

The Climate of West Bengal State



Introduction

The state of West Bengal extending from the Bay of Bengal on the south to the sub-Himalayan region to the north and from hills and Gangetic plains of Jharkhand and Bihar on the West to riverine Bangladesh with innumerable deltas of the Ganges and the Brahmaputra, has climate of varied nature in view of its geographical location. It lies roughly between 21°30'N and 27°11'N latitude and 85°49'30"E and 89°54'E longitude. Front piece gives the orographic features of the state. The state is bounded on the north by Sikkim, Bhutan and by the mighty chain of Himalayas; on the west by Nepal and the districts of Santhal Parganas viz., Deoghar, Godda, Sahebganj, Dumka, Singbhum East and Singbhum West, Dhanbad, Hazaribagh, Ranchi, Singbhum in Jharkhand, Purnea in Bihar and the districts of Mayurbhanj and Balasore in Orissa, on the south by the Bay of Bengal; and on the east by the districts of Kamrup, Garo hills in Assam and Bangladesh. Fig.1 depicts the physical features of the state. The inset Fig. 1(a) indicates its position in the country.

West Bengal contains tracts of very different physical features like alluvial plains of the Ganges together with its deltas and a small portion of the sub-Himalayan region which form the main part of Darjeeling district. The part of West Bengal, west of Bhagirathi lies outside the true delta. The eastern portion of this tract is low and of alluvial formation; but farther west laterite begins to predominate and the surface rises and becomes more and more undulating and rocky, until at last it merges in the uplands of Chhota Nagpur. The part of West Bengal east of Bhagirathi and south of the Padma is formed out of the Ganges

delta. North Bengal lies north of the Padma and is wholly alluvial with the exception of the sub-Himalayan region in the district Darjeeling.

Rivers

The network of river Ganges provides the state with the most striking feature. The river Ganges flows due east as far as Rajmahal hills with Sinusoidal track and enters Malda district of West Bengal. From this point it follows a southerly course as Bhagirathi. As Bhagirathi silted up gradually, the main stream of Ganges was forced to give rise to tributaries: the Ichamati, the Jalangi and the Matabhanga which in turn became the main stream. The Ganges is known as Padma from south of the point where the Bhagirathi leaves it. Along the northern part of Bengal numerous rivers move out of the Himalayas. At present the chief Himalayan tributary of the Ganges in this state is the Mahananda while the Tista is an affluent of the Brahmaputra. On its right bank, the Ganges receives the Bhagirathi, which in the latter part of its course is called the Hooghly. The Ganges is fed by waters of the Damodar and Rupnarayan coming from the same direction. Further south several rivers which drain Chhota Nagpur plateau run through the districts East and West Medinipur before reaching the Bay of Bengal. The Kasai, the Haldi and Subarnarekha are some of them.

The process of land formation which is active along the shores of the Bay of Bengal gives rise to new islands. These islands are gradually joined with the mainland as the channels separating them from the mainland silt up. Sagar Island, off the mouth of the Hooghly, is an important island for centuries.

Although major portion of the state lies beyond the tropical zone, its climate during 8 months of a year, i.e. from the middle of March to the end of October is tropical in nature. During this period the state except for sub-Himalayan region experiences both high temperature and humidity as well as a dry and a wet season. During the rest period the temperature is much lower, humidity is moderate and rainfall is less. The climate of the state is characterized by hot and moist summer, cold and dry winter except in the sub-Himalayan region. The sub-Himalayan regions are very pleasant in the hottest months.

Meteorological sub-divisions

For meteorological purposes, the state has been divided into two sub-divisions namely:

- (a) Gangetic West Bengal consisting of the districts: (1) Bardhaman (2) Bankura (3) Birbhum (4) East Medinipur (5) Hooghly (6) Howrah (7) Kolkata (8) Murshidabad (9) Nadia (10) North 24 Parganas (11) Purulia (12) South 24 Parganas and (13) West Medinipur.
- (b) Sub-Himalayan West Bengal consisting of the districts: (1) Cooch Behar (2) Darjeeling (3) Jalpaiguri (4) Malda (5) North Dinajpur and (6) South Dinajpur.

Climate

Areas in the state under each climatic pattern based on Koppen's classification are shown in Fig. 2. The climate of the state comes under two distinct types. The major parts of sub-Himalayan West Bengal belongs to the type: sub-tropical monsoon, mild winter; dry winter, hot summer (Cwa) and Gangetic West Bengal and adjoining southern parts of Sub-Himalayan West Bengal belongs to the type: Tropical Savanna Hot; seasonally dry (usually winter) (Aw). However, northern most part viz., Darjeeling district has a climatic type: Tropical upland, mild winter; dry winter; short warm summer (Cwb).

The year may be divided into four seasons. The winter season from December to February is followed by the premonsoon season (hot weather season) from March to May. The period from June to the middle of September constitutes the southwest monsoon and the period from the latter half of September to November is the post monsoon period.

The period from December to February is generally very unpleasant due to low temperatures over the sea except in the coastal belt. In the hot weather season from March to May, weather is dry and uncomfortable in the interior. Due to lower temperatures, the hilly regions are however, comparatively less uncomfortable. Weather tends to be oppressive during June due to high humidity and temperature. The rest period of the monsoon is fairly comfortable due to reduced day temperatures, although humidity continues to be high.

Sea Level Pressure and Winds

The seasonal variation of atmospheric pressure over the state takes place in a systematic manner with a maximum in the winter and a minimum in the monsoon season (June and July). The pressure gradient over the state generally remains weak except during the late summer and monsoon season. During winter the higher pressure is to the north. In April, the pressure increases from northwest to the northeast. Accordingly the winds, which are light and mainly from a northerly direction in January turn gradually anticlockwise and

are replaced by light winds from a southerly direction in April. With the advance of the summer the pressure gradient increases and correspondingly the winds from south to southwest also strengthen reaching their maximum strength in May. In the monsoon season a trough over the Head Bay extends northwestwards through Gangetic West Bengal and accordingly, winds are from a westerly direction on the southern side of the trough and from an easterly direction on the northern side of the trough. Oscillation of the monsoon trough plays an important role in determining the flow of air over the state. When this trough shifts southwards, easterly winds become prominent in the state and when the trough shifts northwards westerly winds become prominent. October is the month of transition with the weakest pressure gradient. From October onwards, the change over of the pressure and wind pattern to the winter pattern commences. Table 1 gives the monthly mean wind speed in kilometer per hour, for the observatory stations in the state. In addition, predominant wind directions in the morning and evening have been included. For each sub-division, the mean monthly wind speed is given at the bottom of the respective sub-divisional table.

Temperature

Table 2 gives the mean daily maximum and minimum temperatures at the observatory stations in the state. Fig. 2(a, b, c, d) and 3(a, b, c, d) show the distribution of mean maximum and mean minimum temperatures respectively for the selected months. Fig. 4 and 5 give the extremes of temperature ever recorded in respect of observatory stations. These values were obtained based on data available upto 2001, the oldest observatory being Sagar Island, which has started functioning in 1865.

Day temperatures are more or less uniform over the plains during the monsoon and post monsoon seasons (increases westwards in premonsoon and southwards in winter).

In the state, the night minimum temperatures are lower in higher latitudes. Both day and night temperatures are lower at high level stations than over the plains.

May and April are the hottest months with the mean maximum temperatures of 35.6°C and 33.8°C in the Gangetic and sub-Himalayan West Bengal respectively.

The highest maximum temperature ever recorded at an individual station in the plains is 48.3°C at Berhampore observatory in Murshidabad district on 23rd May 1981, which is about 13°C higher than the normal of the warmest month. January is the coldest month in the state when the mean minimum temperature for the Gangetic West Bengal and the sub-Himalayan West Bengal are 13.3°C and 10.5°C respectively. The lowest minimum

temperature recorded at an individual station in the plain was 0.9°C at Krishnanagar observatory in Nadia district on 2nd January 1986 which was 12°C below the normal for the coldest month. The lowest minimum temperature ever recorded at an individual station in the sub-Himalayan West Bengal is -7.2°C on 30th January 1971 at Darjeeling observatory.

Both the maximum and minimum temperatures rise rapidly from February onwards till April in sub-Himalayan West Bengal and till May in the Gangetic West Bengal. The increase in maximum temperature in the period from January to April/May ranges from about 8°C to 12°C at individual stations in sub-Himalayan West Bengal depending upon the altitude of the stations above mean sea level and from about 6°C to 13°C at individual stations in Gangetic West Bengal depending upon the distance of the stations from the Bay of Bengal. In Gangetic West Bengal from the beginning of June to the end of July the maximum temperature falls only by about 1°C to 3°C whereas the minimum temperature falls only by about 0.1°C to 1.4°C from June to September. In the northern portions of West Bengal close to the foot hills of Himalayas from beginning of June to the end of September, the maximum temperature decreases very slowly whereas the minimum temperature rises or remain almost constant from June to August, contrary to minimum temperature trend in Gangetic West Bengal where, minimum temperature decreases or remain constant. In September, a slight rise in the maximum temperature is experienced in Gangetic West Bengal due to increased insolation. The night temperatures start falling rapidly after September while the day temperature follows this trend after October and both attain lowest values by January. The fall in minimum temperature and maximum temperature is about 6°C to 11°C and 3°C to 5°C respectively during these periods in Gangetic West Bengal and the same is about 3°C to 7°C and 6°C to 13°C respectively during the above period in sub-Himalayan West Bengal.

July and August have the smallest diurnal range of temperature (about 6°C to 7°C). The diurnal range increases rapidly after the withdrawal of the monsoon. During the period from November to May, the diurnal range is of the order of 10°C to 15°C, being greatest in March for sub-Himalayan West Bengal and in December for Gangetic West Bengal. This range is minimum in coastal areas.

Humidity

Table 3 gives the mean relative humidity at 0830 and 1730 hours IST for the individual stations in the state. The relative humidity is generally high during the period from July to September. It is about 80% in June rising to about 83%-85% in July, August and September in the morning. The diurnal variation of relative humidity is least during monsoon season. The relative humidity is lowest during the summer afternoons when it becomes

about 38 to 50% at the plain inland stations. The diurnal variation is highest during the period January to May in plain and inland stations.

Cloudiness

The period from December to March, is cloudless or lightly clouded. Afternoons are however, comparatively more clouded than forenoons, particularly in summer. During monsoon season (June to September) skies are heavily clouded particularly during July and August, when about 6 oktas of the sky are covered with clouds. On an average in each of these two months, the sky remains overcast for 8 to 9 days per month and does not remain clear on a single day in Gangetic West Bengal and 9 to 13 days per month in Sub-Himalayan West Bengal in the afternoon. During October, clouding decreases to a great extent over the entire state.

Tables 4 and 4(a) give the number of days of clear and overcast skies and mean monthly total cloud amount at 0830 and 1730 hours IST respectively.

The mean hours of bright sunshine for different months for some observatory stations in the state are indicated in Table 4(b), maximum and minimum number of bright sunshine hours are in February to April and July respectively. Average bright sunshine in a year is more than 6 hours per day.

Rainfall

Table 5 gives district wise and sub-divisional normals for monthly and annual rainfall and the number of rainy days based on rainfall data for the period 1951-2000. Figures 6 and 6(a) to 6(d) show the annual and seasonal distribution of rainfall.

The total annual rainfall in the plains of the state increases from 142 cm over the southern parts to 371 cm over the northern parts while it decreases to 116 cm over the northwestern parts of Gangetic West Bengal. The foothills of Himalayas receive maximum amount of annual rainfall varying from 205 cm to 450 cm. The southwest monsoon is the principal rainy season when the plains of the state receive almost 74% to 83% of annual rainfall amount whereas the hills of West Bengal receive 73% to 87%. Rainfall in the winter season (December to February) is about 3% of the annual total in Gangetic West Bengal and 1% of the annual total in the plains of the northern parts whereas it is varying from 1% to 5% in the hills of West Bengal. In the hot weather season (March to May), rainfall is about 11% of the annual total in Gangetic West Bengal and 14% in northern parts (plains) respectively and is varying from 10% to 18% in the hills of West Bengal.

Jalpaiguri, a district in the north Bengal receives the maximum amount of rainfall in a year whereas Bankura, a district in the northwest recorded minimum amount in the state. The mean annual district rainfall varies from 116 cm in Bankura district to 371 cm in Jalpaiguri, the same for the state as a whole being 189 cm.

The southwest monsoon sets in over the state by about the first week of June and extends over the entire state by the second week of June. July is the rainiest month in sub-Himalayan West Bengal as well as in Gangetic West Bengal, each of the rainiest months individually accounting to about 25% and 22% of the annual rainfall of the respective sub-division. In June, August and September, rainfall varies from 16% to 20% of the annual rainfall in Gangetic West Bengal and 16 to 19% in Sub-Himalayan West Bengal. In the southwest monsoon months, there are 11 to 18 rainy days (with daily rainfall of at least 2.5 mm) over the state.

The withdrawal of the southwest monsoon begins from the northern parts of the state towards the end of the 1st week of October and by 2nd week, the monsoon withdraws from the entire state.

The features of rainfall described above are also evident from Fig. 7(a) and 7(b), which show the annual and seasonal rainfall for the individual districts and for the subdivisions Gangetic West Bengal and Sub Himalayan West Bengal respectively.

During winter (December to February) the state receives about 3.5 cm of rainfall which although small in amount is of great significance for Agriculture. This rainfall occurs during the passage of western disturbances moving from West to East across the northern parts of the country.

Table 6 gives the monthly and annual rainfall for various river catchments (322, 323, 324, 325, 418, 504, 505) in the state and are depicted in Fig. 8. It shows that the river catchments of sub-Himalayan West Bengal receive rainfall much higher than that of catchment areas in Gangetic West Bengal. The catchment of River Brahmaputra upto Bangladesh border, including River Dihang, River Lohit, streams between River Subansari and Manas and between Manas and Tista, excluding Tista and its tributaries is fed by maximum amount of annual rainfall which is about 387 cm. The catchment of River Tista upto Bangladesh border receives annual rainfall amount of 326 cm. In other catchments of West Bengal, annual rainfall varies from 120 cm to 259 cm.

Rainfall Variability

The spatial distribution of coefficient of variation of annual rainfall over West Bengal is shown in Fig. 9.

Coefficient of annual rainfall is expressed in percentage as:

$$\frac{\text{Standard deviation } (\sigma)}{\text{Normal (N)}} \times 100$$

Where σ = Standard Deviation

N = Normal of the annual rainfall

This is generally less than 30% over the sub-Himalayan West Bengal, partly eastern districts of Gangetic West Bengal mainly Nadia, Hooghly etc., and north western parts of Gangetic West Bengal i.e. Bankura district whereas, over the coastal district South 24 Parganas coefficient of rainfall variation is about 35%.

Fig. 9(a) to 9(d) show coefficient of rainfall variation for premonsoon, southwest monsoon, post monsoon and winter season.

In the monsoon season, extreme northern parts of West Bengal have coefficient of rainfall variation less than 25% whereas the rest of the state has 20% to 35%. It is generally between 55% and 90% over the state in the post monsoon season. In winter, it is extremely high, ranging between 80% and 130%. In the hot weather season, it is more than 60% over coastal belts, less than 40% in sub-Himalayan West Bengal and the rest of the state has 50% to 80%.

Droughts and Excessive Rainfall

A. Droughts

Meteorologically drought over an area or place may be defined as a situation when annual rainfall over the area or place is less than 75% of the normal. It is classified as 'moderate drought' if rainfall deficit is between 25 to 50% and 'severe drought' when it is more than 50%. Areas where frequency of drought as defined above is 20% of the years examined are classified as 'drought areas' and areas having drought condition for more than 40% of the years under consideration represent "chronically drought affected areas".

There is not a single district in the state during 1951-2000, which satisfied the criteria for 'chronically drought affected area', and one district i.e. Nadia which satisfied the criteria for 'drought area'.

All districts of the state except Bankura and Purulia were affected by drought during some year or other during the period 1951-2000. During the fifty year period 1951-2000, drought conditions as prevailed over the state are as described below: The figures within the brackets against each district indicate the number of occasions during the fifty year period when these districts were affected by drought. Bardhaman (1), Birbhum (3), Cooch Behar (2), East Medinipur (2), Hooghly (3), Howrah (2), Jalpaiguri (3), Kolkata (4), Malda (7), Murshidabad (1), Nadia (7), North Dinajpur (1), North 24 Parganas (3), South Dinajpur (4), South 24 Parganas (5), West Medinipur (1).

The details of yearwise occurrence of drought over each district are given in Table (i).

Table (i)

District	Years of Drought	Lowest amount of rainfall (expressed as % of annual normal) with year
Bardhaman	1966	89.0 cm in 1966 (72%)
Birbhum	1954, 1965, 1982	83.3 cm in 1982 (65%)
Cooch Behar	1978, 1994	198.5 cm in 1994 (61%)
Darjeeling	1980, 1994	65.9 cm in 1980 (20%)
East Medinipur	1957, 1964	111.0 cm in 1964 (71%)
Hooghly	1967, 1968, 1982	59.6 cm in 1982 (42%)
Howrah	1954, 1982	89.2 cm in 1982 (57%)
Jalpaiguri	1972, 1992, 1994	241.4 cm in 1994 (65%)
Kolkata	1953, 1954, 1966, 1982	113.1 cm in 1982 (66%)
Malda	1951, 1957, 1966, 1972, 1979, 1986, 1994	62.1 cm in 1979 (44%)
Murshidabad	1962	99.3 cm in 1962 (72%)
Nadia	1960, 1961, 1972, 1978, 1979, 1981, 1998	53.4 cm in 1979 (39%)
North Dinajpur	1974	89.0 cm in 1975 (52%)
North 24 Parganas	1966, 1979, 1982	108.9 cm in 1966 (72%)
South Dinajpur	1961, 1962, 1966, 1972	94.0 cm in 1966 (56%)
South 24 Parganas	1951, 1954, 1957, 1964, 1979	107.7 cm in 1979 (61%)
West Medinipur	1954	89.5 cm in 1954 (63%)

Occurrence of drought conditions in successive years is not frequent in the state. However, individual districts have successive years of drought. Severity of drought not only depends upon the order or rainfall deficiency in a single year, but also on the continued occurrence of deficient rain in successive years, even though the deficiency in each successive years, may not be as high as in a single year. The following Table (ii) depicts district wise years of successive drought during the fifty year period 1951-2000.

Table (ii)

Years of Successive Drought	Names of the district Affected
1967-1968	Hooghly
1953-1954	Kolkata
1960-1961, 1978-1979	Nadia
1961-1962	South Dinajpur

Fig. 10 shows percentage frequency of drought and years of successive drought in the districts during the period 1951-2000.

The following table (iii) shows the years of severe drought for various districts, with the actual rainfall expressed as percentage of normal rainfall, given in brackets, against each district.

Table (iii)

Years of Severe Drought	Affected Districts
1980	Darjeeling (20%)
1982	Hooghly (42%)
1972, 1979	Malda (44%)
1979	Nadia (39%)

Incidence of widespread drought over the state in any particular year was not common. In the years 1954, 1966, 1972, 1979, 1982 and 1994 three – four districts in the state were affected by drought.

There was no drought anywhere in the state in the following 27 years:

1952, 1955, 1956, 1958, 1959, 1963, 1969, 1970, 1971, 1973, 1974, 1976, 1977, 1983, 1984, 1985, 1987, 1988, 1989, 1990, 1991, 1993, 1995, 1996, 1997, 1999 and 2000. The districts Malda and Nadia experienced the maximum number (7 years) of drought conditions during the fifty years under consideration.

B. Excessive rainfall

Rainfall sufficiently in excess of the normal, is a predominant factor for occurrence of floods, particularly in high rainfall regions. Even with a coefficient of variation of rainfall of 20% or less, regions are prone to frequent floods. Since the coefficient of variation of annual rainfall is less than 25% in the state, the state is prone to floods. For the purpose of the present description annual rainfall of 125% or more of the normal is considered as excessive rain.

Fig. 11 shows the percentage frequency of excessive rainfall and successive years of excessive rainfall during the period 1951-2000.

The following Table (iv) gives the district wise excessive rainfall and highest annual rainfall (expressed as percentage of normal) with the year of occurrence.

Table (iv)

District	Years of Excessive Rainfall	Highest amount of rainfall (expressed as % of annual normal) with year
Bankura	1959, 1964, 1968, 1969, 1971, 1978, 1985, 1987, 1995, 1997, 1999	201.0cm in 1971 (174%)
Bardhaman	1956, 1959, 1970, 1971, 1974, 1977, 1978, 1984, 1990, 1991	205.2 cm in 1971 (166%)
Birbhum	1956, 1959, 1971, 1977, 1978, 1980, 1988, 1989, 1994, 1995, 1997, 1999	206.4 cm in 1978 (161%)
Cooch Behar	1958, 1974, 1984, 1985, 1987, 1988, 1990	748.6 cm in 1990 (230%)
Darjeeling	1962, 1977, 1989, 1990, 1991, 1995, 1998	540.4 cm in 1998 (164%)

Table (iv)

District	Years of Excessive Rainfall	Highest amount of rainfall (expressed as % of annual normal) with year
East Medinipur	1956, 1965, 1966, 1971, 1973, 1986, 1990, 1993, 1995, 1999	257.9 cm in 1965 (165%)
Hooghly	1951, 1956, 1959, 1971, 1974, 1977, 1986, 1993	275.2 cm in 1951 (194%)
Howrah	1952, 1971	237.8 cm in 1971 (152%)
Jalpaiguri	1952, 1954, 1955, 1966, 1967, 1968, 1983, 1984, 1998	676.0 cm in 1984 (182%)
Kolkata	1971, 1978, 1984, 1986, 1990, 1993, 1999	260.5 cm in 1999 (152%)`
Malda	1953, 1981, 1987, 1991, 1993, 1995, 1997, 1998, 1999	235.8 cm in 1995 (167%)
Murshidabad	1959, 1971, 1988, 1993, 1995, 1998	233.0 cm in 1971 (169%)
Nadia	1952, 1971	237.8 cm in 1971 (152%)
North Dinajpur	1998	248.1 cm in 1998 (145%)
North 24 Parganas	1959, 1968, 1970, 1971, 1977, 1978, 1981, 1984, 1986, 1990, 1995, 1999	252.7 cm in 1971 (167%)
Purulia	1953, 1959, 1977, 1978, 1984, 1987, 1990, 1993, 1995	214.3 cm in 1978 (176%)
South Dinajpur	1952, 1953, 1956, 1987	322.3 cm in 1953 (192%)
South 24 Parganas	1956, 1971, 1977,, 1981, 1986, 1988, 1990, 1991, 1995	646.4 cm in 1995 (366%)
West Medinipur	1956, 1968, 1971, 1973, 1978, 1986, 1989, 1990, 1993, 1997, 1999	270.0 cm in 1971 (190%)

From the above table, it is seen that during the fifty year period 1951-2000, there were 38 years in which some districts or other in the state recorded excessive rainfall, the maximum amount being 748.6 cm, 230 % of the annual normal rainfall in the year 1990 for the district Cooch Behar. The district Birbhum has experienced maximum number of years (12) of such rainfall. In the year 1971, a large number of districts (12) of the state experienced excessive rainfall.

The successive years of excessive rainfall against each district are listed below:

Table (v)
Successive years of Excessive Rainfall (Districtwise)

Successive Years of Excessive Rainfall	Districts
1968-1969	Bankura
1970-1971, 1977-1978, 1990-1991	Bardhaman
1977-1978, 1988-1989, 1994-1995	Birbhum
1984-1985, 1987-1988	Cooch Behar
1989-1990-1991	Darjeeling
1965-1966	East Medinipur
1954-1955, 1966-1967-1968, 1983-1984	Jalpaiguri
1997-1998-1999	Malda
1970-1971	Nadia
1970-1971, 1977-1978	North 24 Parganas
1977-1978	Purulia
1952-1953	South Dinajpur
1990-1991	South 24 Parganas
1989-1990	West Medinipur

The heaviest one day rainfall on record at any station in the state is 884.5 mm at Sagar Island observatory of South 24 Parganas district on 22nd July 1991.

Cyclonic Storms and Depressions

Cyclonic storms and depressions in the Bay of Bengal which affect the weather of West Bengal give rise to storm surges and gale winds in the coastal belts. The height of the storm surges and wind force along the coast increases as the systems approach the area. These storm surges and gale winds especially associated with storms cause heavy loss of lives and damage to houses, other properties and standing crops in the low lying agricultural land. As the storms/depressions approach the coast more and more damage to life and property occur. The devastating effect reaches its peak when the storms cross the coast.

Table VII gives the total number of storms/depressions which affected the state during the period 1891-1990.

The cyclonic storms and depressions which affect West Bengal originate and intensify over the Bay of Bengal, mostly during May to November. They usually travel west-northwest and cross the coast. In general, storms and depressions weaken on entering the land. Hence, the state, being situated on the east coast of India, experiences very frequently the full fury of the severe storms and depressions of the Bay. Maximum number of storms affect the state in July/August. During their course of movement the systems sometimes turn or recurve towards north or northeast. This point of turning progressively shifts westwards till September. For example, the systems in May recurve while still out in the Bay of Bengal. As such, exceptionally few of them which cross the coast and travel inland affect the weather of the state in May.

During the period 1891-1990, there was no Bay storm during January-April which affected the weather of West Bengal whereas 55 and 26 storms/depressions affected the weather of the state in October and in November respectively. During the period from June to September the systems form over the Head Bay of Bengal and while traveling westwards pass across Orissa-West Bengal, Bihar and Madhya Pradesh. Sometimes they move west or northwestwards as far as Rajasthan and recurve north, northeastwards under the influence of slow moving deep westerly system across Pakistan and northwest India. During the period 1891-1990, 530 storms/depressions influenced the weather of West Bengal state.

The track of the Bay cyclones is more in southerly latitudes in October and November and 55 such storms and depressions of October/November influenced the weather of West Bengal.

Other Weather Phenomena

Thunderstorms and Duststorms

Convective activity is essential for the occurrence of thunderstorms and dust storms. With the advance of the summer, thunder activity becomes pronounced due to ground heating. When the moisture is insufficient in the atmosphere, dry thunderstorms or dust storms occur. Maximum number of thunderstorms occur with the approach of the monsoon current, while dust storms are mainly confined to the summer months of April-June. Hail occur in the state during the period from March-September.

Squalls occasionally occur mainly during the premonsoon and monsoon period. The average number of days of thunderstorms during monsoon varies from 5 to 50, in the plains. Thunderstorm activity attains its maximum in June and September. Even in the winter months, the state may experience thunderstorms resulting from low pressure areas induced due to eastward moving upper air disturbances known as 'Western Disturbances'. Thunder activity is generally minimum in the month of December.

Norwesters

Premonsoon thunderstorm activity of West Bengal, plays an important role in Indian Climatology. These thunderstorms are generally associated with squalls and torrential rain in the premonsoon months March, April and May and are known as 'Norwesters', also locally known as 'Kalbaisakhi'. Majority of these thunderstorms originate in the afternoon over Chhota Nagpur hills in Jharkhand where a heat low develops. They move southeast towards the Head Bay of Bengal and are sometimes associated with hail. There is a type which originates from the hills flanking northern and eastern border of northeast India in the night or early morning. From the hilly region of sub-Himalayan West Bengal they move south towards the mouth of Meghna River in Bangladesh. Very rarely these thunderstorms originate over Khasi hills in the forenoon and travel from northeasterly or easterly direction.

Tornado

These occur in the form of a narrow funnel below the base of the thunderstorm cloud and on the water surface it is known as water spout. It is a vortex with high angular velocity and large pressure defect inside and has an almost vertical axis. It can do a lot of damage by virtue of its churning motion when it reaches the ground surface. Records of tornado occurrence though rare in India show that maximum number of tornadoes were reported from West Bengal. It is worth mentioning that on 9th April 1993, a severe tornado hit Murshidabad and adjoining areas with a speed of 250 kmph.

Fog

Hill fog is frequent during the rainy months of July and September, when air is almost saturated and is easily cooled below the dew point while rising over high elevations. Condition like light to calm wind, clear skies etc., which favour the occurrence of radiation fog exist after the withdrawal of the monsoon till February. But due to lack of sufficient moisture, fog occurs only occasionally, the maximum frequency of occurrence being only about 5 to 20 in January in southern parts of West Bengal.

**TABLE – I
MEAN WIND SPEED (kmph) AND PREDOMINANT WIND DIRECTION**

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
GANGETIC WEST BENGAL														
Alipore	a	3.3	4.4	6.0	8.7	9.7	7.8	6.8	6.0	5.4	4.0	3.6	3.0	5.7
	m	C/NW/N	C/N	SW/C	S/SW	S	S	S	SE	C/S	C/NE	C/N	C/NW/N	
	e	C/NW/N	C/NW	S/C	S	S	S	S	S/SE	C/S	C/NW	C/NW	C/NW	
Bagati	a	2.1	2.5	3.7	6.5	7.3	5.1	5.3	4.0	4.3	2.8	1.5	1.7	3.9
	m	N	N	SW	SW	SW/S	SW/S	S	S	SW/S	N/SW	N	N	
	e	N	N	S	S	S	S	S	S	S	S	N	N	
Bankura	a	1.9	1.8	2.2	2.1	2.5	2.7	2.9	2.4	2.5	2.1	1.8	1.6	2.2
	m	C/W	C/W	C/W	C/W	C/S	C/S	C/SW	C/NE	C/S	C/NE	C/N	C/W	
	e	C	C	C	C/Var	C/Var	C/Var	C/SW	C/Var	C/Var	C	C	C	
Bardhaman	a	3.1	3.7	5.8	7.3	10.1	9.0	8.7	7.5	6.8	4.8	3.5	2.9	6.1
	m	NW	NW	NW/SW	SW/S	SE/SW	SE/SW	SE/SW	SE	SE	NW	NW	NW	
	e	NW	NW	NW/C	SE/S	SE	SE	SE	SE	SE	C/N	C/NW	NW	
Berhampore	a	0.8	1.3	2.3	3.7	5.4	4.7	3.9	3.3	2.6	1.3	0.7	0.6	2.6
	m	C	C	C/Var	C/S	C/S/E	C/S	C/Var	C/W	C/Var	C/Var	C/Var	C	
	e	C	C	C	C/Var	C/E/S	C/Var	C/Var	C/Var	C	C	C	C	
Canning	a	-	-	-	-	-	-	-	-	-	-	-	-	-
	m	N/NE	N/NE	SW	SW	SW/S	SW	SW/S	SW	S	NE/N	N/NE	N/NE	
	e	C	C/S	S	S	S	S/SW	S/SW	S	S	C/S	C	C	
Contai	a	3.8	5.7	9.7	14.4	16.8	12.6	10.6	9.2	7.7	4.4	2.9	2.9	8.4
	m	N	N	SW/N	SW	SW	SW	SW	SW/SE	SW	N	N	N	
	e	C/S	S	S	S	S	S	S	S	S/SE	C/S	C/Var	C/S	
Diamond Harbour	a	-	-	-	-	-	-	-	-	-	-	-	-	-
	m	C/NE/N	C/NE	C/SW	C/S/SW	C/S/SW	C/S/SW	C/S/SW	C/SW	C/SW	C/Var	C/NE	C/NE/N	
	e	C	C/Var	C/SW/S	S/SW	S	C/S	C/S/SW	C/SW	C/S	C	C	C	
Digha	a	1.7	3.0	5.7	9.1	9.3	8.2	7.3	5.8	4.7	2.4	1.5	1.5	5.0
	m	C/N	C/N	C/S/SW	S/SW	S	SW/S	SW	C/SW	C/S/SW	C/N	C/N	N/C	
	e	C/SE	C/S/SE	S	S	S	S/SW	S/SW	S	S/C	C/S	C	C	
Dum Dum	a	3.5	4.5	7.3	11.9	13.9	11.1	10.3	8.8	7.4	4.9	3.5	3.0	7.5
	m	N/C	N	S	S	S	S	S	S	S/SE	N	N	N	
	e	C/N	C/N	S/C	S	S	S	S	S	S	C/S	C/N	C/N	
Haldia	a	3.7	5.4	9.8	13.7	12.4	11.9	11.2	9.4	7.6	4.6	3.9	3.7	8.1
	m	C/NW	C/NW	C/SW	SW	SW/S	SW/S	SW	S/SW/C	C/SE	C/NW	N	C/N	
	e	C/NW	C/S/NW	S/SW	S	SW	S/SW	S/SW	SE/SW	S/SE	C/SE/S	C/NW	C/NW	

**TABLE – I Contd....
MEAN WIND SPEED (kmph) AND PREDOMINANT WIND DIRECTION**

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
GANGETIC WEST BENGAL														
Krishnanagar	a	1.7	2.8	5.2	8.0	10.2	8.2	6.5	5.1	4.0	2.9	1.8	1.4	4.8
	m	C	C	C	C	C	C	C	C	C	C	C	C	
	e	C	C	C	C/S	C	C	C	C	C	C	C	C	
Midnapore	a	3.3	3.9	5.5	7.5	9.0	6.8	5.7	5.0	4.1	3.2	3.1	3.2	5.0
	m	C/N/NE	NE	C/NE	C/S/W/S	S/S/W	S/S/W	SW/S	C/S	C/S/S/W	C/NE/N	C/N/NE	N	
	e	C/N	C/N/S	C/S	S	S	S	S	S	C/S	C/S	C/N	C	
Panagarh(A)	a	2.2	3.0	4.3	6.6	7.7	7.1	5.9	5.8	4.8	2.6	2.0	2.0	4.5
	m	C/NW	C/NW	C/W/NW	S	S	S/SE	S	E/S	S	C/NE	C/N	C/NW	
	e	C	C/NW	C/NW	C/SE	SE/E	SE	S/SE	C/SE	C/SE	C	C	C	
Purulia	a	3.1	3.9	4.5	5.6	6.7	6.7	6.0	5.4	4.9	3.5	2.9	2.8	4.7
	m	NW	NW	NW/C	C/NW	C/SE	SE	SW	SE/C	C/SE	C/NW	NW	NW	
	e	C	C/NW	C/NW	NW/C	NE/SE	SE	C/SE	SE/C	C/SE	C	C	C	
Sagar Island	a	10.5	12.6	18.4	25.6	28.4	24.8	24.2	20.7	16.9	11.5	10.5	10.5	17.8
	m	N	N/NE	SW	SW	SW/S	SW	SW	SW/S	SW/S	NE/N	N/NE	NE/N	
	e	N	S	S	S	S	S/SW	SW/S	S/SW	S/SW	SW	N/NE	N/NE	
Sand Heads	a	-	-	-	-	-	-	-	-	-	-	-	-	-
	m	N/NE	SW	SW	SW	SW	SW	SW	SW	SW	NE	N	N	
	e	N	SW	SW	SW	SW	SW	SW	SW	SW	N	N	N	
Shantiniketan	a	5.0	5.6	6.8	8.8	10.2	9.0	8.4	7.0	6.2	4.0	4.4	4.8	6.7
	m	NW	NW/C	W/NW	SW	S	S/SE	S/SW	SE	SE	C/NE	NW/NE	NW	
	e	C/NE	C/NW	C/W/NW	SE	SE/S	SE/S	S/SE	SE/S	C/SE/S	C/NE	C/NE	C/NE/NW	
Suri	a	4.5	5.7	6.8	8.5	9.3	8.2	7.2	6.2	5.5	4.2	4.0	4.4	6.2
	m	NW/N	W/NW	W	S	S/SE	S/SE	S	S/SE	S	N	N	NW/N	
	e	-	-	-	-	-	-	-	-	-	-	-	-	
Uluberia	a	3.0	4.8	5.2	8.6	9.4	7.0	6.8	5.4	5.0	4.0	3.7	3.1	5.5
	m	C/NE	NE/C	SW	SW	SW/SE	SE/SW	SW/SE	SE/SW	SW	NE	NE/NW	C/NE/NW	
	e	C/NE	C/NE	SE/C	SE	SE	SE	SE/SW	SE	SE/C	C/NE	C/NE	C/Var	
Sub.Div.Means.	a	3.6	4.7	6.8	9.8	11.1	9.4	8.6	7.3	6.3	4.2	3.4	3.3	6.5

**TABLE – I Contd.....
MEAN WIND SPEED (kmph) AND PREDOMINANT WIND DIRECTION**

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
SUB-HIMALAYAN WEST BENGAL													
Balurghat	a	2.5	3.0	4.6	7.1	7.4	6.5	6.2	5.0	3.2	2.4	2.4	4.7
	m	C/N	C/W	W/C	SE/E	SE	SE	SE/C	C/SE/E	C/E	C/NE	C/N	
	e	C	C	C/W	C/E/SE	C/SE/E	C/SE	C/SE/E	C/SE	C	C	C	
Coochbehar	a	2.3	3.2	4.7	6.5	5-0	4.2	3.7	3.5	3.6	2.3	1.8	4.0
	m	C/E	E/C	E	E	E	E/C	E/C	E/C	E	E	E/C	
	e	C	C	C/W	C/E	C/E	C/E	C/S	C/E	C	C	C	
Jalpaiguri	a	3.6	4.8	6.4	9.0	7.6	6.7	5.9	5.5	4.4	3.6	3.3	5.8
	m	C/N	C/N	E	E	E	E	E	E/C	C/NE	C/N	E/C	
	e	C/N	C/SW	C/SW	E	E/C	E/C	C/E	C/E	C/N	C	C	
Malda	a	3.5	4.0	4.8	6.2	6.4	6.0	5.7	5.1	3.5	2.9	3.3	4.9
	m	C/NW	C/NW	C/W	S/C	SE/E/S	C/S	E/SE/S	C/E	C/Var	C/NW	NW/N	
	e	C/NW	C/NW/W	C/W/NW	C/E	SE/C	C/SE	C/E	C/SE	C/Var	C/NW	C/NW	
Sub.Div.Means.	a	3.0	3.7	5.1	7.0	6.6	5.8	5.4	4.8	3.7	2.8	2.7	4.8

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
HILL STATIONS													
Darjeeling	a	2.2	2.9	3.8	4.6	3.9	3.1	2.8	2.7	2.4	1.8	1.8	2.8
	m	C	C	C	C	C	C	C	C	C	C	C	
	e	C	C	C/SW	C/SW	C	C	C	C	C	C	C	
Kalimpong	a	5.5	5.1	6.7	6.8	6.6	5.8	5.2	5.6	5.4	5.2	5.4	5.7
	m	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	
	e	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	

a Mean wind speed in kms per hour
m Predominant wind direction in the morning
e Predominant wind direction in the evening
Var Variable
C Calm

TABLE - II

MEAN DAILY MAXIMUM AND MINIMUM TEMPERATURE ($^{\circ}\text{C}$)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Bagati	Max.	26.5	29.3	33.5	36.6	36.7	35.0	33.1	33.0	33.0	32.9	30.7	27.5	32.3
	Min.	12.1	14.8	19.5	23.3	24.3	25.1	25.1	25.3	25.1	22.9	17.9	12.9	20.7
Bankura	Max.	26.1	28.6	33.9	37.9	38.8	36.9	33.7	33.2	33.4	32.4	29.8	26.3	32.6
	Min.	11.9	15.1	19.4	23.9	25.6	26.0	25.4	25.2	24.9	22.6	18.1	12.7	20.9
Berhampore	Max.	25.4	28.7	34.1	37.0	35.9	34.9	32.8	33.6	33.1	32.6	30.5	26.8	32.1
	Min.	12.3	14.7	19.3	23.4	24.6	25.8	25.8	25.8	25.6	23.7	19.0	13.9	21.2
Bardhaman	Max.	26.9	29.4	33.8	37.2	37.4	35.7	33.3	32.6	33.1	32.4	30.5	27.4	32.5
	Min.	12.0	14.2	18.5	23.0	23.7	24.9	24.0	24.3	24.3	22.1	16.6	12.0	20.0
Canning	Max.	25.9	29.2	33.6	35.6	35.3	33.9	32.4	32.1	32.2	32.1	30.0	27.3	31.6
	Min.	13.5	17.1	21.7	24.9	26.2	26.5	26.3	26.3	25.9	24.2	19.6	14.7	22.2
Contai	Max.	25.8	28.5	31.8	33.2	33.3	32.8	31.3	31.0	31.3	31.2	29.3	26.5	30.5
	Min.	14.0	17.4	21.4	24.8	25.6	26.0	25.4	25.3	25.2	23.5	18.5	14.6	21.8
Diamond Harbour	Max.	25.4	28.3	31.8	33.2	33.4	32.8	31.6	31.5	31.7	32.0	29.7	26.7	30.7
	Min.	14.0	17.8	22.5	25.6	26.6	27.1	26.8	26.7	26.4	24.6	19.9	15.5	22.8
Digha	Max.	25.6	27.8	30.6	31.8	32.4	32.4	31.3	31.0	31.4	31.3	29.6	27.0	30.2
	Min.	14.0	17.9	22.4	25.1	26.4	26.6	26.2	26.0	25.7	23.5	18.6	14.2	22.2
Haldia	Max.	25.6	28.4	31.8	33.1	33.4	33.0	31.8	31.6	31.8	31.8	29.8	27.0	30.8
	Min.	14.7	18.4	22.8	25.7	26.6	27.2	26.8	26.8	26.4	24.6	20.1	15.7	23.0
Kolkata (Alipore)	Max.	26.1	29.1	33.5	35.4	35.3	34.0	32.4	32.0	32.3	32.3	30.2	26.9	31.6
	Min.	13.9	17.2	21.9	25.1	26.1	26.6	26.2	26.2	25.9	24.0	19.6	14.7	22.3
Kolkagta (Dum Dum)	Max.	25.8	28.8	33.2	35.5	35.4	34.0	32.5	32.2	32.4	32.1	29.8	26.7	31.5
	Min.	12.9	16.2	20.9	24.6	25.6	26.3	26.0	26.0	25.7	23.8	19.1	13.8	21.7
Krishnanagar	Max.	28.2	30.4	34.8	38.0	37.8	36.0	33.7	33.3	33.8	33.9	32.4	29.3	33.5
	Min.	10.7	13.0	17.7	22.0	223.0	23.7	23.5	23.7	23.6	22.1	17.3	12.1	19.4
Medinipur	Max.	25.9	29.1	34.1	37.4	37.2	34.9	32.4	31.9	32.1	31.7	29.4	26.2	31.9
	Min.	13.4	16.5	20.7	24.2	25.5	26.0	25.5	25.5	25.1	23.0	18.4	13.7	21.5
Panagarh (A)	Max.	25.5	28.7	34.0	37.9	37.5	35.3	32.9	32.5	32.6	31.8	29.4	26.1	32.0
	Min.	10.3	13.2	18.5	23.2	24.9	25.8	25.5	25.4	24.6	21.6	16.0	10.9	20.0
Purulia	Max.	25.4	28.2	33.7	38.2	38.7	25.6	32.3	31.7	32.0	31.6	29.1	25.9	31.9
	Min.	11.6	14.1	18.8	23.4	24.9	25.1	24.3	24.2	23.7	20.9	16.5	12.3	20.0
Sagar Island	Max.	24.9	27.0	29.8	31.2	32.0	31.9	30.6	30.6	30.8	30.7	28.6	25.6	29.5
	Min.	16.3	19.5	23.9	26.4	27.2	27.4	26.9	26.8	26.8	25.4	21.6	17.3	23.8
Sandheads	Max.	25.4	27.1	29.3	30.5	31.7	31.5	30.5	30.5	30.9	31.2	29.2	26.4	29.5
	Min.	20.8	22.5	25.1	26.6	27.4	27.3	26.6	26.4	26.8	26.7	24.8	22.1	25.3
Shantiniketan	Max.	24.8	28.2	33.6	37.1	36.9	34.9	32.7	32.2	32.3	31.7	29.4	26.0	31.7
	Min.	11.9	14.5	19.3	23.4	25.0	25.9	25.8	25.8	25.3	22.6	17.5	12.9	20.8

TABLE - II

MEAN DAILY MAXIMUM AND MINIMUM TEMPERATURE (°C)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Suri	Max.	25.2	28.5	34.1	38.0	37.5	35.1	32.8	32.2	32.4	31.9	29.6	26.1	32.0
	Min.	11.6	14.1	18.6	22.9	24.1	25.1	24.6	24.6	24.0	21.9	17.1	12.5	20.1
Uluberia	Max.	26.0	28.7	33.2	35.1	35.1	34.0	32.3	31.9	32.2	31.9	29.6	26.6	31.4
	Min.	12.7	15.9	20.7	24.5	25.5	26.3	26.0	26.1	25.9	24.0	18.9	13.7	21.7
Sub.Div.Means	Max.	25.8	28.6	32.9	35.5	35.6	34.2	32.3	32.0	32.2	32.0	29.8	26.7	31.5
	Min.	13.3	16.2	20.7	24.3	25.4	26.0	25.6	25.6	25.3	23.4	18.8	14.1	21.6
SUB-HIMALAYAN WEST BENGAL														
Balurghat	Max.	25.0	27.4	32.3	35.1	34.1	33.7	32.9	33.2	32.7	31.7	29.5	26.5	31.2
	Min.	10.6	12.9	17.3	21.0	22.7	24.5	25.2	25.6	25.2	23.2	17.8	12.2	19.9
Cooch Behar (A)	Max.	23.5	25.7	30.0	31.5	20.9	31.4	31.1	31.9	31.0	20.5	28.5	25.2	29.3
	Min.	9.2	11.3	15.5	19.9	21.9	23.9	24.5	24.8	23.8	20.8	15.2	10.6	18.5
Jalpaiguri	Max.	24.3	26.4	30.5	32.0	31.8	32.1	31.5	32.2	31.5	31.6	29.3	26.3	30.0
	Min.	9.9	11.7	15.3	19.9	21.9	23.7	24.2	24.5	23.6	21.3	16.4	12.2	18.7
Malda	Max.	24.8	28.1	33.4	36.8	35.8	34.6	32.6	32.8	32.8	32.1	29.9	26.5	31.7
	Min.	12.2	14.6	18.6	22.4	24.1	25.8	25.9	26.1	25.6	23.4	18.5	13.8	20.9
Sub.Div.Means.	Max.	24.4	26.9	31.6	33.8	33.2	33.0	32.0	32.5	32.0	31.5	29.3	26.1	30.5
	Min.	10.5	12.6	16.7	20.8	22.6	24.5	25.0	25.3	24.5	22.2	17.0	12.2	19.5
HILL STATIONS														
Darjeeling	Max.	9.9	11.7	15.5	18.1	18.8	20.1	20.0	20.5	20.2	19.9	16.9	13.1	17.1
	Min.	1.2	2.5	6.0	8.9	10.5	13.0	13.4	13.1	11.9	9.9	6.0	3.4	8.3
Kalimpong	Max.	21.2	20.9	22.1	23.8	24.8	25.6	26.2	26.0	26.3	25.5	24.6	22.8	24.1
	Min.	8.7	9.6	10.9	12.2	12.9	13.5	14.5	14.7	15.7	14.7	12.4	9.7	12.5

Hill stations not considered for sub-divisional means

TABLE - III
MEAN RELATIVE HUMIDITY (%)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Bagati	M	78	74	74	78	79	83	86	87	85	82	77	78	80
	E	60	60	63	65	70	77	84	84	82	78	69	62	71
Bankura	M	66	63	63	63	67	78	82	83	83	77	69	68	72
	E	55	53	57	57	62	75	82	83	84	75	66	59	67
Berhampore	M	75	67	64	71	80	84	89	88	87	82	76	76	78
	E	61	56	52	52	67	78	84	84	84	78	68	65	69
Bardhaman	M	63	61	63	70	71	76	82	84	81	74	67	63	71
	E	49	46	42	49	60	67	79	80	78	70	60	53	61
Canning	M	75	74	72	72	75	81	85	86	85	80	75	73	78
	E	63	57	56	68	73	79	82	84	86	82	75	68	73
Contai	M	67	67	69	71	74	78	84	84	83	76	71	67	74
	E	66	69	75	80	80	82	85	85	85	79	71	66	77
Diamond Harbour	M	76	77	76	78	80	84	87	88	87	80	76	75	80
	E	65	65	66	75	78	83	85	86	85	78	71	68	75
Digha	M	76	75	75	75	77	80	82	84	83	80	76	73	78
	E	67	69	74	78	79	80	81	72	80	75	70	66	75
Haldia	M	76	74	73	74	82	83	85	86	85	76	75	70	78
	E	57	59	61	75	78	83	82	85	82	75	69	61	72
Kolkata (Alipore)	M	74	68	68	71	73	78	83	84	82	75	69	72	75
	E	58	52	49	60	67	75	82	82	81	73	66	63	68
Kolkata (Dum Dum)	M	73	69	68	72	75	80	84	84	82	76	70	71	75
	E	58	52	49	61	67	77	82	83	82	74	67	63	68
Krishnanagar	M	71	65	64	69	71	75	77	79	78	75	69	70	72
	E	49	47	45	46	55	68	73	75	73	66	60	53	59
Medinipore	M	62	57	57	62	67	75	82	83	82	74	66	61	69
	E	49	43	40	51	58	71	81	82	81	72	61	55	62
Panagarh (A)	M	71	61	53	60	68	77	84	85	83	78	72	72	72
	E	59	49	36	38	52	70	81	82	82	77	71	67	64
Purulia	M	70	63	55	54	62	74	83	85	83	76	69	70	71
	E	55	46	40	37	46	66	78	79	77	66	60	59	59
Sagar Island	M	77	75	78	81	82	84	86	86	85	79	75	75	80
	E	68	70	77	83	83	83	85	85	84	78	72	69	78
Sandheads	M	70	74	79	82	81	82	85	85	81	75	68	66	77
	E	66	69	78	83	83	83	85	84	81	74	65	63	76

TABLE - III (contd...)
MEAN RELATIVE HUMIDITY (%)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Shantiniketan	M	73	65	57	63	72	79	86	87	85	80	74	73	74
	E	56	46	38	41	55	71	82	83	84	79	69	62	64
Suri	M	55	47	45	54	67	73	80	81	80	73	60	57	64
	E	-	-	-	-	-	-	-	-	-	-	-	-	-
Uluberia	M	83	78	79	79	79	83	88	88	87	83	81	83	83
	E	61	56	56	69	73	78	83	84	83	77	70	65	71
Sub.Div.Means.	M	72	68	67	70	74	79	84	85	83	78	72	71	75
	E	56	53	53	58	64	72	78	79	78	71	64	59	65
SUB HIMALAYAN WEST BENGAL														
Balurghat	M	74	67	63	68	76	80	82	82	83	82	75	75	76
	E	68	59	54	61	71	76	80	80	82	82	75	72	72
Cooch Behar (A)	M	85	77	65	70	81	86	89	86	87	80	74	80	80
	E	68	58	50	60	72	79	82	80	83	78	73	71	71
Jalpaiguri	M	87	79	66	71	78	85	88	86	86	81	77	83	81
	E	67	58	52	63	72	79	81	80	81	76	71	70	71
Malda	M	72	66	58	60	66	73	78	78	77	73	69	70	70
	E	60	52	44	47	56	67	74	73	74	69	63	62	62
Sub.Div.Means.	M	80	72	63	67	75	81	84	83	83	79	74	77	77
	E	66	57	50	58	68	75	79	78	80	76	71	69	69
HILL STATIONS														
Darjeeling	M	81	80	70	77	87	92	95	91	91	83	72	73	83
	E	84	82	72	79	89	92	95	92	92	87	79	78	85
Kalimpong	M	77	78	79	76	79	78	77	76	77	79	81	80	78
	E	78	77	79	76	78	77	77	77	80	81	81	80	78

Hill stations not considered for sub divisional means.

M : Morning
E : Evening

TABLE - IV

MEAN NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AND MEAN CLOUD AMOUNT ** (OKTA OF THE SKY) AT 0830 HOURS IST

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Bagati	a	26	22	22	16	11	5	2	1	5	13	22	26	171
	b	0	1	1	1	1	4	4	4	3	1	1	0	21
	c	0.7	1.2	1.4	2.3	3.5	5.0	5.7	5.9	5.0	3.0	1.3	0.6	3.0
Bankura	a	23	20	21	20	19	12	7	7	8	17	20	25	199
	b	1	1	1	0	1	3	6	7	4	2	1	1	28
	c	1.2	1.2	1.2	1.3	1.6	2.9	4.2	4.7	3.8	2.1	1.4	0.9	2.2
Berhampore	a	25	22	23	17	10	6	1	1	4	15	23	26	173
	b	1	2	2	5	8	10	15	12	10	5	2	1	73
	c	0.7	1.1	1.2	2.2	3.6	4.8	6.2	5.3	4.8	2.5	1.0	0.6	2.8
Bardhaman	a	22	20	21	16	14	10	3	4	8	16	19	24	177
	b	1	2	2	2	2	4	5	6	3	1	1	1	30
	c	1.0	1.2	1.2	1.9	2.3	3.4	4.5	4.7	3.6	1.5	0.8	0.6	2.2
Canning	a	17	14	13	6	2	0	0	0	1	7	15	20	95
	b	3	3	2	1	3	8	10	7	6	2	3	1	49
	c	1.7	2.2	2.5	3.5	4.7	5.9	6.7	6.4	5.8	3.4	2.3	1.4	3.9
Contai	a	19	14	13	6	2	0	0	0	1	7	16	19	97
	b	1	2	2	1	3	8	12	10	6	3	2	1	51
	c	1.4	2.1	2.2	3.2	4.7	6.0	6.7	6.5	5.6	3.0	2.0	1.4	3.7
Diamond Harbour	a	20	16	16	10	4	2	0	0	0	9	18	21	120
	b	2	2	1	0	2	8	8	8	6	2	2	1	42
	c	1.5	2.0	1.9	2.7	4.2	5.5	6.2	6.1	5.4	3.0	1.9	1.2	3.5
Digha	a	17	14	10	4	2	0	0	0	1	8	15	19	92
	b	2	2	1	1	2	6	8	7	6	2	2	1	40
	c	2.0	2.3	2.7	3.7	4.7	6.0	6.4	6.0	5.7	3.5	2.3	1.5	3.9
Haldia	a	18	18	19	10	6	4	0	4	5	9	16	17	126
	b	2	1	0	0	2	6	10	11	5	2	2	1	42
	c	1.7	1.5	1.4	2.5	3.5	4.8	6.1	5.4	4.3	3.2	1.9	1.6	3.1
Kolkata (Alipore)	a	20	15	14	7	3	0	0	0	1	8	15	20	103
	b	1	1	1	1	2	6	8	7	5	2	1	1	36
	c	1.4	1.9	2.2	3.2	4.3	6.0	6.6	6.5	5.7	3.4	2.1	1.2	3.7
Kolkata (Dum Dum)	a	20	16	15	7	3	0	0	0	0	8	15	20	104
	b	1	2	1	1	2	7	10	9	6	2	2	1	44
	c	1.6	2.1	2.3	3.4	4.6	6.3	6.9	6.8	6.0	3.6	2.2	1.4	3.9

T A B L E - IV (contd....)

MEAN NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AND MEAN CLOUD AMOUNT ** (OKTA OF THE SKY) AT 0830 HOURS IST

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Krishnanagar	a	24	22	23	21	18	11	8	7	9	21	25	28	217
	b	0	0	0	0	0	0	0	0	0	0	0	0	0
	c	0.2	0.3	0.3	0.7	1.1	1.9	2.3	2.4	2.0	0.9	0.4	0.1	1.1
Medinipur	a	21	17	19	14	11	2	0	0	2	12	17	22	137
	b	4	4	4	5	7	15	19	18	14	7	5	3	105
	c	1.8	2.2	2.1	2.8	3.7	6.1	6.9	6.7	6.1	3.6	2.4	1.5	3.8
Panagarh	a	19	15	17	11	7	2	0	0	2	11	15	19	118
	b	1	1	2	1	3	6	9	7	4	3	2	1	40
	c	1.6	2.0	2.1	2.9	3.8	5.8	6.8	6.8	5.9	3.2	2.2	1.5	3.7
Purulia	a	20	17	18	16	13	4	0	0	3	14	18	20	143
	b	2	2	2	2	2	8	14	14	8	4	2	2	62
	c	1.5	1.7	1.6	1.7	2.3	4.7	6.5	6.4	4.9	2.5	1.6	1.3	3.0
Sagar Island	a	20	14	10	4	2	0	0	0	1	6	14	19	90
	b	0	0	0	0	1	3	3	3	2	1	1	0	14
	c	1.4	2.1	2.9	4.1	5.0	6.1	6.3	6.2	5.5	9.7	2.3	1.6	3.9
Sandheads	a	19	14	12	5	3	1	0	0	1	5	10	17	87
	b	0	1	0	1	3	9	9	10	5	3	2	1	44
	c	1.1	1.5	1.8	2.9	3.8	5.7	6.2	6.1	5.0	3.3	2.7	1.5	3.5
Shantiniketan	a	21	16	17	12	7	2	0	0	2	12	16	21	126
	b	1	1	1	1	3	5	8	6	4	3	2	1	36
	c	1.4	1.6	1.9	2.5	3.5	5.1	6.3	6.1	5.1	2.7	1.9	1.1	3.3
Suri	a	25	22	23	19	15	9	4	1	3	12	21	26	180
	b	2	2	2	4	7	11	16	14	12	6	3	2	81
	c	1.0	1.1	1.2	2.0	3.2	4.7	6.0	5.7	5.6	3.4	1.5	0.5	3.0
Uluberia	a	13	10	9	4	3	0	0	0	0	3	7	11	60
	b	2	3	2	1	2	5	8	8	5	2	1	2	41
	c	2.9	3.3	3.6	4.3	5.1	6.3	6.8	6.8	6.3	4.9	3.8	3.2	4.7
Sub Div. Means	a	20	17	17	11	08	03	01	01	03	11	17	22	131
	b	1	2	1	1	3	7	9	8	6	3	2	1	44
	c	1.4	1.7	1.9	2.7	3.7	5.1	6.0	5.4	5.1	3.0	1.9	1.2	3.3

T A B L E - IV (contd...)

MEAN NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AND MEAN CLOUD AMOUNT ** (OKTA OF THE SKY) AT 0830 HOURS IST

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
SUB HIMALAYAN WEST BENGAL														
Balurghat	a	23	19	20	11	6	2	0	1	3	12	20	25	142
	b	0	0	0	1	2	1	3	3	3	1	0	0	14
	c	0.8	1.0	1.5	2.6	3.6	4.6	5.3	4.8	4.5	2.7	1.2	0.7	2.8
Cooch Behar	a	18	16	16	6	2	0	0	0	1	7	15	18	99
	b	2	1	2	4	8	13	15	10	9	4	1	1	70
	c	1.7	1.8	2.3	4.1	5.4	6.5	6.9	6.4	6.0	3.5	1.6	1.2	4.0
Jalpaiguri	a	16	15	16	8	4	2	0	1	2	9	16	17	106
	b	3	2	3	6	9	15	20	14	13	5	1	1	92
	c	1.5	1.3	1.5	3.5	4.4	6.3	7.2	6.5	6.1	3.2	1.3	1.0	3.6
Malda	a	22	18	19	12	7	2	0	0	2	13	20	23	138
	b	2	2	2	4	7	9	12	10	8	3	2	1	60
	c	1.3	1.6	1.7	3.0	4.3	5.7	6.5	6.2	5.5	2.7	1.3	1.0	3.4
Sub Div.	a	20	17	18	9	5	1	0	1	2	10	18	21	122
Means	b	2	1	2	4	7	9	13	9	8	3	1	1	61
	c	1.3	1.4	1.7	3.3	4.4	6.0	6.5	6.0	5.5	3.0	1.3	1.0	3.5
HILL STATIONS														
Darjeeling	a	8	7	15	9	4	4	2	4	4	10	13	14	94
	b	6	6	3	7	10	11	11	13	11	6	4	3	91
	c	4.1	4.2	2.3	3.6	4.9	5.0	4.0	4.9	4.5	3.6	2.5	2.3	3.8
Kalimpong	a	7	5	6	4	3	2	2	1	2	4	6	7	49
	b	3	2	2	3	6	6	9	8	5	2	1	1	48
	c	2.8	2.8	2.8	3.3	3.8	4.5	4.6	4.5	4.0	3.1	2.7	2.8	3.5

a: Days with clear sky

b: Days with sky overcast

c: Mean cloud amount

** Okta = Unit, equal to area of one eighth of the sky used in specifying cloud amount.

For example: 1 Okta means 1/8th of the sky covered.

* Hill station not considered for sub divisional mean.

TABLE - IV (a)

MEAN NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AND MEAN CLOUD AMOUNT ** (OKTA OF THE SKY) AT 1730 HOURS IST

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Bagati	a	28	24	26	20	17	10	5	3	6	15	25	28	207
	b	0	0	0	1	1	3	4	4	3	1	0	0	18
	c	0.4	0.6	0.6	1.5	2.2	3.6	4.7	4.9	4.2	2.2	0.7	0.4	2.2
Bankura	a	24	22	22	20	19	12	7	8	9	17	22	26	207
	b	1	1	1	1	2	5	7	8	6	3	1	1	37
	c	0.9	1.0	1.1	1.5	1.9	3.3	4.3	4.5	3.9	2.1	1.2	0.8	2.2
Berhampore	a	26	23	25	18	13	6	1	2	3	15	22	26	180
	b	1	1	2	4	7	9	13	10	9	5	2	1	64
	c	0.7	0.9	0.8	2.0	3.1	4.5	5.6	5.0	4.9	2.5	1.2	0.5	2.6
Bardhaman	a	22	19	20	16	12	13	4	4	8	14	17	21	171
	b	0	1	1	1	2	3	4	4	3	1	1	1	22
	c	0.8	1.1	1.2	1.8	1.9	2.3	3.8	4.8	3.7	1.5	0.8	0.6	2.0
Canning	a	17	13	11	5	3	0	0	0	0	4	10	16	78
	b	2	1	2	3	4	8	10	9	8	4	3	1	54
	c	1.7	2.1	2.4	3.7	4.4	5.8	6.3	6.7	6.3	4.3	2.7	1.5	4.0
Contai	a	19	13	12	4	2	0	0	0	0	5	12	17	85
	b	1	1	2	3	4	7	8	7	5	3	1	1	43
	c	1.3	2.0	2.5	4.0	4.9	6.1	6.4	6.3	5.6	3.2	2.2	1.5	3.8
Diamond Harbour	a	20	17	14	7	4	1	0	0	0	6	14	19	102
	b	1	1	1	2	3	8	10	7	7	3	2	1	45
	c	1.3	1.6	2.1	3.4	4.2	5.9	6.4	6.3	5.9	3.8	2.2	1.3	3.7
Digha	a	17	13	12	4	3	0	0	0	0	4	12	16	81
	b	1	1	1	3	3	7	8	6	4	4	2	1	40
	c	1.6	2.1	2.6	4.3	4.4	6.0	6.4	6.4	5.8	4.1	2.5	1.8	4.0
Haldia	a	18	17	16	5	4	0	5	0	0	4	12	21	101
	b	1	1	1	4	3	8	8	10	6	4	2	1	49
	c	1.6	1.7	2.0	3.9	3.9	6.0	5.2	6.6	6.0	4.4	2.3	1.1	3.7
Kolkata (Alipore)	a	17	13	12	6	3	1	0	0	0	2	9	15	79
	b	1	1	1	2	3	7	8	7	6	3	2	1	42
	c	1.5	1.9	2.3	3.4	4.2	6.0	6.7	6.6	6.3	4.3	2.5	1.6	3.9
Kolkata (Dum Dum)	a	17	13	13	6	3	0	0	0	0	3	10	16	82
	b	1	1	2	3	4	9	11	9	8	4	2	1	54
	c	1.6	2.0	2.5	3.7	4.5	6.4	6.9	6.8	6.5	4.5	2.7	1.7	4.2

TABLE - IV (a)

MEAN NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AND MEAN CLOUD AMOUNT ** (OKTA OF THE SKY) AT 1730 HOURS IST

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Krishnanagar	a	25	21	22	14	11	7	7	6	7	15	20	26	181
	b	0	0	0	0	0	0	0	0	0	0	0	0	0
	c	0.6	0.8	0.9	2.1	2.5	3.5	3.3	3.7	3.2	1.9	1.0	0.4	2.0
Medinipur	a	21	17	16	10	7	2	0	0	1	10	17	22	122
	b	2	2	4	5	7	13	18	17	14	7	4	2	95
	c	1.4	1.8	2.3	3.2	4.1	6.1	6.8	6.8	6.2	3.7	2.2	1.2	3.8
Panagarh	a	18	13	14	8	5	0	0	0	0	5	11	16	91
	b	1	1	2	2	4	9	12	9	9	3	2	1	55
	c	1.7	2.2	2.3	3.5	4.4	6.6	7.1	7.0	6.6	4.0	2.7	1.8	4.2
Purulia	a	17	14	14	9	6	1	0	0	1	7	14	17	100
	b	2	2	3	4	6	15	19	17	15	6	3	2	94
	c	1.8	2.0	2.3	2.9	3.8	6.2	7.0	6.8	6.2	3.3	2.0	1.6	3.8
Sagar Island	a	20	15	12	4	3	0	0	0	0	6	11	14	87
	b	0	0	0	0	1	3	3	2	2	1	1	0	14
	c	1.3	2.0	2.7	4.2	4.4	5.9	6.3	6.2	5.6	3.8	2.6	1.8	3.9
Sandheads	a	20	15	14	6	5	1	0	0	1	6	12	18	99
	b	0	1	1	1	2	7	9	7	4	3	2	1	38
	c	0.8	1.3	1.8	3.0	3.4	5.4	5.9	5.9	5.1	3.1	2.2	1.2	3.3
Shantiniketan	a	19	15	15	9	5	1	0	0	0	7	13	18	103
	b	1	1	1	2	4	8	11	7	7	3	1	1	47
	c	1.4	1.7	2.0	2.9	3.8	5.8	6.6	6.3	5.8	3.1	2.0	1.3	3.6
Suri	a	Data not available												
	b	Data not available												
	c	Data not available												
Uluberia	a	12	8	9	3	3	0	0	0	0	1	3	7	47
	b	2	2	1	2	3	6	7	8	6	2	1	2	43
	c	2.8	3.2	3.4	4.4	4.8	6.2	6.8	6.8	6.5	5.1	4.1	3.4	4.8
Sub Div.	a	2	16	16	9	7	3	1	1	2	8	14	19	116
Means	b	01	01	01	02	03	07	09	08	06	03	02	01	44
	c	1.3	1.7	2.0	3.1	3.7	5.3	5.9	6.0	5.5	3.4	2.1	1.3	3.4

TABLE - IV (a)

MEAN NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AND MEAN CLOUD AMOUNT ** (OKTA OF THE SKY) AT 1730 HOURS IST

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
SUB HIMALAYAN WEST BENGAL														
Balurghat	a	23	19	21	15	8	3	1	1	2	13	20	23	149
	b	0	0	0	1	2	2	3	2	3	1	0	0	16
	c	0.8	0.8	1.0	1.9	3.1	4.3	4.9	4.6	4.4	2.4	1.0	0.7	2.5
Cooch Behar	a	16	12	13	6	2	0	0	0	0	5	12	15	82
	b	1	1	1	2	3	5	5	4	4	2	1	1	30
	c	1.5	1.9	2.2	3.4	4.2	5.7	6.2	5.9	5.5	3.1	1.6	1.4	3.6
Jalpaiguri	a	15	11	15	11	6	2	1	1	2	9	17	17	107
	b	1	1	1	3	3	8	8	7	6	3	1	1	43
	c	1.0	1.0	1.0	2.4	2.7	4.8	5.2	4.5	4.5	2.4	0.9	0.7	2.6
Malda	a	20	18	18	14	9	2	0	0	1	10	18	21	131
	b	2	1	1	2	4	7	9	7	8	4	1	1	48
	c	1.3	1.4	1.6	2.1	3.2	5.4	6.1	5.9	5.5	2.9	1.3	1.1	3.3
Sub Div. Means	a	19	15	17	11	6	2	1	1	1	9	17	19	118
	b	1	1	1	2	3	5	6	5	5	3	1	1	34
	c	1.1	1.3	1.5	2.5	3.3	5.1	5.6	5.2	5.0	2.7	1.2	1.0	3.0
HILL STATIONS														
Darjeeling	a	4	5	8	5	4	3	3	4	4	6	8	8	62
	b	10	8	7	10	11	12	9	12	11	7	6	7	110
	c	5.3	4.9	4.0	4.7	5.6	5.2	3.7	5.0	4.8	4.3	4.0	3.6	4.6
Kalimpong	a	7	5	6	4	3	2	2	2	3	4	5	6	49
	b	3	2	2	3	6	6	8	8	5	2	1	2	49
	c	3.3	3.0	3.1	3.6	4.0	4.6	4.7	4.7	4.3	3.6	3.2	3.1	3.8

a: Days with clear sky

b: Days with sky overcast

c: Mean cloud amount

** Okta = Unit, equal to area of one eighth of the sky used in specifying cloud amount.

For example: 1 Okta means 1/8th of the sky covered.

* Hill station not considered for sub divisional mean.

T A B L E - IV (b)

MEAN NUMBER OF HOURS OF BRIGHT SUNSHINE PER DAY

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL													
Chinsurah	8.9	9.4	9.2	9.5	8.8	5.6	4.7	5.1	5.9	7.3	9.1	9.0	7.7
Kolkata	7.9	8.6	8.2	8.6	8.2	4.4	3.8	3.9	4.5	6.3	8.3	8.2	6.7
SUB HIMALAYAN WEST BENGAL													
Nagarkata	8.3	7.6	7.9	7.1	6.4	3.7	3.3	4.1	5.3	7.5	8.9	8.4	6.5
Nagri Farm	6.6	5.4	7.1	5.8	5.0	2.8	2.4	3.2	4.3	6.4	7.5	7.0	5.3

TABLE - V

MEAN RAINFALL (in mm) AND NUMBER OF RAINY DAYS

DISTRICTS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GANGETIC WEST BENGAL														
Bankura	a	10.7	16.0	18.9	28.6	61.0	182.3	266.1	247.9	230.3	81.8	9.2	2.4	1155.2
	b	0.8	1.2	1.4	1.7	3.5	9.3	14.0	13.6	11.1	4.4	0.5	0.2	61.7
Birbhum	a	14.3	14.1	18.2	29.3	74.3	210.0	291.1	277.8	235.0	101.8	12.2	3.9	1282.0
	b	1.0	1.1	1.5	1.9	4.6	10.1	14.5	14.4	10.8	5.0	0.7	0.3	65.9
Bardhaman	a	10.8	16.2	19.0	32.9	75.1	211.9	276.0	257.2	232.0	92.4	8.0	4.5	1236.0
	b	0.8	1.2	1.5	2.1	4.4	9.9	14.0	13.6	10.9	4.7	0.6	0.3	64.0
Howrah	a	10.6	21.5	31.9	51.9	123.4	255.7	315.6	315.3	299.9	107.4	23.6	7.9	1564.7
	b	0.9	1.4	2.0	3.0	5.8	11.7	14.2	16.0	12.7	5.9	1.1	0.5	75.2
Hooghly	a	13.1	20.4	23.2	48.6	108.0	233.4	291.9	272.3	278.9	112.9	12.0	3.8	1418.5
	b	0.7	1.4	1.8	2.6	5.4	10.7	14.5	14.4	12.0	6.0	0.7	0.2	70.4
East Medinipur	a	14.8	23.3	25.8	43.4	110.8	237.3	291.1	294.6	340.8	154.4	22.8	4.0	1563.1
	b	0.9	1.5	1.6	2.6	4.8	10.4	13.3	14.0	13.2	6.6	1.0	0.2	70.1
West Medinipur	a	14.5	20.2	26.8	45.0	98.8	216.2	295.9	297.2	287.8	102.4	13.2	3.1	1421.1
	b	0.8	1.4	1.8	3.0	5.1	10.0	14.0	14.0	12.0	5.3	0.8	0.2	68.4
Murshidabad	a	20.1	13.8	18.5	34.0	80.0	254.1	338.4	245.4	231.6	129.9	11.6	1.5	1378.9
	b	1.2	0.9	1.3	1.9	4.5	10.2	14.6	12.9	10.6	5.1	0.6	0.1	63.9
Nadia	a	10.9	13.2	22.5	49.7	98.4	252.9	293.9	250.0	244.9	115.9	12.8	4.3	1369.4
	b	0.8	1.1	1.6	2.6	5.9	11.6	14.7	14.4	11.3	5.5	0.8	0.3	70.6
North 24 Parganas	a	14.3	16.9	25.7	49.5	104.3	266.1	315.8	194.1	276.2	132.5	14.4	3.1	1512.9
	b	0.9	1.5	1.8	2.8	5.5	11.5	14.9	15.2	12.3	6.2	0.8	0.2	73.6
South 24 Parganas	a	14.3	21.0	32.7	43.8	107.6	289.4	380.8	348.2	325.1	154.9	41.2	7.0	1766.0
	b	0.9	1.5	1.8	2.5	5.1	11.6	14.8	15.4	13.0	6.4	1.5	0.3	74.8
Kolkata	a	14.7	23.8	34.9	52.3	110.5	278.4	363.2	336.1	309.3	156.1	25.2	9.0	1713.5
	b	1.0	1.7	2.3	3.2	6.1	12.5	17.1	17.0	13.9	7.1	1.2	0.5	83.6
Purulia	a	12.1	16.9	16.8	19.3	36.2	173.9	291.2	271.0	277.4	89.6	10.7	2.6	1217.7
	b	1.0	1.3	1.5	1.4	2.9	9.4	14.8	14.4	12.1	4.6	0.6	0.3	64.3
Sub.Div.Means.	a	13.5	18.3	24.2	40.6	91.4	235.5	308.5	285.2	274.6	117.8	16.7	4.4	1430.7
	b	0.9	1.3	1.7	2.4	4.9	10.7	14.6	14.6	12.0	5.6	0.8	0.3	69.7

T A B L E - V (contd...)

MEAN RAINFALL (in mm) AND NUMBER OF RAINY DAYS

DISTRICTS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
SUB HIMALAYAN WEST BENGAL														
Cooch Behar	a	9.6	14.4	34.3	121.1	358.3	655.6	828.2	621.0	447.8	146.3	12.8	5.2	3254.6
	b	0.8	1.1	2.5	6.4	13.7	17.5	19.7	15.7	12.6	5.4	0.7	0.5	96.6
Jalpaiguri	a	12.4	24.4	46.4	142.9	363.1	733.3	962.7	702.7	529.3	168.7	19.4	8.8	3714.1
	b	0.9	1.6	2.7	7.3	13.8	18.9	22.3	18.4	15.3	6.2	1.2	0.7	109.3
Malda	a	14.1	10.1	14.0	32.6	104.6	209.6	339.6	287.7	277.6	102.3	12.9	6.7	1411.8
	b	1.0	1.2	1.1	2.5	5.5	10.2	15.6	14.0	11.6	4.6	0.7	0.6	68.6
North Dinajpur	a	11.6	13.1	22.2	56.1	150.3	212.3	434.4	367.9	314.0	114.7	9.2	5.1	1710.9
	b	0.8	0.9	1.3	3.5	7.5	10.0	16.5	14.3	11.0	4.8	0.9	0.4	71.9
South Dinajpur	a	19.1	9.2	23.3	47.4	143.5	333.0	394.2	294.7	289.1	115.5	7.9	1.8	1678.7
	b	1.0	0.6	1.5	2.3	6.1	12.2	14.7	12.3	11.1	4.5	0.5	0.2	67.0
Sub-Div.	a	13.4	14.2	28.0	80.0	224.0	428.8	591.8	454.8	371.6	129.5	12.4	5.5	2354.0
Means	b	0.9	1.1	1.8	4.4	9.3	13.8	17.8	14.9	12.3	5.1	0.8	0.5	82.7
	a:	Normal Rainfall (mm)												
	b:	Average number of rainy days (i.e.days with rainfall of 2.5 mm or more)												

T A B L E - V(a)

MEAN RAINFALL (in mm) AND NUMBER OF RAINY DAYS

HILL STATIONS

STATIONS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Bijanbari (Hydro)	a	5.2	14.0	26.3	85.8	148.2	367.8	517.6	428.3	316.4	120.8	104.4	4.0	2044.8
	b	0.5	1.2	1.9	6.5	10.4	15.7	22.5	20.2	14.4	4.2	0.8	0.5	98.8
Darjeeling (Obsy)	a	24.2	14.1	44.4	78.0	166.0	492.5	784.5	533.3	413.3	94.7	14.2	3.0	2662.2
	b	1.5	1.6	3.7	6.7	12.0	19.9	25.5	22.9	16.3	5.0	1.2	0.4	116.7
Kalimpong (Obsy)	a	17.8	15.7	33.2	75.7	136.5	381.7	663.9	472.0	374.4	105.1	6.8	3.8	2286.6
	b	1.2	1.3	2.6	4.9	9.4	15.6	21.0	17.6	12.0	3.2	0.6	0.4	89.8
Mongpoo	a	23.8	10.8	67.4	116.3	233.8	640.5	861.1	606.7	428.4	130.8	12.5	2.9	3135.0
	b	1.5	1.0	4.1	7.4	13.8	21.2	24.4	21.7	14.8	4.3	1.0	0.4	115.6
Pedong	a	21.3	26.1	56.1	88.2	214.4	397.1	629.4	520.7	356.0	118.1	21.7	2.0	2451.1
	b	2.0	2.6	5.3	7.2	14.8	21.2	25.8	26.5	16.8	4.9	1.8	0.2	129.1
Phalut (Hydro)	a	103.6	74.1	97.4	233.3	477.9	735.6	867.5	934.-	725.7	161.5	30.3	24.6	4465.4
	b	3.1	3.3	5.1	10.8	19.3	25.0	26.7	24.5	21.3	8.8	2.5	1.3	151.7
Sandakphu (Hydro)	a	68.4	45.5	89.0	220.0	344.5	638.8	926.7	785.8	544.9	116.1	23.9	9.5	3813.1
	b	2.3	2.1	4.4	9.0	15.8	23.0	27.4	25.9	19.5	5.4	1.8	0.7	1373.3
Tanglu (Hydro)	a	40.8	33.7	84.9	165.3	408.7	646.3	969.1	909.6	536.6	123.5	15.9	7.5	3941.9
	b	2.3	2.6	4.9	9.7	19.3	23.0	27.5	27.0	20.0	6.2	1.4	0.7	144.6
Jhepi (Hydro)	a	6.4	22.9	24.4	111.2	179.3	451.3	849.2	466.7	450.6	195.9	6.3	14.1	2778.3
	b	0.8	1.5	1.8	8.4	14.8	21.0	17.1	22.9	18.0	6.9	0.8	0.9	124.7
Kurseong	a	17.0	18.7	79.4	88.2	224.0	742.7	1138.4	966.2	707.6	109.3	12.4	1.5	4105.4
	b	1.6	1.6	3.2	4.6	11.1	20.9	26.3	25.4	20.1	5.8	0.8	0.2	121.6
	a:	Normal Rainfall (mm)												
	b:	Average number of rainy days (i.e.days with rainfall of 2.5 mm or more)												

T A B L E - VI

**MEAN RAINFALL (mm) OVER DIFFERENT CATCHMENTS
OF WEST BENGAL**

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1. River Subarnarekha and streams between River Baitarni and River Subarnarekha: (Catchment No: 322)												
Districts/Parts of districts within this catchment:-												
Gangetic West Bengal : West Medinipur, Purulia												
6.4	17.7	24.6	31.7	84.5	197.4	325.6	307.6	291.6	104.2	12.7	2.7	1406.7
2. Streams between river Subarnarekha and Damodar (excluding River Damodar): (Catchment No: 323)												
Districts/Parts of districts within this catchment:-												
Gangetic West Bengal : West Medinipur, Purulia, East Medinipur, Bankura, Hooghly												
14.4	20.1	23.5	38.2	83.9	209.0	278.6	276.7	285.0	109.5	15.1	3.3	1357.3
3. River Damodar (Catchment No.: 324)												
Districts/Parts of districts within this catchment:-												
Gangetic West Bengal : Purulia, Bankura, Bardhaman												
9.9	15.0	17.6	29.5	64.2	193.3	281.0	254.0	231.4	95.5	8.1	3.1	1202.6
4. River Hooghly and River Mor: (Catchment No.: 325) (Catchment No. 306)												
Districts/Parts of districts within this catchment:-												
Gangetic West Bengal : Bardhaman, Hooghly, Howrah, Nadia, Murshidabad, Birbhum, South 24 Parganas, North 24 Parganas, Kolkata												
14.3	17.3	23.6	41.9	96.3	250.7	317.1	284.0	269.5	121.5	17.5	4.3	1458.0

T A B L E - VI (contd...)

**MEAN RAINFALL (mm) OVER DIFFERENT CATCHMENTS
OF WEST BENGAL**

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
5. River Ganga from its confluences with River Kosi to Bangladesh: (Catchment No. 418)												
Districts/Parts of districts within this catchment:-												
Sub Himalayan West Bengal : South Dinajpur, North Dinajpur, Darjeeling, Malda												
23.2	17.7	41.6	87.7	208.0	451.4	668.1	535.9	415.5	126.2	11.1	5.1	2591.5
6. River Brahmaputra upto Bangladesh border including River Dihang, River Lohit, streams between River Subansari and Manas and between Manas and Tista, excluding Tista and its tributaries: (Catchment No. 504)												
Districts/Parts of districts within this catchment:-												
Sub Himalayan West Bengal : Jalpaiguri, Cooch Behar												
14.2	19.6	47.2	148.5	409.5	786.1	999.0	729.5	528.3	164.1	16.8	6.3	3869.1
7. River Tista upto Bangladesh border : (Catchment No. 505)												
Districts/Parts of districts within this catchment:-												
Sub Himalayan West Bengal : Darjeeling, Jalpaiguri, Cooch Behar												
17.7	23.8	44.3	121.4	289.1	620.3	837.3	637.2	484.9	157.9	18.8	8.9	3261.6

TABLE – VII
STORMS/DEPRESSIONS AFFECTING WEST BENGAL STATE
DURING 1891-1990

MONTH	NO. OF DAYS OF STORMS/DEPRESSIONS	
	GANGETIC WEST BENGAL	SUB HIMALAYAN WEST BENGAL
January	0	0
February	0	0
March	0	0
April	0	0
May	15	8
June	63	17
July	112	16
August	121	19
September	79	20
October	42	13
November	13	13
December	3	0
TOTAL	448	82

BARDHAMAN DISTRICT



The climate of this district is characterised by an oppressive hot summer, high humidity nearly all the year round and well distributed rainfall during the monsoon season. The winter season starts by about the middle of November and continues till the end of February. The period from March to May is the summer season. The southwest monsoon season is from June to September. October and first half of November constitute the post monsoon season.

Rainfall

Records of rainfall in the district are available for 8 stations for the period ranging from 12 to 99 years. The details of the rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 1236.0 mm. About 79% of the annual rainfall is received during the southwest monsoon months i.e June to September. The variation in the rainfall from year to year is not large. Considering the district as a whole, during fifty years period from 1951 to 2000, the highest annual rainfall in the district amounting to 166% of the normal occurred in 1971, while 1966 was the year with the lowest annual rainfall, which was 72% of the normal. There are three years in which the annual rainfall was less than 80% of the normal, and none of them were consecutive. It is seen from Table 2 that in 25 years out of 40, the annual rainfall was between 1001 and 1500 mm.

On an average there are 64 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 47 at Mangalkote to 75 at Panagarh Aero (Obsy).

The heaviest rainfall in 24 hours recorded at any station in the district was 391.2 mm at Mangalkote on 26th September, 1956.

Temperature

The district has two meteorological observatories, one at Bardhaman and other at Panagarh (Aerodrome). The western part of the district comprising the Panagarh subdivision is slightly different from the rest of the district in its climatic features. The temperature and other data of Panagarh (Aerodrome) may be taken to represent the condition in this part and data of Bardhaman observatory represents the rest of the district. Temperatures in summer are higher at Panagarh (Aerodrome) than at Bardhaman, while those in the cold season are slightly lower than Bardhaman. Temperatures begin to rise rapidly from the beginning of March. The day temperatures reach a maximum in April and May. The night temperatures increase further upto June and remains steady till September. The heat in summer is oppressive due to high moisture contents in the air. The maximum temperature sometimes rise upto 47^oC. There is welcome relief from the heat though only temporarily when thundershowers occur on some days in this season. The mean daily maximum temperature in the month of May is 37.4^oC, while the mean daily minimum temperature is about 23.7^oC at Bardhaman (Obsy). The mean daily maximum temperature is 37.9^oC and mean daily minimum temperature is 23.2^oC at Panagarh Aero (Obsy). With the onset of the southwest monsoon season by about the first week of June, the day temperatures drop appreciably but night temperatures remain high. With the increased humidity in the air and the continuing high night temperatures, even during the monsoon season weather is often uncomfortable. The southwest monsoon withdraws early in October and the temperature begins to drop. The drop in night temperatures is particularly more rapid from about the middle of November. January is the coldest month with the mean daily maximum temperature at about 26.0^oC to 27.0^oC and the mean daily minimum temperature at about 10.0^oC to 11.0^oC. In association with the passage of western disturbances, spells of cold wave are experienced in the winter season and on individual days minimum temperature may drop down upto 3 to 4^oC.

The highest maximum temperature ever recorded at Bardhaman was 46.8^oC on 22nd May 1980 and the lowest minimum temperature ever recorded was 4.4^oC on 17th January 1962, 3rd February 1905 and 24th December 1961. Whereas, the highest maximum

temperature ever recorded at Panagarh (Aerodrome) was 47.4⁰C on 19th May 1972 and the lowest minimum temperature ever recorded was 2.8⁰C on 14th January 1989.

Humidity

The values of relative humidity are generally high throughout the year. But in summer months values of relative humidity are comparatively less being about 60-70% in the morning and 35 to 40% in the afternoons.

Cloudness

In winter and early part of summer skies are clear or lightly clouded. Skies are moderately clouded in May and heavily clouded to overcast in the southwest monsoon season. Cloudiness decreases in October.

Winds

Winds are generally light with a slight increase in force in summer and southwest monsoon months. In winter months and March winds blow mainly from northwest and north. In April southerlies appear and south easterlies are predominant till September. Winds blow mostly from northerly and northwesterly directions in post monsoon months.

Special Weather Phenomina

Storms and depressions from the Bay of Bengal in May and post monsoon often reach the district and its neighbourhood and cause widespread heavy rain with high winds. Depressions in the monsoon season also affect the district and heavy rains occur. Thunderstorms are common, mostly in the afternoons, in the hot season in association with them heavy rain, occasional hail and severe squalls occur. These thunderstorms are called 'Norwesters' due to the fact that the squalls associated with them usually come from the northwest and are locally known as 'Kalbaisakhi'. A sharp drop in temperatures is experienced during these storms which are often violent. Rain during the monsoon season is also often associated with thunder. Occasional fog occurs during the cold season.

Tables 3, 4, 5 and Tables 3(a), 4(a), 5(a) give the temperature and relative humidity, mean wind speed and frequency of special weather phenomena respectively for Bardhaman and Panagarh (Aero) observatories in the district.

TABLE – 2

**Frequency of Annual Rainfall in the District
(Data 1951 -2000)
(BARDHAMAN)**

Range in mm	No. of years	Range in mm	No. of years
801 – 900	1	1501 – 1600	3
901 – 1000	2	1601 – 1700	4
1001 – 1100	7	1701 – 1800	2
1101 – 1200	6	1801 – 1900	1
1201 – 1300	3	1901 – 2000	1
1301 – 1400	5	2001 – 2100	1
1401 – 1500	4		

(Data available for 40 years only)

TABLE – 3

**Normals of Temperature and Relative Humidity
(BARDHAMAN)**

MONTH	Mean Daily Maximum Temperature °C	Mean Daily Minimum Temperature °C	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
			°C	Date	°C	Date	0830 IST	1730 IST
January	26.9	12.0	36.7	1951 Jan 16	4.4	1962 Jan 17	63	49
February	29.4	14.2	38.8	1974 Feb 25	4.4	1905 Feb 03	61	46
March	33.8	18.5	41.7	1941 Mar 28	10.0	1928 Mar 09	63	42
April	37.2	23.0	46.0	1965 Apr 25	14.6	1981 Apr 19	70	49
May	37.4	23.7	46.8	1980 May 22	15.4	1982 May 01	71	60
June	35.7	24.9	45.6	1926 Jun 15	18.6	1981 Jun 01	76	67
July	33.3	24.0	39.8	1982 Jul 04	19.4	1981 Jul 18	82	79
August	32.6	24.3	38.3	1981 Aug 02	19.7	1981 Aug 24	84	80
September	33.1	24.3	38.0	1968 Sep 23	18.9	1981 Sep 30 1982 Sep 29	81	78
October	32.4	22.1	36.7	1951 Oct 21	15.4	1980 Oct 29	74	70
November	30.5	16.6	35.6	1896 Nov 02	9.8	1981 Nov 27	67	60
December	27.4	12.0	31.7	1951 Dec 07	4.4	1961 Dec 24	63	53
Annual	32.5	20.0					71	61

TABLE – 4

**Mean Wind Speed in km/hr.
(BARDHAMAN)**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
3.1	3.7	5.8	7.3	10.1	9.0	8.7	7.5	6.8	4.8	3.5	2.9	6.1

TABLE – 5

**Special Weather Phenomena
(BARDHAMAN)**

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4
Hail	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dust storm	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Squall	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Fog	0.1	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.7	1.7

TABLE – 3(a)**Normals of Temperature and Relative Humidity
(PANAGARH (A))**

MONTH	Mean Daily Maximum Temperature	Mean Daily Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	25.5	10.3	32.8	1990 Jan 30	2.8	1989 Jan 14	71	59
February	28.7	13.2	36.7	1985 Feb 26	5.4	1974 Feb 11	61	49
March	34.0	18.5	41.4	1973 Mar 31	9.6	1972 Mar 02	53	36
April	37.9	23.2	46.4	1975 Apr 02	16.2	1977 Apr 03	60	38
May	37.5	24.9	47.4	1972 May 19	14.6	1988 May 16	68	52
June	35.3	25.8	46.2	1972 Jun 02	21.0	1974 Jun 23	77	70
July	32.9	25.5	40.3	1982 Jul 04	18.1	1976 Jul 27	84	81
August	32.5	25.4	40.1	1974 Aug 02	21.6	1987 Aug 03	85	82
September	32.6	24.6	37.6	1968 Sep 08	14.5	1981 Sep 16	83	82
October	31.8	21.6	38.6	1974 Oct 11	12.9	1983 Oct 29	78	77
November	29.4	16.0	35.4	1977 Nov 07	6.6	1982 Nov 30	72	71
December	26.1	10.9	31.7	1975 Dec 05	3.1	1988 Dec 29	72	67
Annual	32.0	20.0					72	64

TABLE – 4(a)**Mean Wind Speed in km/hr.
(PANAGARH (A))**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2.2	3.0	4.3	6.6	7.7	7.1	5.9	5.8	4.8	2.6	2.0	2.0	4.5

TABLE – 5(a)**Special Weather Phenomena
(PANAGARH (A))**

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.7	2.1	3.9	6.1	8.6	11.7	13.4	13.0	12.6	4.0	0.2	0.1	76.4
Hail	0.0	0.0	0.2	0.3	0.4	0.7	0.9	0.7	0.9	0.1	0.0	0.0	4.2
Dust storm	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3
Squall	0.0	0.0	0.1	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Fog	2.9	1.4	1.0	0.9	0.2	0.2	0.0	0.1	0.5	1.4	1.4	2.7	12.7