

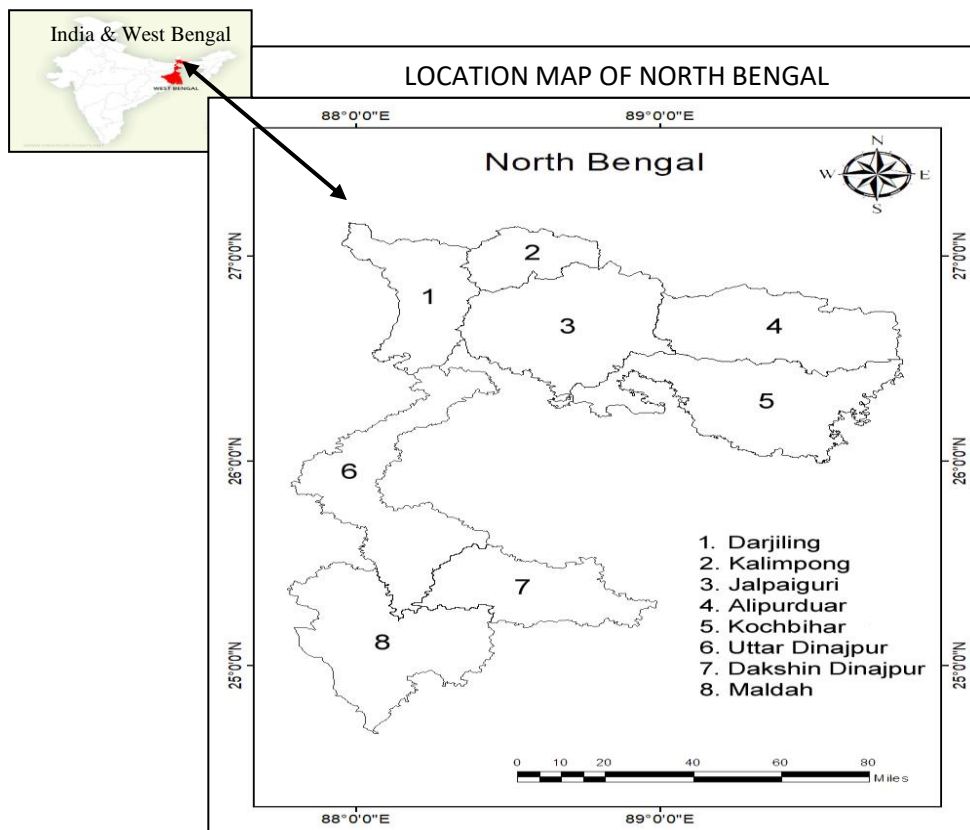
Climatic Characteristics of North Bengal (West Bengal) - A Geographical Discussion

Madhusree Roy

Assistant Professor
Department of Geography
Maynaguri College, Jalpaiguri, India.

Abstract: Geographically North Bengal is full of diversity. Because, hilly and mountainous region in the north; marshy and swampy (i.e., Terai and Dooars) in the foothills; riverine plains in the south, and hills & valleys in the middle. Therefore, the climate on this region is also much diversified. In the present study, climatic characteristics of North Bengal have been analyzed. The seasonal variability of climate and the nature of North Bengal based on the contribution of different meteorologist and geographers have been explored. Districwise variability has also described.

Keywords: Geographical divisions, Climatic classifications, seasonal variability, regional analysis.



INTRODUCTION:

North Bengal consists of eight districts (Koch Behar, Jalpaiguri, Alipurduar, Kalimpong, Darjeeling, North Dinajpur, South Dinajpur and Maldah) in the northern part of the West Bengal. The climate of the study area is characterized by hot, humid and heavy rainfall although in the northern hilly areas a cool climate prevails. It extends approximately from 24° 45' / N to 27° 20' / N and from 87° 45' / E to 89°50' / E. The total area of the region is about 21859 sq. km (26322 sq. km). Geographically, the region is located in the Teesta-Torsha-Mahananda basin in between Darjeeling and the Himalayas in the north and the Gangetic plains in the south.

It is bounded on the north by Sikkim and Bhutan; on the east by Assam and the Rangpur and Rahsahi divisions of Bangladesh; on the south by the Presidency division of West Bengal; and on the west by Bihar and Nepal. The Ganges separates North Bengal from South Bengal.

Objectives:

These objectives have been taken for describing the present topic- **(i)** to highlight the climatic features of the study area, views of different climatologists and geographers has been mentioned; **(ii)** to find out the climatic variability, geographical divisions and district wise climate has been described; **(iii)** to explore the climatic condition of North Bengal, seasonal variability high lightened.

Method:

The study is based on secondary sources, such as research paper, journal, internet access, Wikipedia, different books, and many reports etc.

Identification of climatic of North Bengal by the author based on the views of climatologist and geographers:

Some of the important views of climatologists, geographers and experts have been given their contribution about macro and meso region but haven't given clear concept on micro region like North Bengal. But for identifying the climatic region of North Bengal, I have extracted the characteristics of North Bengal from the World/Indian climatic classifications/regions which have been given by the following climatologist and geographers.

Koppen based his scheme of Climatic classification on monthly values of temperature and precipitation. But based on his climatic classification scheme, North Bengal falls into "Cwg" climatic region. "Cwg" is characterized by Monsoon Type with Dry Winters. The average temperature of the cold months is less than 18°C and the average temperature of the coldest month is over 15°C. the maximum temperature is recorded in the month of May or first half of June. **Trewartha** corresponds with the vegetative, agricultural and even geographical regions of India. Based on Trewartha's climatic classification scheme, North Bengal falls into "Caw" climatic zone. "Caw" is characterized by Sub-Tropical Humid (dry winter). The mean temperature for the coldest month of January is less than 18°C, while the mean maximum in the summer season may cross 45°C. the average annual rainfall varies from 250 cm in the east (North Bengal) to only about 65 cm in the west (west India). **Thorntwaite's** scheme is based on the concept of water balance. Based on this climatic classification scheme, North Bengal falls into "B" Type of climatic region. This "B" Climate is characterized by humid climate and it falls into mesothermal region. **Stamp** used 18°C isotherm of mean monthly temperature for January to divide the country into two broad climatic regions, viz., and temperate or continental zone in the north and tropical in the south. According to this classification, Darjeeling and Kalimpong fall into The Himalayan temperate region which is characterized by heavy rainfall. The winter and summer temperature are 4-7°C and 13-18°C respectively. The average annual rainfall exceeds 200 cm and Darjeeling is its representative city. But Jalpaiguri, Koch Behar, Alipurduar and Malda district fall into tropical region of heavy rainfall. The January and July temperatures range from 18-24°C to 29-35°C respectively. The average annual rainfall is 100-200 cm. Following Kendrew and Stamp, **Dr. R.L. Singh (1971)** divided the country into 10 climatic divisions based on the temperature conditions of the hottest and the coldest months and average annual rainfall. According to this climatic divisions, North Bengal falls into the Humid North-East climatic region. The average annual rainfall in this climatic division is more than 200 cm. the mean July temperature Varies between 25°C and 33°C, while mean January temperature varies between 10°C and 25°C.

Geographical divisions and climatic features:

The North Bengal may broadly be divided into three geographical regions, i.e.,

a. The Darjeeling Himalaya Mountainous region is located on the north-eastern border of West Bengal, above the eastern Himalayan mountain range. The mountainous region in the north is cold on account of its altitude but their humidity is high. The mountain range affects the pattern of air circulation to a considerable extent by preventing the severe cold air from the north to penetrate southwards into the areas of West Bengal. Thus, the Himalayas act as a major climatic barrier between very severe climatic environment of the north and the tropical humid environment of the south of the range. It is also the cause of formation of a large number of local winds; the upper-air flow pattern is also affected to a considerable degree.

b. The Terai-Duars regions politically constitute the plains of Darjeeling district, whole of Jalpaiguri and Alipurduar district and upper region of Cooch Behar district in West Bengal. The average rainfalls of the duars region is about 3500 mm. monsoon generally starts from the middle of May and continue till the end of September. Winters are cold with foggy mornings and nights. Summer is mild and constitutes a very short period of the year.

c. North Bengal plain starts from the south of the Terai region and continues up to the left bank of the Ganges. The southern parts of the district Jalpaiguri, North Dinajpur baring some extreme northern regions, south Dinajpur, Malda, Alipurduar and southern part of Koch Behar districts constitute this geographical region. The plain is mostly rainy and climatic variation is less but has a sharp contrast with the mountainous areas. The amount of rainfall and humidity decreases southwards, as one move from the north towards south. Due to heavy rainfall and high humidity and flat character of the terrain greater amount of water is available for downward percolation. Annual average rainfall is 250 to 350 cm and climate are humid and moist compare to south of West Bengal.

District Wise Explanations:**Alipurduar**

Geographically the district lies in between 26.4°N to 26.83°N and 89°E to 89.9°E. The climate of Alipurduar is swampy with heavy rainfall lasting from May to September. Heat is moderated but humidity is high. The winter is very strong as it is comparatively in the high altitude located at the foothills of the "duars". The town is surrounded by deep forest and tea garden.

Koch Behar

Koch Behar lies between 25°57'47"N to 26°36'2" N and between 89°54'35"E to 88°47'44"E. Five distinct seasons (summer, monsoons, autumn, winter and spring) can be observed in Koch Behar, of which summer, monsoons and winter are more prominent. Koch Behar has a moderate climate characterised by heavy rainfall during the monsoons and slight rainfall from October

to mid-November. The district does not have high temperatures at any time of the year. The summer season is from April, the hottest month, to May. The winter season lasts from the end of November to February; January is the coldest. The atmosphere is highly humid except from February to March, when relative humidity is around 60 percent. The rainy season lasts from June to September. Average annual rainfall in the district is 3,248 mm (127.9 in).

Jalpaiguri

Jalpaiguri district is situated between 26° 16'N and 27° 0'N and 88° 4'E and 89° 53'E. Jalpaiguri is part of monsoon climate zone of South-Eastern Asia. May is the hottest month of this region with average maximum temperature of about 32 °C whereas January is coldest with 11 °C. The average annual humidity in the district is of 82%. The annual average rainfall is 3160 mm. December is the driest month with average rainfall 0.2 mm and July is wettest with 809.3 mm. Number of rainy days are 0 to 1 during November to February and 24 days during July. Thunderstorms are common weather phenomenon during May.

MONTHLY EXTREMES OF TEMPERATURE (°C) AND RAINFALL (mm) IN FEW STATIONS OF NORTH BENGAL UPTO 2012

Station	Temperature in °C				Rainfall in mm			
	Tx	Date	Tn	Date	RF24	Date	RF(T)	Date
Bagdogra (A)	41.7	15.4.1952	2.4	26.12.1961	395.5	21.7.1988	2524.1	June, 1995
Cooch Behar	41.0	11.11.1977	3.3	31.1.1964	417.3	27.11.1970	1871.6	July, 1985
Darjeeling	28.5	21.8.1970	-7.2	30.1.1971	492.8	25.11.1899	1479.8	July, 1890
Jalpaiguri	40.9	21.7.1986	2.2	3.2.1905	474.0	10.7.1999	1546.2	July, 1996
Kalimpong	35.0	23.5.2012	-0.6	27.12.1922	419.2	5.10.1968	1209.2	July, 1991
Malda	45.0	27.5.1958	3.9	3.2.1905	281.6	7.10.2004	1159.8	September, 1995

Source: India Meteorological Department, "[Extremes of Temperature & Rainfall for Indian Stations\(Upto2012\)](#)" (PDF). page no. M229-M238, issued by Climate Service Division Office of the Additional Director General of Meteorology (Research) India Meteorological Department.

Darjeeling

Darjeeling has a temperate warm climate with wet summers caused by monsoon rains. The annual mean maximum temperature is 14.9 °C while the mean minimum temperature is 8.9 °C, with monthly mean temperatures ranging from 6 to 18 °C. The average annual precipitation is 3,092 mm (121.7 in), with an average of 126 days of rain in a year. The highest rainfall occurs in July (more than 790 mm) and minimum temperature fluctuate between 14-15°C.

Kalimpong

Situated at a height of 1250 metres and between 26°51'N to 27°12'N and 88°53' E. Kalimpong has a mild and temperate climate. Summers are mild. Temperatures in winter however between a high of 17°C and a low of 5°C. The annual temperature is 18°C and the average annual rainfall is 220 cm. Kalimpong has five distinct seasons. Spring from March through April, summer in May and June, monsoon from mid-June to September, autumn in October and November and winter months stretch between December and February. The monsoons are severe and the typical rainy season is marked by heavy downpours and long, persistent drizzles.

N. Dinajpur

North Dinajpur district lies between latitude 25°11' N to 26°49' N and longitude 87°49' E to 90°00' E . The climate of this district is characterised by hot-summer with high humidity, abundant rainfall and cold winter. The summer begins from April. Monsoon starts from June and lasts till September. December and January are the coldest months.

S. Dinajpur

Under the Köppen climate classification, Dinajpur has a tropical wet and dry climate with summer monsoon. The district has a distinct monsoonal season, with an annual average temperature of 25 °C (77 °F) and monthly means varying between 18 °C (64 °F) in January and 29 °C (84 °F) in August. Maximum rainfall occurs during the monsoon in July-August.

Malda

The latitude range is 24°40'20" N to 25°32'08" N, and the longitude range is 87°45'50" E to 88°28'10" E. The climate is warm and temperate. The summers are much rainier than the winters. This location is classified as Cwa by Köppen and Geiger. In Malda, the average annual temperature is 25.4°C. Precipitation here is about 1349 mm (53.1inch) per year. The driest month is December. The greatest amount of precipitation occurs in July, with an average of 352 mm (13.9 in). The weather of Malda is usually extremely humid and tropical. Temperatures can reach as high as 42 °C during the day in May and June and fall as low as 8 °C overnight in December and January.

Seasonal Variation in North Bengal:

The Meteorological Department of India, however, divides the seasons of India into the following four seasons:

(i) Hot weather season, mid-March to May

The mean temperature of West Bengal during summer season is 20°C-30°C. but some places have temperatures ranging from 38°C-45°C. The onset of cyclone Norwesters (Kalbaishakhi) from the north-west in mid-May has resulted in thunderstorms and reduced temperatures. However, in the Darjeeling Himalaya, the summer is pleasant because of the high altitude of the land and temperature drops to 14°C-17°C. The temperature in Jalpaiguri stays below 20°C due to the cool winds of the Himalaya.

Average temperature and rainfall for some cities in summer (March to May)

SI No.	City/Station	Average temperature in °C	Average Rainfall in mm
1	Darjeeling	13.1	446
2	Siliguri	24.2	447
3	Jalpaiguri	24.0	453
4	Malda	28.3	188
	West Bengal	26.9	248.3

Source: "Climate of West Bengal", regional Meteorological Department Kolkata".

(ii) Rainy season, June to September

From this time onwards, moist southwest monsoon began to blow from the Bay of Bengal in West Bengal. The monsoon rains all over the state started within June 15. The mean annual rainfall of West Bengal is 175 cm, but about 125 cm rainfall occurs during rainy season. The amount of rainfall in Jalpaiguri and Koch Behar district during this season is about 250 cm – 350 cm. Buxaduars of Alipurduars district is the highest rainfall region in West Bengal, 455 cm annual rainfall. Over 250 cm rainfall occurs in North Bengal in this season. Due to the uneven distribution of rainfall, occasional severe floods occur in the northern region. The rivers swelled as a result of several days of heavy rains in the narrow area. Due to the accumulation of silt in the river sector, the drainage system was damaged and the water flooded.

Average temperature and Rainfall for some cities in monsoons (June to September)

SI No.	City/Station	Average temperature in °C	Average Rainfall in mm
1	Darjeeling	16.4	2796
2	Siliguri	28.1	2651
3	Jalpaiguri	28.0	2674
4	Malda	29.6	1207
	West Bengal	28.1	1649.0

Source: "Climate of West Bengal", regional Meteorological Department Kolkata".

(iii) Season of retreating monsoon, October to mid-December

After September 15, the rainfall decreases and the monsoon winds begin to recede. Rainfall and temperature both decrease during these two months from October to November. The nights feel a little chilly and the morning dew falls. The time is therefore very comfortable. However, the low-pressure belt in the Bay of Bengal and the onset of cyclones or Ashwin storms sometimes cause nuisance. That storm is more harmful than the Norwesters storm. At the end of this season, the air gradually becomes frosty.

Average temperature and Rainfall for some cities in autumn (October and November)

SI No.	City/Station	Average temperature in °C	Average Rainfall in mm
1	Darjeeling	13.4	74
2	Siliguri	23.2	181
3	Jalpaiguri	23.6	169
4	Malda	26.2	132
	West Bengal	24.3	160.4

Source: "Climate of West Bengal", regional Meteorological Department Kolkata".

(iv) Winter season, mid-December to mid-March

With the exception of the hilly region of Darjeeling in the north, the average winter temperature in other parts of West Bengal is 13° to 19°C. the highest are in the hills of Darjeeling, ranging from 0° to 5°C. occasionally there is occasional snowfall in Darjeeling during this time. There is usually no rain in winter, but westerly winds and light rainfall occur due to western disturbances.

Average temperature and Rainfall for some cities in winter (December to February)

SI No.	City/Station	Average temperature in °C	Average Rainfall in mm
1	Darjeeling	7.6	30
2	Siliguri	17.3	60
3	Jalpaiguri	18.9	36
4	Malda	20.6	27
	West Bengal	17.0	38.5

Source: "Climate of West Bengal", regional Meteorological Department Kolkata".

CONCLUSION:

Therefore, the climate of North Bengal is characterized by tropical humid climate where, Summer is warm and humid, but mild in nature than south Bengal; Winter is dry and cold, occasional snowfall occurs on the hilly regions; Region is heavy rainfall zone; Mountainous region is more temperate than tropical type; Seasonal average rainfall is high on Jalpaiguri, Koch Behar, Alipurduar, Darjeeling and Kalimpong than N. Dinajpur, S. Dinajpur and Malda; Seasonal average temperature is high on Malda, North and South Dinajpur than others district of North Bengal; Highest rainfall occurs during general rainfall season (July to August); Climate is highly influenced by monsoon wind; Seasonal variability is cyclical in nature. The climate of the mountainous region is characterised by 300-400 cm average annual rainfall, 12.6°C average annual temperature, and the minimum temperature is 8.6°C, but the southern plain is characterized by a hot and apprising summer season, plentiful rain and moisture in the air while during winter temperature drops rapidly.

REFERENCES:

1. Sam. K. and Chakma N. (2019), "An exposition into the changing climate of Bengal Duars through the analysis of more than 100 years' trend and climatic oscillations", *J. Earth Syst. Sci.* (2019) 128:67.
2. Sam. K. and Chakma N. (2019), "Variability and trend detection of temperature and rainfall: A case study of Bengal Duars", *MAUSAM*, 70, 4 (Oct 2019), 807-814.
3. Husain, Majid, "Geography of India", Tata McGraw Hill Education Private Limited, Third Edition, page no. 4.15-4.38.
4. Singh, Savindra, "Climatology", Prayag Pustak Bhawan, page no. 276-286.
5. Mishra, Swadesh (1984), "Climatic Regions of West Bengal-A Regional Climatic Study", web, <https://shodhganga.inflibnet.ac.in/> accessed 20 October, 2020.
6. Biswas, Bhudeb (1994), "Climatological Studies On Rainfall Distribution In West Bengal With Particular Reference To The Monsoon Trough", web, <https://shodhganga.inflibnet.ac.in/> accessed 29, October, 2020.
7. Karmakar, Madhusudan, (2011), "Ecotourism And Its Impact On The Regional Economy-A Study of North Bengal (India)", Web, https://www.researchgate.net/publication/316238802_ECOTOURISM_AND_ITS_IMPACT_ON_THE_REGIONAL_ECONOMY_-_A_STUDY_OF_NORTH_BENGAL_INDIA accessed 17, October, 2020.
8. Meena K. R., Dubey S. and Basak S. (2016), "Study on the pattern of rainfall distribution using some competing probability distribution in Cooch Behar District of West Bengal", *IJSR*, ISSN (online) 2319-7064, Vol. 7.
9. India Meteorological Department, "Extremes of Temperature & Rainfall for Indian Stations(Upto2012)" (PDF), page no. M229-M238, issued by Climate Service Division Office of the Additional Director General of Meteorology (Research) India
10. "Climate of West Bengal", regional Meteorological Department Kolkata, Wikipedia, web, https://en.wikipedia.org/wiki/Climate_of_West_Bengal accessed 10, Nov, 2020.
11. "Alipurduar district", Wikipedia, 8th Nov, 2020, web, https://en.wikipedia.org/wiki/Alipurduar_district accessed 15, Nov, 2020.
12. "Cooch Behar", Wikipedia, 2020, web, https://en.wikipedia.org/wiki/Cooch_Behar accessed
13. "Location of Cooch Behar District within West Bengal", web, http://coochbehar.nic.in/htmlfiles/CoB_inWB.html accessed 18, Nov, 2020.
14. "Jalpaiguri District", Wikipedia, Nov, 2020, web, https://en.m.wikipedia.org/wiki/Jalpaiguri_district accessed 18, Nov, 2020.
15. "Darjeeling Climate (India)", CLIMATE-DATA.ORG, web, <https://en.climate-data.org/asia/india/west-bengal/darjeeling-33809/> accessed 25, Nov, 2020.
16. "Kalimpong", Wikipedia, 2020, web, <https://en.wikipedia.org/wiki/Kalimpong> accessed 5, Dec, 2020.
17. "Gangarampur", Wikipedia, 2020, web, <https://en.wikipedia.org/wiki/Gangarampur> accessed 5, Dec, 2020.
18. "Dinajpur District, Bangladesh", Wikipedia, 2020, web, https://en.wikipedia.org/wiki/Dinajpur_District,_Bangladesh accessed 5, Dec, 2020.
19. "Malda district", Wikipedia, 2020, web, https://en.wikipedia.org/wiki/Malda_district accessed 1, Dec, 2020.