in the mentality of habitats living in the flood plains. The post effects of the flood like the spread of epidemic, agony of survivors, non-availability of essential commodities and medicines, damages of the dwellings make floods most feared among the natural disasters that are being faced by humankind".

Generally, flood is an excess of water, can be caused by heavy rain fall followed by inadequate capacity of rivers to hold the water within their banks. Specially in the region of tropical and subtropical monsoonal climatic conditions the River flood occurred mainly, due to heavy,and prolonged rainfall or rapid snowfall in upstream watershed or abundant rainfall over a short period in relatively flat terrain exceeding the absorptive capacity of the soil and the flow capacity of the channel. This results watercourse to overflow its banks and inundating the adjacent the areas. Recent years have experienced more frequent and more severe flood. Basically these disasters are accelerated by anthropogenic impact, it is not only by taming rivers flow un-ecologically but also creating more vulnerability with unsafe settlement and un-planned land use practices. This paper deals particularly with the climatic reason of flood in River Rapti during the months of October 2022.



Source:- Flood Hazard Map Of Uttar Pradesh India

Keywords: Flood, Disaster , The International Disasters Database, Anthropogenic.

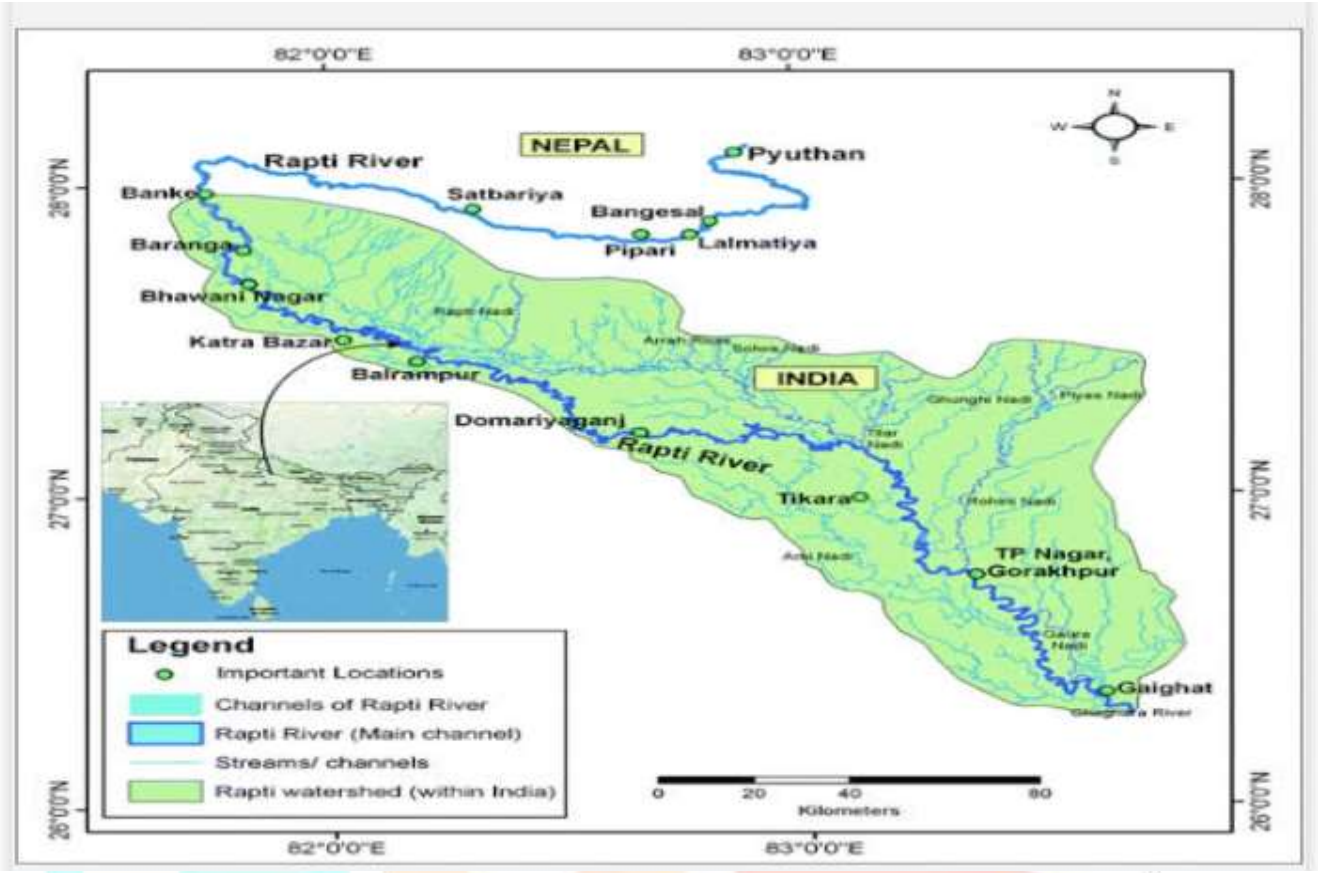
Study Area

Background:. River Rapti

River Rapti & one of the rives in India that originated in the from the Himalayas and after covering the basin catchment of two countries it gets merged with the tributaries of the River Ganga. Basically the Rapti River originated in Nepal near Rukumkot in the Mahabharat range of the Lesser Himalayas commonly known as Shivalik Himalayas The river begins in the Mahabharat range at an elevation 3050 m from the sea level. The total catchement of the river is 25783 sq. km in which 44% (11,401 km2) lies in Nepal and 56% (14,392 km2) in Uttar Pradesh, India. Rapti River flow through the districts of Rukumkot, Salyan, Rolpa, Gurmi, Arghakhanchi, Dang and Banke of Nepal territory; and Bahraich, Shrawasti, Balrampur, Siddharthnagar, Santkabinagar, Gorakhpur and Deoria districts of the Eastern Uttar Pradesh.

The Rapti River was historically known as Iravati. Rapti River begins as a small river draining Nepalese district Chitwan (Inner Terrai) valley and flows towards west to join the Narayani (Gandaki) river which cover a short distance to the north. The Rapti river basin zone is situated in Nepal's Middle Hills, between the Gandaki and Karnali Basins and flows westward along the Mahabharat range, and then shaped towards southeast down and then enters into the Indo-Gangetic plains to join the Sharda (Ghaghara) River. After flowing in Nepal, it then enters in the eastern region of Uttar Pradesh through Chanda Pargana, east of the Kundwa village of the district Bahraich. It flows in a very sinuous course with shallow depth and because of, it causes heavy flooding in the districts of eastern Uttar Pradesh. The Rapti River has a total length of about 776 km from its origin to its confluence with the Ghaghra at Kaparwarghat in Deoria District, Uttar Pradesh. Out of this, 290 km lies in Nepal territory. After the hair pin bend just above the Indo-Nepal border, the river maintains a south-easterly direction passing through a number of lakes and swamps and some abandoned water courses.

The physiography of the River Rapti is diverse in nature. The topographic nature of the entire river basin constitutes of undulating plains, mountains are lofty and possess inner and outer terrai region. Due to difference in altitude, the Rapti river has two distinct climatic regions, the temperate climate prevails in the mountainous region while the plain has subtropical climate. Himalayas has a temperate climate. Summer season are warm and winters are cool to severe. Subtropical Climate plain region experiences typical monsoon type of climate with dry winter season. The weather is very hot in summers. Daily maximum temperature goes upto 46.5 °C. The eastern part is quite colder than compared with the western part.Temperatures range between 20 and 30 degrees Celsius from mid-October to mid-March. The predominant winds are westerly. During mid-April to the end week of May, the hot wind Loo blows strongly. The monsoon season, which begins in mid-June and lasts until September, accounts for 90% of the 150 cm of rain. Temperatures range from a low of 9 °C in the winter to a high of 45 °C in the summer.



Source:- https://link.springer.com/chapter/10.1007/978-981-10-2984-4_13

The course of the River is divided among three sections. The first section is mountainous, in this section, theThe course of the River is divided among three sections. The first section is mountainous one, in this section, the river runs along a longitudinal valley. It receives the combined waters of Madi, Lungi and Jhirmuk. The altitude drops from 3000 m to 1500 m and the slope of this section is steep. The second one section of the river is referred as the Rapti Doon. This is the section of the river that flows up to Nepalganj region of Nepal. That is the reason where the river turns towards south presenting an elbow bend towards Nepalganj. The altitude of this section varies from 300 m to 150 m. The third section in which the River Rapti enters the tarai region of eastern Uttar Pradesh. In this region, the gradient is very low throughout its easterly. The altitude of this section varies from 100 m to 80 m.

The study area that covered through this Research Paper is that part of the River Rapti which lies under the Indian Territory i.e. all the region of the Indian Rapti Basin from Baharaich to Deoria District of Uttar Pradesh.

Keywords: Mahabharat Range, Shiwalik Himalayas, Nepal, Gaghara River.

Methodology

The methodology of this paper is mainly based on the data provided by the government authorities and also from the authentic agencies in India. The maps are mostly from Mateorological Department of India and from Remote Sensing Application Centre of Uttar Pradesh. The review of journal and newspaper articles, reports, surveys, and data, both qualitative and quantitative, are used as a secondary sources.The synthesis of this study came up with the data used from these sources. Relevant information, data, and sources used in this paper gathered from a systematic review of pertinent works regarding the flood, that are published in English only.

Findings

The climatic conditions are favourable for the heavy rainfall in the months of October 2022. This possessed a condition of river flood in the whole region of India but it mostly and brutally impacted in the Uttar Pradesh and Bihar States. The Rapti Basin received a huge rainfall in a very short period of time and because of low carrying of the River it outbustted and caused flood. Some water level station of the basin cross it's previous flood water level of 1998 flood and create a new record of it like in the Sravasti District and in the Siddharth Nagar District.

Some of the records and data from government agencies which shows the conditions are mentioned below.

Rainfall trends in October

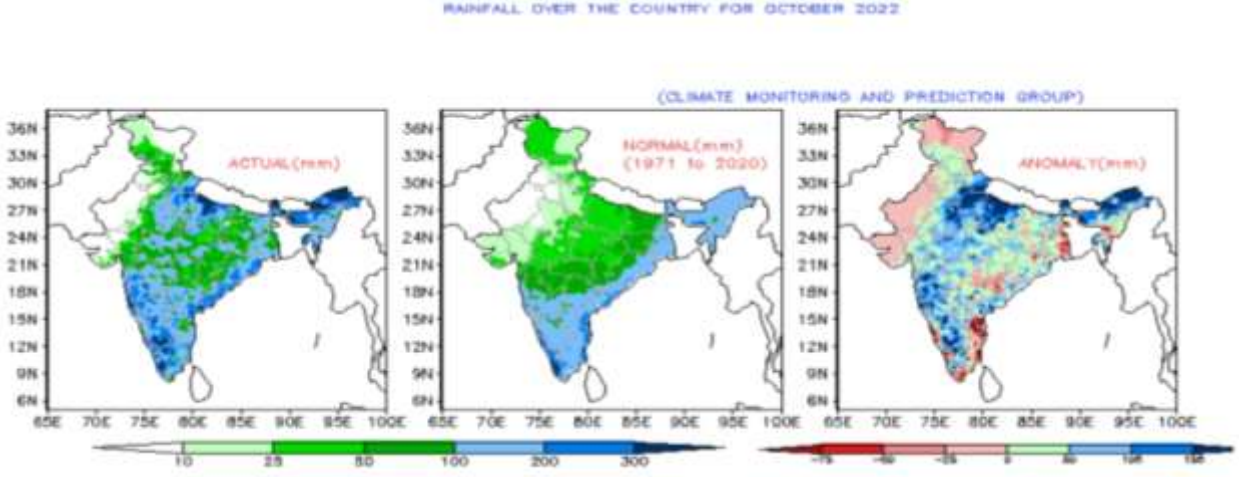
Rainfall in the month of October 2022 throughout whole region of country recorded 110.8 mm, which is 47% more than its Long Period Average (LPA) 75.4 mm. Rainfall across the region of Northwest India (64.3 mm) was 7th highest since 1901 after the years 1956 (149.9 mm), 1955 (148.5 mm), 1917 (102.2 mm), 1985 (92.7 mm), 1903 (72.7 mm) and 2021 (66.5 mm)

The monthly rainfall for October 2022 is given in the table below:

Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	110.8	75.4	47.1
Northwest India	64.3	21.6	197.7
Central India	93.2	57.0	63.6
South Peninsula	170.1	152.3	12.0
East & northeast India	164.5	123.2	33.5

Source :- INDIA METEOROLOGICAL DEPARTMENT

The following map used to observed spatial rainfall, normal rainfall for the period 1971 to 2020 and its departures from normal for the month of October 2022 . And through this map it is quite clear that rainfall intensity in the October is quiet more than enough as we compared with the data from 1971 to 2022.



Source :- INDIA METEOROLOGICAL DEPARTMENT

Withdrawal of southwest monsoon over the country

Southwest Monsoon has withdrawn on 23rd October 2022 throughout whole Indian territory against its normal date of withdrawal of 15th October. The normal date of withdrawal and its actual date is shown in Fig.2. There is a delay in withdrawal of southwest monsoon from the Northwest India and withdrawal from entire country. The figure shows the withdrawal date from west Rajasthan with refence to 1st September and withdrawal from entire country for the period 1975 to 2022. It can be seen that there is an increasing trend in withdrawal dates.

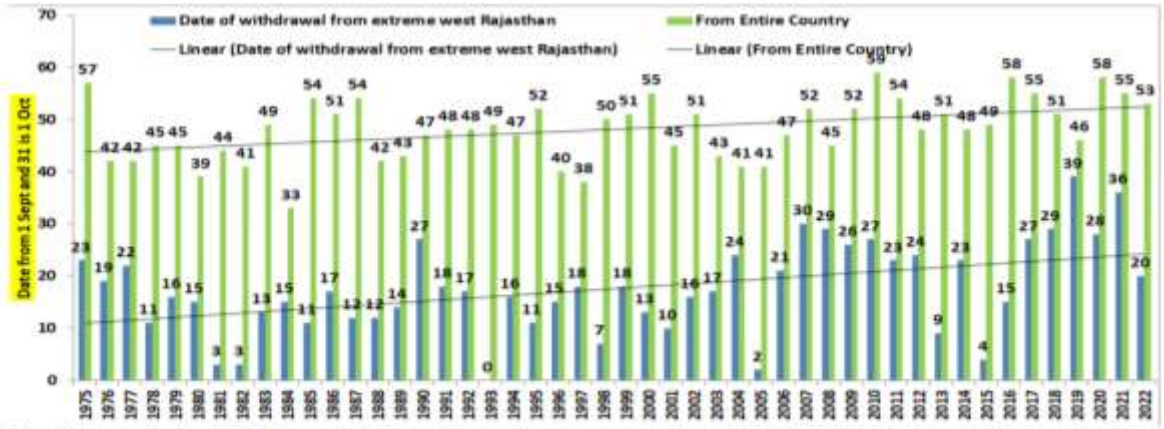


Fig.3 Trends in Withdrawal of southwest monsoon from West Rajasthan and from Entire India during 1975-2022

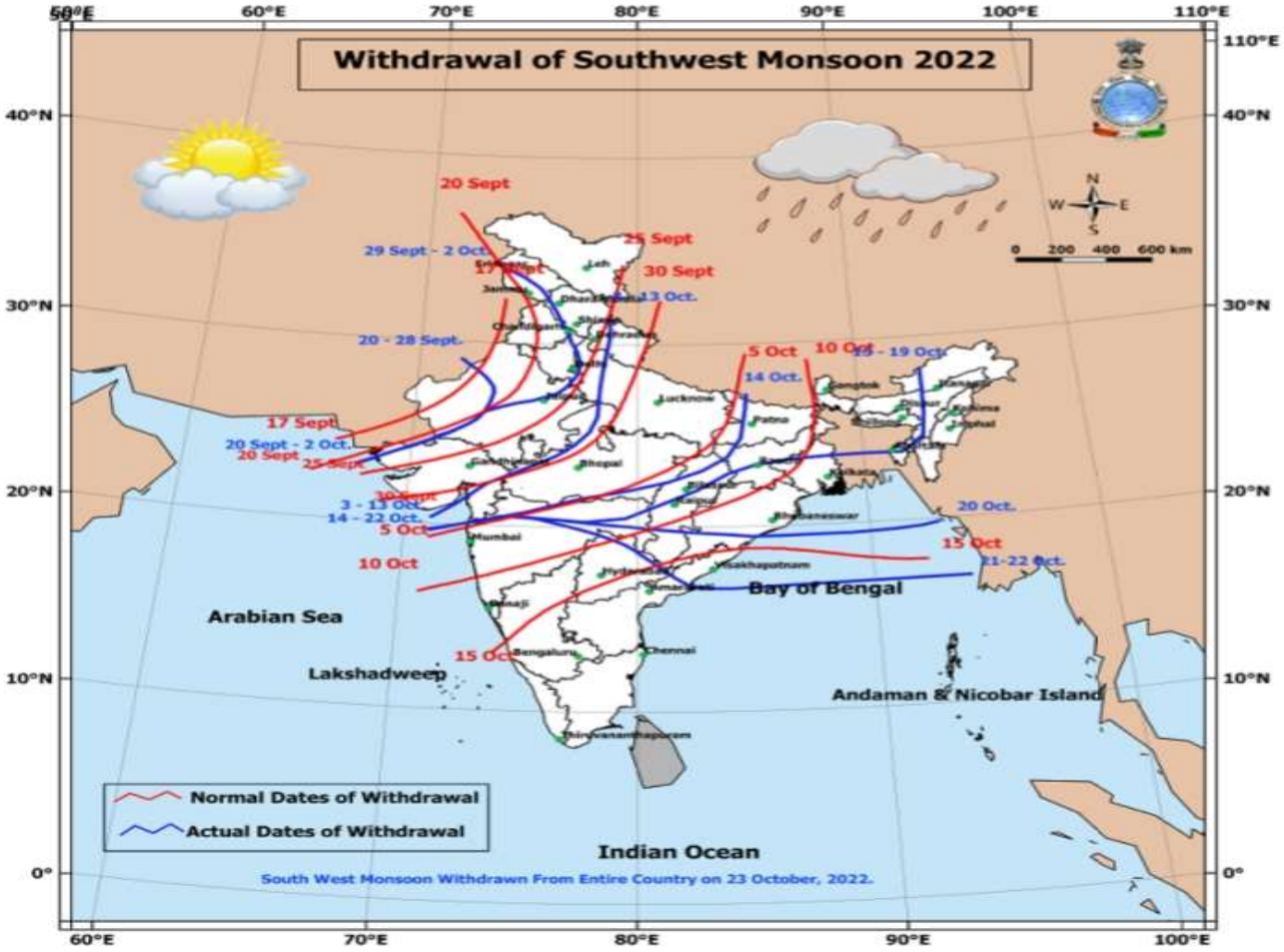
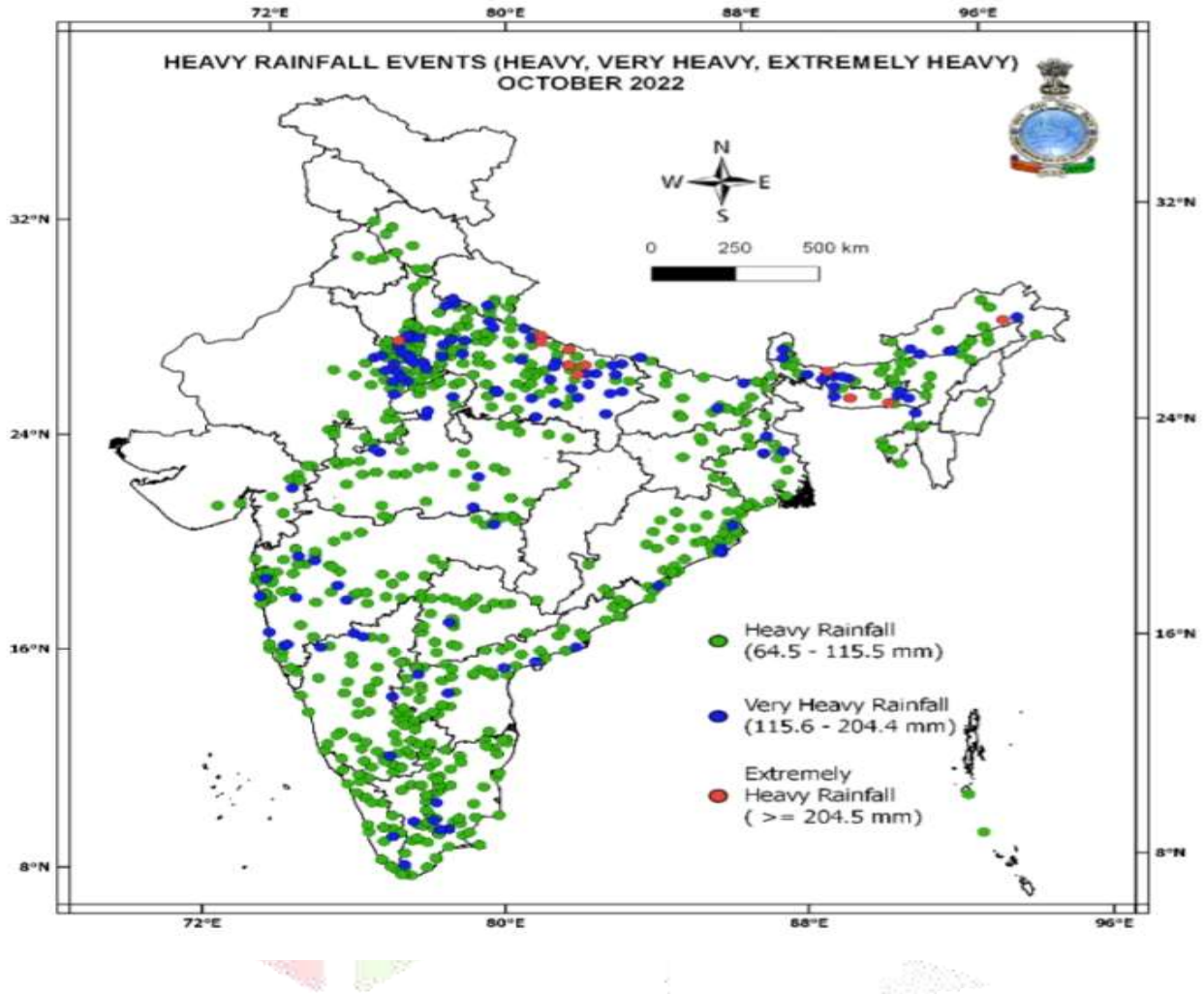


Fig.2 Withdrawal of Southwest Monsoon 2022.

Source :- INDIA METEOROLOGICAL DEPARTMENT

Frequency of Heavy Rainfall events

The October 2022 recorded extremely heavy rainfall events mainly over the Eastern Uttar Pradesh, Assam & Meghalaya, Arunachal Pradesh, Eastern Rajasthan and Sub Himalayan West Bengal & Sikkim. The location of occurrences of heavy, very heavy and extremely heavy rainfall events is shown in the Figure. Out of total 725 stations, 12 stations reported extremely heavy rainfall (>204.5 mm), 122 station reported very heavy rainfall (115.6 to 204.4 mm) and 591 stations reported heavy rainfall (from 64.5 to 115.5 mm) during this month.

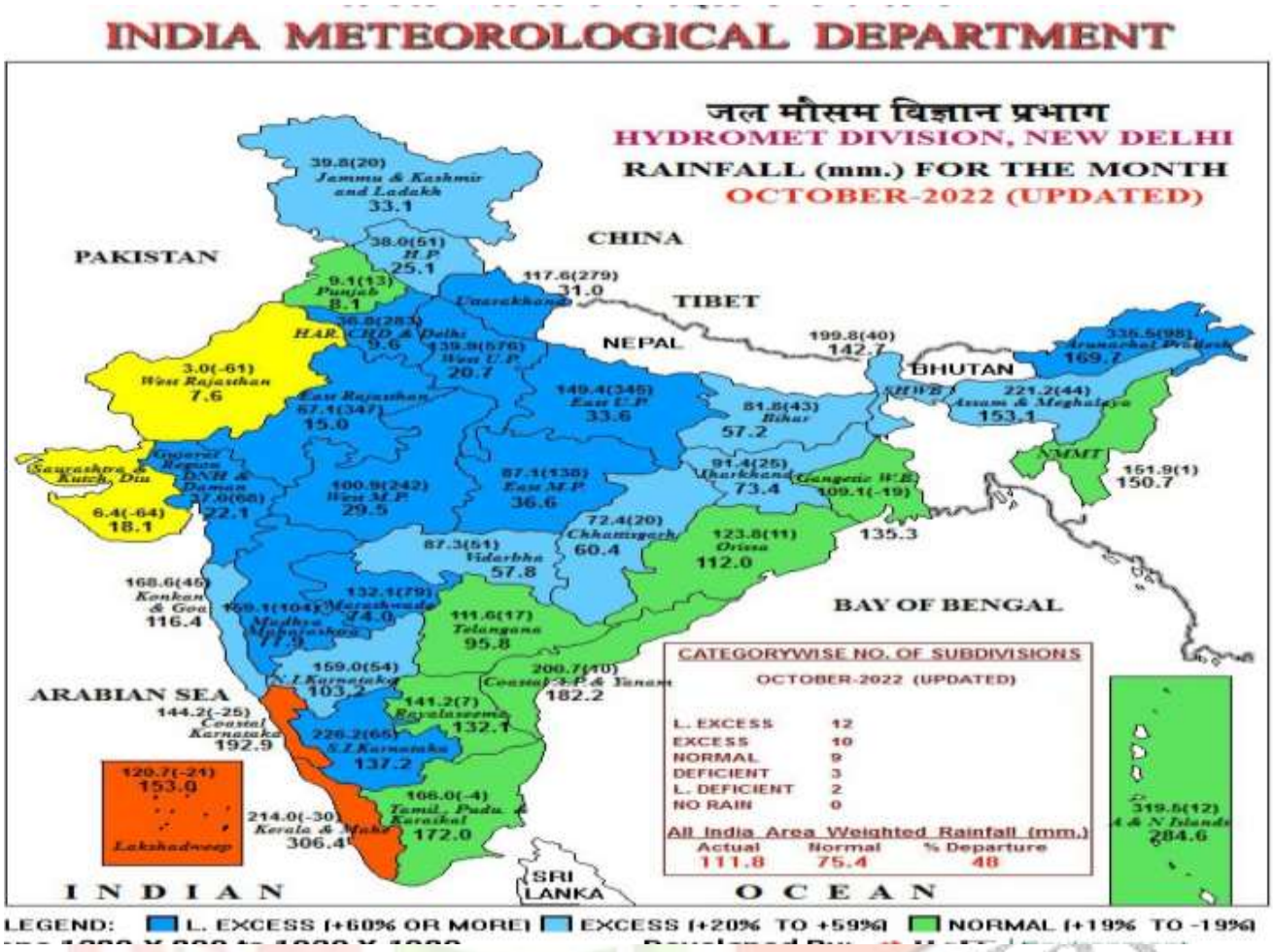


Source : INDIA METEOROLOGICAL DEPARTMENT

Results and Conclusions

After the analysis of climatic and environmental condition of the Rapti Basin during the months of the October 2022, it is quiet clearly visible that the heavy rainfall is the only condition for the heavy flood in the river. The rainfalls amount is also differed in the different region of the India but it is heavily downpour in the Uttar Pradesh region especially in the Northern part of the Ganga River Basin. Their are so many different causes for these types of heavy rainfall but the main reason is the condition of Withdrawal of Monsoon in the October and also the late return of the monsoon from India also shows its long impact over the weather of India. Normally the monsoon exit from India upto 15th of October but it lasted upto 23rd made a huge impact over the rainfall condition.

Below image shows the variability of the rainfall in the months of October during the monsoon retreated.



Source :- INDIA METEOROLOGICAL DEPARTMENT

As per the map Uttar Pradesh receive maximum rainfall if it compared with any other part of the country after Arunachal Pradesh. The other region of heavy rainfall might be the Cyclone **Sitrang**. According to the India Meteorological Department (IMD), Cyclone Sitrang formed over the east-central Bay of Bengal, which impacted too bad in the region of Bangladesh and some coastal part of Bengal, India. But is this posses any impact over the rainfall in Uttar Pradesh is quiet not acceptable.

At last it may finally conclude that generally, floods are caused by the excessive rainfall in a short duration causing heavy discharge in river and become a reason for heavy loss of life and economy.

Keywords: Rapti River, Monsoon, IMD, Cyclone Sitrang.

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