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DISTRIBUTION OF RAINFALL AND ITS EFFECT IN KODAGU DISTRICT

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Abstract

This study examines and assesses the geographical perspective in understanding the monsoon and retreating monsoon. The study aims at analyzing the distribution of rainfall across the Kodagu district using the annual, monthly, and weekly rainfall data. The analysis was also carried out over the seasons namely, per-monsoon, southwest monsoon, and post-monsoon. The annual rainfall of three taluks of Kodagu district shows a significant variation during all four periods of study. The distribution of rainfall across seasons indicates a shift in rainfall pattern from southwest monsoon to post and pre-monsoon seasons. Problems faced by flash floods and relief organizations during handling related projects. Different periods have been studied and analyzed to develop an understanding of the disaster issue faced by the district.

Keywords: Monsoon rainfall; disaster; premonsoon; postmonsoon; flash floods

INTRODUCTION

Kodagu formally known as Coorg district lies in the southwestern part of Karnataka state and part of mighty Western Ghats. It falls in a high precipitation zone with picturesque topography occupying the eastern and western slopes of Western Ghats. Closed with primeval forest or glassy and broken by few cultivated villages. It has a mountainous configuration that presents a ground panorama, verdant, ravines, fast-flowing streams, lofty peaks, and awe-inspiring spurs. It enjoys a typical tropical climate. In the economy of the state and the country, Kodagu enjoys a distinct place given its international reputation as a prominent coffee-producing center.

Coffee revenue helped Kodagu to become one of the richest districts in

India. Kodagu is considered rich with wildlife and has three wildlife sanctuaries and one national park: the Brahmagiri, Talakaveri, and Pushpagiri Wildlife Sanctuaries, and the Nagarhole National Park, also known as the Rajiv Gandhi National Park.

STUDY AREA

The study area lies in the Kodagu district, Karnataka, and is bounded between latitudes 12.00.00N and 12.30.00N and longitudes 75.15.00E and 75.45.00E. It is bounded by Dakshin Kannada district in the north, Mysore district in the east, and Kasaragod district of Kerala state on the west and south. The study area is well connected by highways and other main roads.

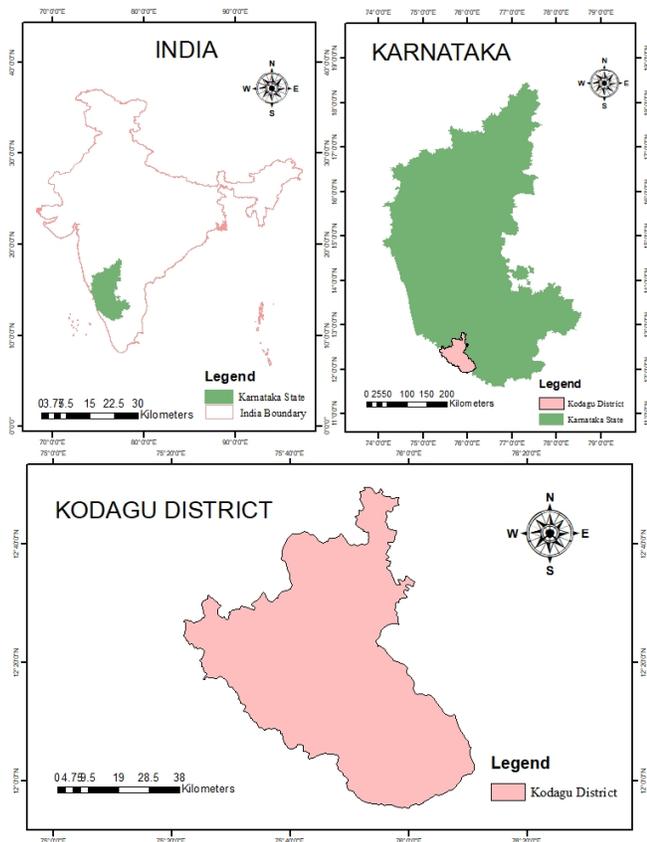


Fig. 1. Study area location map of Kodagu district

The Bangalore–Mangalore highway (SH-88) and Mysore-Cannanore highway (SH-88A) passes through the area. It is about 262km from Bangalore (state capital), 128KM from Mysore, and 130Km from Mangalore. The nearest railway stations are Hassan and Mysore. The nearest airport is located at a distance of about 130km from Mangalore.

Kodagu is a mountainous district, bordered by six districts, three districts (Dakshina Kannada, Hassan, and Mysore) in Karnataka state, and two districts (Kasaragod and Kannur) in Kerala state. As it is located on the eastern slopes of the Western Ghats range the whole district is covered by beautiful mountain ranges, the green trap of forest, waterfalls, the misty climate in the monsoon and winter season.

Kodagu (Coorg), the thickly wooded grandeur on the Western Ghats, is the most beautiful hill station of Karnataka. It occupies an area of 4,102 square kilometers (1,584 sq mi) in the Western Ghats of southwestern Karnataka. As of 2001, the population was 548,561, 13.74% of which resided in the district’s urban centers, making it the least populous of the 30 districts in Karnataka. Kodagu is well known in the world for coffee and its “brave warriors”. Madikeri is the headquarters of Kodagu. Kodagu is home to the native speakers of the Kodava language. Much of Kodagu is used for agriculture. Characteristically and historically, paddy fields are found on

the valley floors, with Coffee and pepper agroforestry in the surrounding hills mainly near Madikeri. The most common plantation crop is coffee, especially the Coffee robusta variety. Kodagu is the second coffee production region in India, after the Baba Budangiri hills in Chikkamagaluru district.

OBJECTIVES

- This study aims to understand the pattern posed by monsoon rain and the measures taken by concerned organizations to limit these effects from a flash-related disaster project management perspective.
- This study also discusses the shared advantages of rainfall and conserves the water so that devastating effects like landslides should be reduced.

METHODOLOGY

This is a qualitative study carried out using quantitative data. Secondary data for multiple periods have been collected from organizations such as KSNDMC involved in metrological related projects and activities. Secondary data has been collected for the research in which BHUVAN has been a great help in providing the data and other shapefiles. From DIVA-GIS they shapefile has been used and GOOGLE EARTH has been a great use for further reference points. The GIS platforms such as QGIS and ArcGIS has been used for projecting the data and maps. Microsoft excel had been used for the analysis and table formation.

RESULTS AND DISCUSSION

Comparative study of rainfall in Kodagu District from 2018-2019

Month of June

During June 2018 the district experienced Vigorous monsoon for 1-day, Active monsoon for 6 days, normal monsoon for 9 days, and Weak monsoon for 14 days. Rainfall distribution of monsoon during 2018 indicates widespread rainfall for 3 days, Fairly Widespread rainfall for 18 days, scattered rainfall 3 days, isolated rainfall for 6 days. The District as a whole received 891.3 mm rainfall against normal rainfall 622.4 mm with departure from normal being 43% hence district is Excess. The taluk wise rainfall pattern indicates: Madikeri received more rain as compared to another taluk.

The hobli wise rainfall pattern indicates the rainfall during months ranging from 321 mm in Kushalnagar hobli to a maximum of 1520.60 mm in Hudakere hobli. During June 2019 the district experienced a Normal monsoon for 13 days, Weak monsoon for 17 days. Rainfall Distribution of monsoon during June 2019 indicates Scattered rainfall 8 days, Isolated rainfall 19 days, Negligible rainfall for 3 days. The district as a whole received 261.7 mm rainfall against normal rainfall



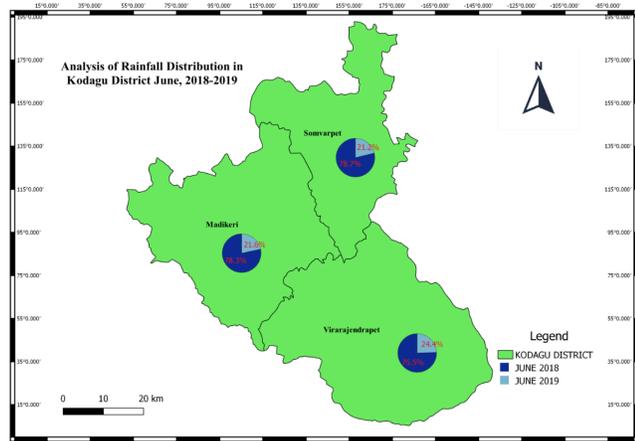


Fig. 2. Analysis of rainfall Distribution in Kodagu District, 2018-2019

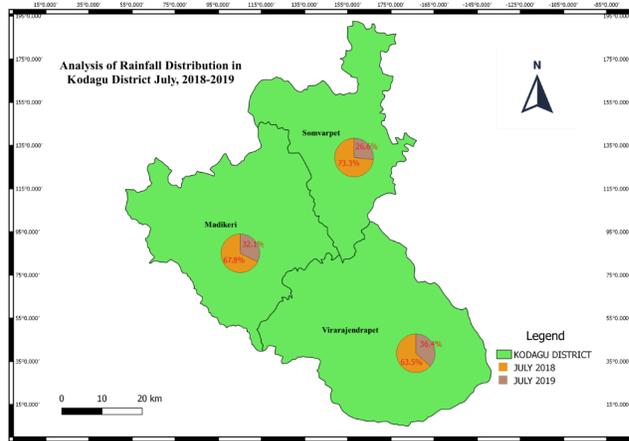


Fig. 4. Analysis of rainfall distribution in Kodagu district July, 2018-2019

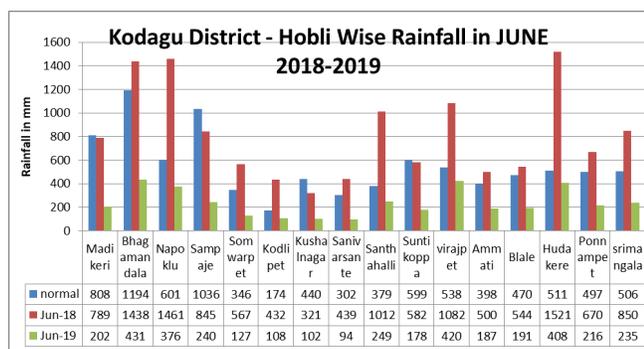


Fig. 3. Kodagu district hobli wise rainfall in June 2018-2019. (Table Source: KSNDMC)

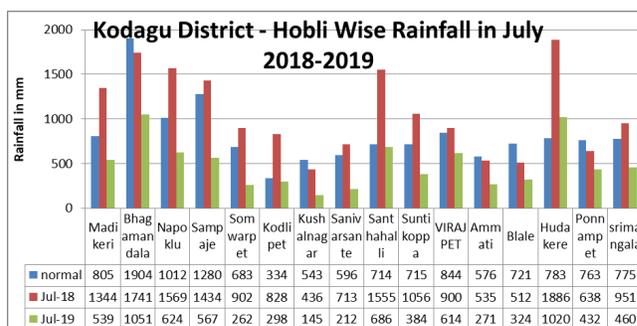


Fig. 5. Kodagu district hobli wise rainfall in July, 2018-2019. (Table Source: KSNDMC)

of 622.4 mm with departure from normal being -58% hence the district is Deficit. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 93.90 mm in Sanivarsante hobli to a maximum of 431.30 mm in Bhagamandala hobli.

Month of July

During July 2018 the district experienced a Normal monsoon for 21 days, Weak monsoon for 10 days. Rainfall Distribution of monsoon during July 2018 indicates widespread rainfall for 22 days, fairly widespread rainfall for 2 days, scattered rainfall 5 days, isolated rainfall 2 days. The district as a whole received 1116.9 mm rainfall against normal rainfall 904.7 mm with departure from normal being 23% hence the district is Excess. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during

the month ranging from 436.50 mm in Kushalnagar hobli to a maximum of 1886 mm in Hudakere hobli. Monsoon

Activity during July 2019 the district experienced a Normal monsoon for 16 days, Weak monsoon for 15 days. Rainfall Distribution The distribution of monsoon during July 2019 indicates widespread rainfall for 17 days, Fairly Widespread rainfall for 8 days, Scattered rainfall for 5 days.

Rainfall pattern during July 2019 the district as a whole received 540.4 mm rainfall against normal rainfall 904.7 mm with departure from normal being -40% hence the district is Deficit. The taluk-wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 144.80 mm in Kushalnagar hobli to a maximum of 1051.30 mm in Bhagamandala hobli.

Month of August

During August 2018 the district experienced a Vigorous monsoon for 2 days, a Normal monsoon for 20 days, and a Weak monsoon for 9 days. Rainfall Distribution of monsoon during July 2018 indicates widespread rainfall for 23 days, fairly widespread rainfall for 4 days, scattered rainfall 3 days, isolated rainfall 1 day.



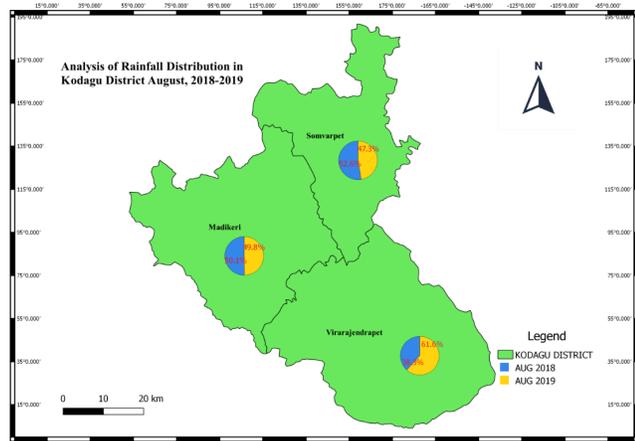


Fig. 6. Analysis of rainfall distribution in Kodagu district August, 2018-2019

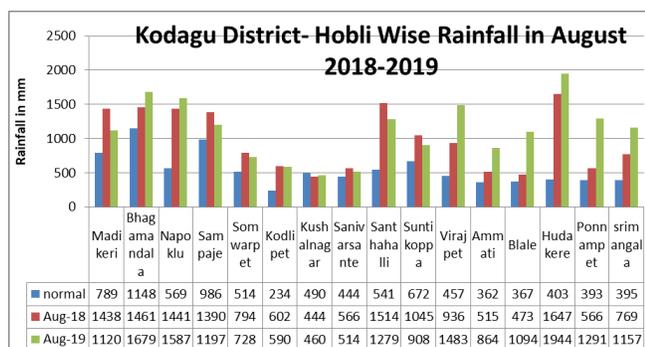


Fig. 7. Kodagu district hobli wise rainfall in August 2018-2019. (Table Source: KSNDMC)

The district as a whole received 1033.1 mm rainfall against normal rainfall 597.1 mm with departure from normal being 73% hence the district is Excess. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 443.80 mm in Kushalnagar hobli to a maximum of 1646.60 mm in Hudakere hobli. Monsoon Activity during August 2019 the district experienced Vigorous monsoon for 4 days, Normal monsoon for 20 days, and Weak monsoon for 7 days. Rainfall Distribution The distribution of monsoon during August 2019 indicates widespread rainfall for 20 days, Fairly Widespread rainfall for 5 days, scattered rainfall for 5 days, isolated rainfall for 1 day.

The district as a whole received 1204.9 mm rainfall against normal rainfall 597.7 mm with departure from normal being 102% hence the district is excess. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 460.50

mm in Kushalnagar hobli to a maximum of 1943.80 mm in Hudakere hobli.

Month of September

During September 2018 the district experienced a Vigorous monsoon for 1-day, a Normal monsoon for 7 days, and a Weak monsoon for 22 days. Rainfall Distribution of monsoon during September 2018 indicates widespread rainfall for 4 days, fairly widespread rainfall for 2 days, scattered rainfall 7 days, isolated rainfall 16 days.

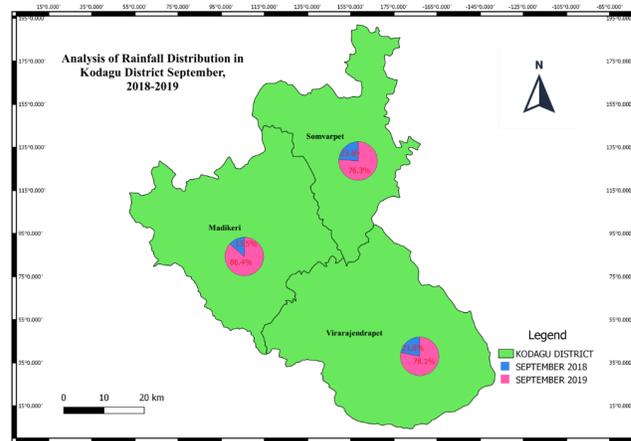


Fig. 8. Analysis of rainfall distribution in Kodagu district September 2018-2019

The district as a whole received 112.6 mm rainfall against normal rainfall 219.9 mm with departure from normal being -49% hence the district is Deficit. The taluk wise rainfall pattern indicates: Virajpet received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 79.30 mm in Bhagamandala hobli to a maximum of 116.20 mm in Srimangala hobli. Monsoon Activity during September 2019 the district experienced Vigorous monsoon for 6 days, Active monsoon for 2 days, Normal monsoon for 14 days, and Weak monsoon for 8 days. Rainfall Distribution The distribution of monsoon during September 2019 indicates widespread rainfall for 12 days, Fairly Widespread rainfall for 5 days, scattered rainfall for 4 days, isolated rainfall for 9 days. Rainfall pattern during September 2019 the district as a whole received 491.7 mm rainfall against normal rainfall 219.9 mm with departure from normal being 124% hence the district is Excess. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 174.40 mm in Kushalnagar hobli to a maximum of 878.20 mm in Hudakere hobli.



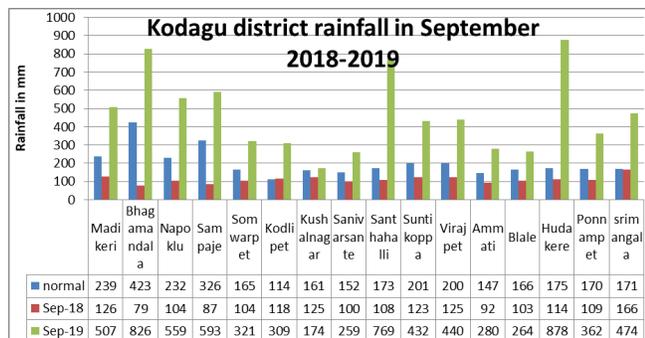


Fig. 9. Kodagu district rainfall in September, 2018-2019. (Table Source: KSNDMC)

Month of October

During October 2018 the district experienced Active monsoon for 1-day, Normal monsoon for 12 days, and Weak monsoon for 18 days.

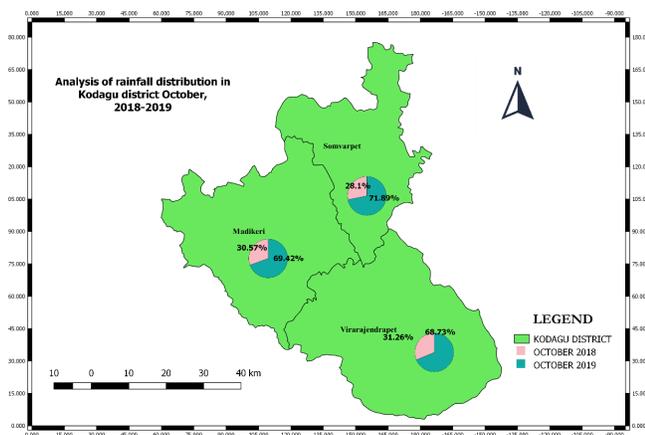


Fig. 10. Analysis of rainfall distribution in Kodagu district November, 2018-2019

Rainfall Distribution of monsoon during October 2018 indicates widespread rainfall for 6 days, fairly widespread rainfall for 4 days, scattered rainfall for 4 days, isolated rainfall 6 days, negligible rainfall for 11 days. The district as a whole received 132.1 mm rainfall against normal rainfall of 200.7 mm with departure from normal being -34% hence the district is Deficit. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 59.30 mm in Hudakere hobli to a maximum of 181.80 mm in Bhagamandala hobli. Monsoon Activity during October 2019 the district experienced Vigorous monsoon for 3 days, Active monsoon for 4 days, Normal monsoon for 16 days, and Weak monsoon for 8 days. Rainfall Distribution The distribution of monsoon

during October 2019 indicates widespread rainfall for 10 days, Fairly Widespread rainfall for 6 days, scattered rainfall for 8 days, isolated rainfall for 7 days. The district as a whole received 303.8 mm rainfall against normal rainfall of 200.7 mm with departure from normal being 51% hence the district is Excess. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during months ranging from 194 mm in Srimangala hobli to a maximum of 446.80 mm in Bhagamandala hobli.

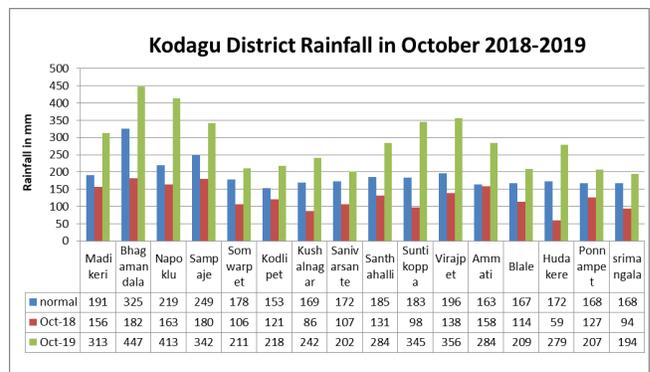


Fig. 11. Kodagu district rainfall in October, 2018-2019. (Table Source: KSNDMC)

Month of November

During November 2018 the district experienced a Normal monsoon for 4 days, Weak monsoon for 26 days. Rainfall Distribution of monsoon during November 2018 indicates scattered rainfall 2 days, isolated rainfall 10 days, negligible rainfall for 18 days.

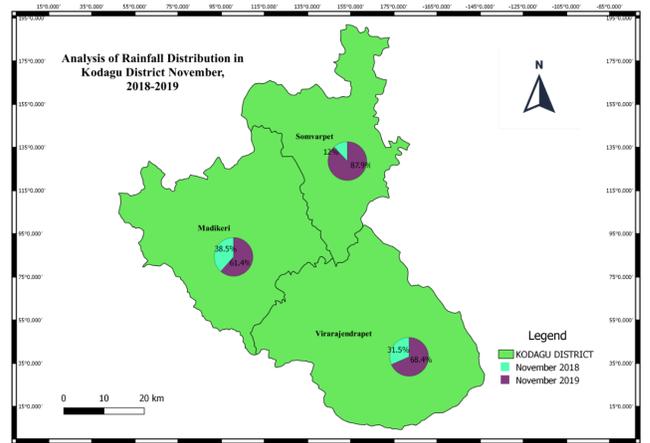


Fig. 12. Analysis of rainfall distribution in Kodagu district November, 2018-2019



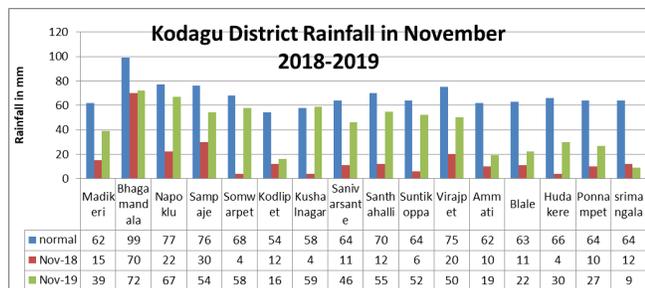


Fig. 13. Kodagu district rainfall in November, 2018-2019. (Table Source: KSNDMC)

The district as a whole received 19.5 mm rainfall against normal rainfall of 70 mm with departure from normal being -73% hence the district is Scanty. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during months ranging from 3.90 mm in Kushal Nagar hobli to a maximum of 70 mm in Bhagamandala hobli.

Monsoon Activity during November 2019 the district experienced Active monsoon for 3 days, Normal monsoon for 5 days, and Weak monsoon for 22 days. Rainfall Distribution The distribution of monsoon during November 2019 indicates Fairly Widespread rainfall for 2 days, scattered rainfall 3 days, isolated rainfall 11 days, negligible rainfall for 14 days. Rainfall pattern during November 2019 the district as a whole received 43.6 mm rainfall against normal rainfall 70 mm with departure from normal being -38% hence the district is Deficit. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 9.10 mm in Srimangala hobli to a maximum of 72.10 mm in Bhagamandala hobli.

Month of December

During December 2018 the district experienced Active monsoon for 3 days, Normal monsoon for 3 days, and Weak monsoon for 25 days.

Rainfall Distribution of monsoon during December 2018 indicates isolated rainfall 7 days, negligible rainfall for 24 days. The district as a whole received 8.6 mm rainfall against normal rainfall of 17.7 mm with departure from normal being -51% hence the district is Deficit.

The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 0.70 mm in Somwarpet hobli to a maximum of 31.80 mm in Bhagamandala hobli. Monsoon Activity during December 2019 the district experienced Vigorous monsoon for 1 day, Active monsoon for 3 days, Normal monsoon for 5 days, and Weak monsoon for 22 days. Rainfall Distribution The distribution of monsoon during December 2019 indicates

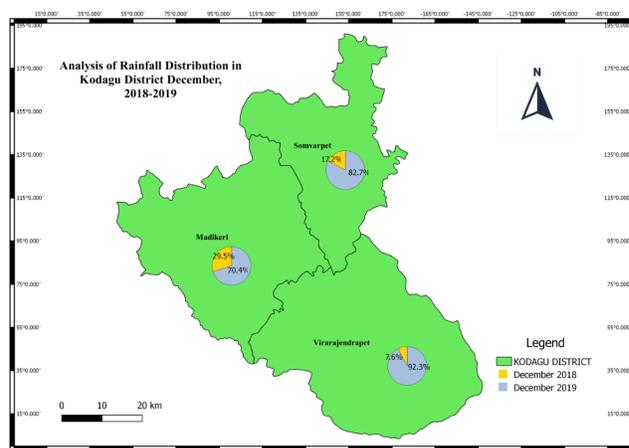


Fig. 14. Analysis of rainfall distribution in Kodagu district December, 2018-2019

Widespread rainfall 1 day, Scattered rainfall 1 day, Isolated rainfall 9 days Negligible rainfall for 20 days. The district as a whole received 35.4 mm rainfall against normal rainfall of 17.7 mm with departure from normal being 100% hence the district is Excess. The taluk wise rainfall pattern indicates: Madikeri received more rainfall as compared to other taluks. The hobli wise rainfall pattern indicates the rainfall during the month ranging from 16.70 mm in Kodlipet hobli to a maximum of 51.90 mm in Virajpet hobli.

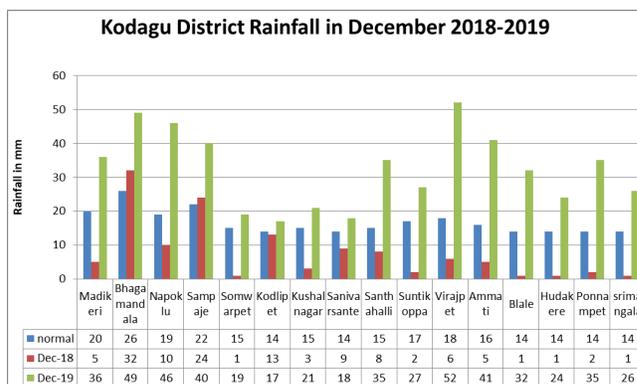


Fig. 15. Kodagu district rainfall in December 2018-2019. (Table Source: KSNDMC)

For effective management of pre-and post-monsoon disaster efforts, this study led us to the following Discussion:

1. Among different types of floods not anyone type of flood can be observed here. Situated in the Western Ghats and source of the river it can be said as river flood. In the recent past, we have observed that a lot of infrastructure development has taken place for better connectivity and increasing urbanization and so-called



urban flood. If we observe the days of the span of rainfall from the records the no of days has reduced and in the same day rainfall has increased which has led to flash floods.

2. The number of days of the span has reduced and rainfall amount in those days is the same this led to flash flood which occurs only in the monsoon period In India.
3. Several causes have been observed in the Kodagu district. For the development of infrastructure, trees have been cut down and this led to deforestation. In return to this the soil holding capacity to hold water reduces. Even the concrete jungles have resulted in the accumulation of water in the outskirts of the city or low-lying area.
4. Forests delay the return of rainwater to the rivers because these intercept the falling raindrops and leaf litters and herbaceous ground covers hold waters. This encourages more infiltration of river water and therefore reduce, marginally, the amount of surface runoff. It significantly reduces soil erosion and hence reduces the sediment load of the rivers. This can effectively reduce the frequency and dimension of the flood.
5. Developing nations are a lot more prone to disasters than developed countries due to the unavailability of skilled manpower, resources for transportation, communication and relief, and proper planning. They also bear more cost of managing disasters due to the lack of awareness and management skills. Early warning frameworks are inadequate or nonexistent.
6. Research and study of past disaster floods can help in planning for resources pre-positioning and assets management.

FINDING AND SUGGESTIONS

In light of the findings of this research, the following suggestions are being proposed:

1. Delay the return of surface runoff resulting from the high-intensity rainfall to the rivers. This can be achieved by large-scale reforestation and afforestation in the source catchment area of those rivers which are notorious for their recurrent disastrous floods. .
2. Divert the flood water by a flood-diversion system which implies diversion of floodwater in low-lying areas, depressions, or artificially constructed channels bordered by artificial dykes so that the flood crests may be reduced and flood magnitude may be decreased.
3. Embankments, dikes, and floodwalls can be used to confine the floodwater within the valley or say within

a narrow channel. These engineering works include the building of artificial levees of earthen materials, stones, or even concrete walls.

4. Artificial bunds of earthen dikes are also constructed on either side of the river for longer distances to protect the floodplains from floods.
5. Stone spurs are also used to protect the towns, cities, and other important places from severe erosion during and after floods.
6. Volunteer services from all levels must be formalized for effective rescue and rehabilitation.
7. One significant weakness is the deficiency of flying resources like helicopters. For disaster-stricken areas, a framework for quick logistic management is required to transport supplies for rescue and relief, like heavy machinery, food, medicines, manpower, etc.
8. There is an immediate need for a flood information system (FIS) which may communicate the concerned governments for issuing timely warning messages to the inhabitants of the area likely to be affected by flood hazard.
9. Information technology and communication have proved very useful for flood forecasting and warning system

CONCLUSION

The constitution of central flood control board in 1954 and the establishment of state flood control boards at state level have proved beneficial in adopting several flood controls measures. From the above study we can conclude that monsoon is well defined in this region. Due to human intervention in the natural environment it's giving us signs to watch out steps carefully for sustainable development. The flash flood, landslides etc. are the results of climatic changes. With the increase in flash flood situation in pre and post monsoon period the effective and improved technology with more capacity to store water and other drainage ways for rainwater to move through the concrete jungle and not destroy the natural habitat. There is need for effective sustainable planning for the conservation of natural as well as human kind. It may be mentioned that flood forecasting and warning system is well organized in India and flood warning messages are communicated in time through electronic and print media. The concerned authorities also alert the people about the immediate flood occurrence but the social constraints taboo the evacuation plan because people are always scared of theft of their property in case, they evacuate their homes and move to other places.

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