भारत सरकार
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भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

उत्तर-पूर्वी राज्यों की जलवायु

CLIMATE OF NORTH EASTERN STATES

NORTH EASTERN STATES

(ASSAM, MEGHALAYA, ARUNACHAL PRADESH, NAGALAND, MANIPUR, MIZORAM & TRIPURA)

CLIMATOLOGICAL SUMMARIES OF STATES SERIES - No. 19

ISSUED BY

OFFICE OF THE
ADDITIONAL DIRECTOR GENERAL
OF METEOROLOGY (RESEARCH)
INDIA METEOROLOGICAL DEPARTMENT
PUNE - 411 005

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PRICE
Publication with CD
* Inland - Rs.3050/-
* Foreign - U.K. £ 75 or US $ 124

PRICE
Publication without CD
* Inland - Rs. 2050/-
* Foreign - U.K. £ 51 or US $ 84

PRICE
Publication on CD only
* Inland - Rs.1000/-
* Foreign - U.K. £ 25 or US $ 41

Designed & CD authored
at the Climatological Publication Section
and Printed at
Meteorological Office Press
Office of the Addl. Director General of
Meteorology (Research), Pune

P R E F A C E

The importance of meteorology and its economic and social benefits are being increasingly realised all over the world. In our country also, various sectors like agriculture, aviation, power and energy, tourism, shipping, transport industry etc., require climatological information pertaining to different regions of the country, for planning and executing the different projects, with a view to derive maximum advantage from meteorological and/or climatological conditions. Keeping these requirements in view, it was decided by India Meteorological Department to publish a series of "Climatological Summaries" for each state in the country, incorporating the district climatological summaries. The nineteenth issue in the series of 'State Climatological Summaries' is "Climate of Northeastern States" comprising of Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura. The climate of these states is prepared for the first time.

The present publication contains extensive information on meteorological parameters - rainfall, temperatures, wind, humidity, clouds and other weather parameters in northeastern states and in all districts of these states as well as other information on climatic classification, coefficient of rainfall variation, droughts, excessive rainfall, cyclonic storms/depressions and earthquakes are also included in the publication. The northeastern region of India is mostly hilly terrain with several valleys and rivers. Hence, climatic conditions vary from place to place in this region. Spatial distribution of two main climatic elements – rainfall and temperature have been elaborated and depicted in maps. Spatial temperatures for representative months of all seasons have been determined by applying lapse rate of representative months considering topographic features of the location. Climatic classification over the state is determined by using Koppen's technique.

The contributions for preparation of climatological summary have been made by Shri G. S. Dhekne, Shri S. M. Deshpande, Smt. U. S. Satpute, Shri R. S. Wayal, Smt. P. R. Iyer, Smt. P. P. Bhagwat and Shri A. B. Dhule from "Climatological Publication Section" of the Office of the Additional Director General of Meteorology (Research), India Meteorological Department, Pune. Late Shri Philipose Abraham has also made contribution.

The publication has been prepared by Dr. T. P. Singh, Director and reviewed by Shri B. Mukhopadhyay, DDGM(C). Shri S. Krishnaiah, LACD-ADGM(R) provided the overall guidance for this publication. I appreciate their sincere efforts.

I am hopeful that this publication will be extensively useful source of climatic information in various fields for development of northeastern region of India.

NEW DELHI
December, 2013

Dr. L. S. RATHORE
DIRECTOR GENERAL OF METEOROLOGY

INDIA METEOROLOGICAL DEPARTMENT
DOCUMENT AND DATA CONTROL SHEET

1.	Document title	"Climate of Northeastern States"
2.	Document type	Scientific Publication
3.	Issue No.	Climatological Summaries of States Series - No. 19
4.	Issue date	December 2013
5.	Security Classification	Unclassified
6.	Control Status	Uncontrolled
7.	Document type	Scientific Report
8.	No. of Pages	500 approx.
9.	No. of Figures	33
10.	No. of references	NIL
11.	Distribution	Unrestricted
12.	Language	English
13.	Authors	Climatological Publication Section Office of Additional Director General of Meteorology (Research), Pune
14.	Originating Division/Group	Climatological Publication Section
15.	Reviewing and Approving Authority	Director General of Meteorology, India Meteorological Department, New Delhi
16.	End Users	State Gazetteers Units, Central & State Ministries of Agriculture, Science & Technology, Education, Irrigation and Power, Disaster Management Agencies, Research Institutes & Agricultural Universities.
17.	Abstract	The publication contains extensive information on the climate of North Eastern States, viz. Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura and its districts based on rainfall, temperature, winds, clouds and other weather parameters. The information on droughts, excessive rainfall, depressions and cyclonic storms and earthquakes are also included in the publication.
18.	Key Words	State Summary, District Summary, Physical Features, Climatic Classification, Heaviest Rainfall, Highest Maximum Temperature, Lowest Minimum Temperature, Rainfall Variability, Seasonal Rainfall, Annual Rainfall, Mean Maximum Temperature, Mean Minimum Temperature.

I N T R O D U C T I O N

The climatology of the state of Northeastern region of India comprising of Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura is published as “Climate of Northeastern States”. The climatology of Northeastern States in terms of various meteorological parameters such as temperature, rainfall, rainfall variability, pressure and winds, relative humidity, clouds, weather hazards, etc., is described in respective state summary, followed by a detailed description of the climate of each district considering topographic characteristics of the location. In this publication, the districts of Northeastern States which were in existence as on 1st January 2012, have been considered and the climatology of these districts, arranged in alphabetical order is presented.

The normals for each month and annual rainfall are generally based on the data for the period 1951 to 2000 and when sufficient data is not available for particular district, available data for the period 1901-2000 is also utilised. The monthly and annual normals of other meteorological parameters viz. temperatures, relative humidity, wind speed ,wind direction, cloud amount, special weather phenomena etc. used for describing the climate are generally based on data for the period 1971 to 2000. The extreme values of temperature and rainfall presented in the publication are based on the updated data upto the year 2010. These data have been obtained from National Data Centre, Pune.

Cyclones and depressions affected northeastern states during the period 1891-2012 based on, “Storms and depressions Atlas” are incorporated in respective state summaries. Since northeastern states are seismic prone region, earthquakes occurred during period 1862-2012 are also incorporated in respective state summaries.

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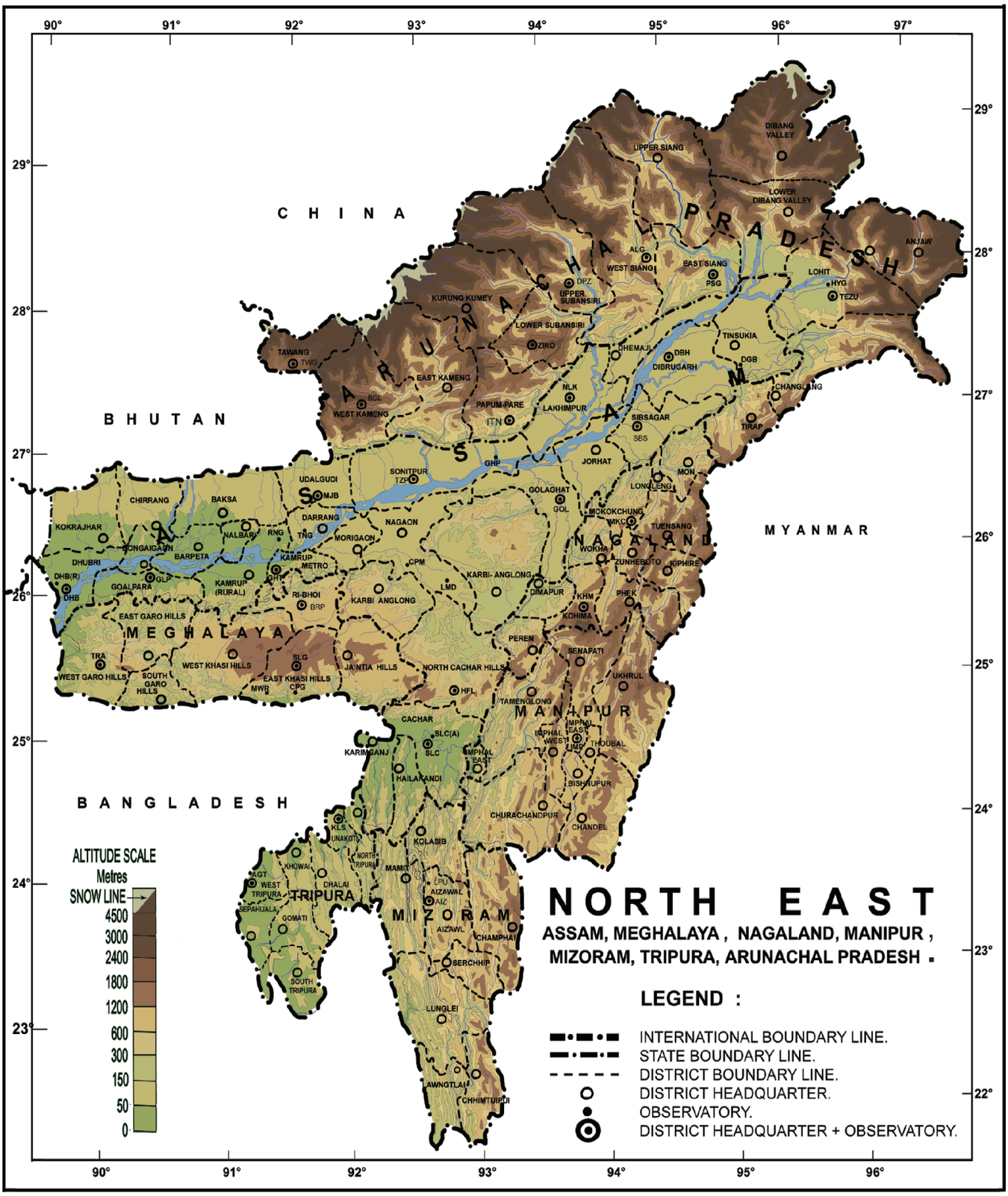

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FIG: 1(a) : INSET

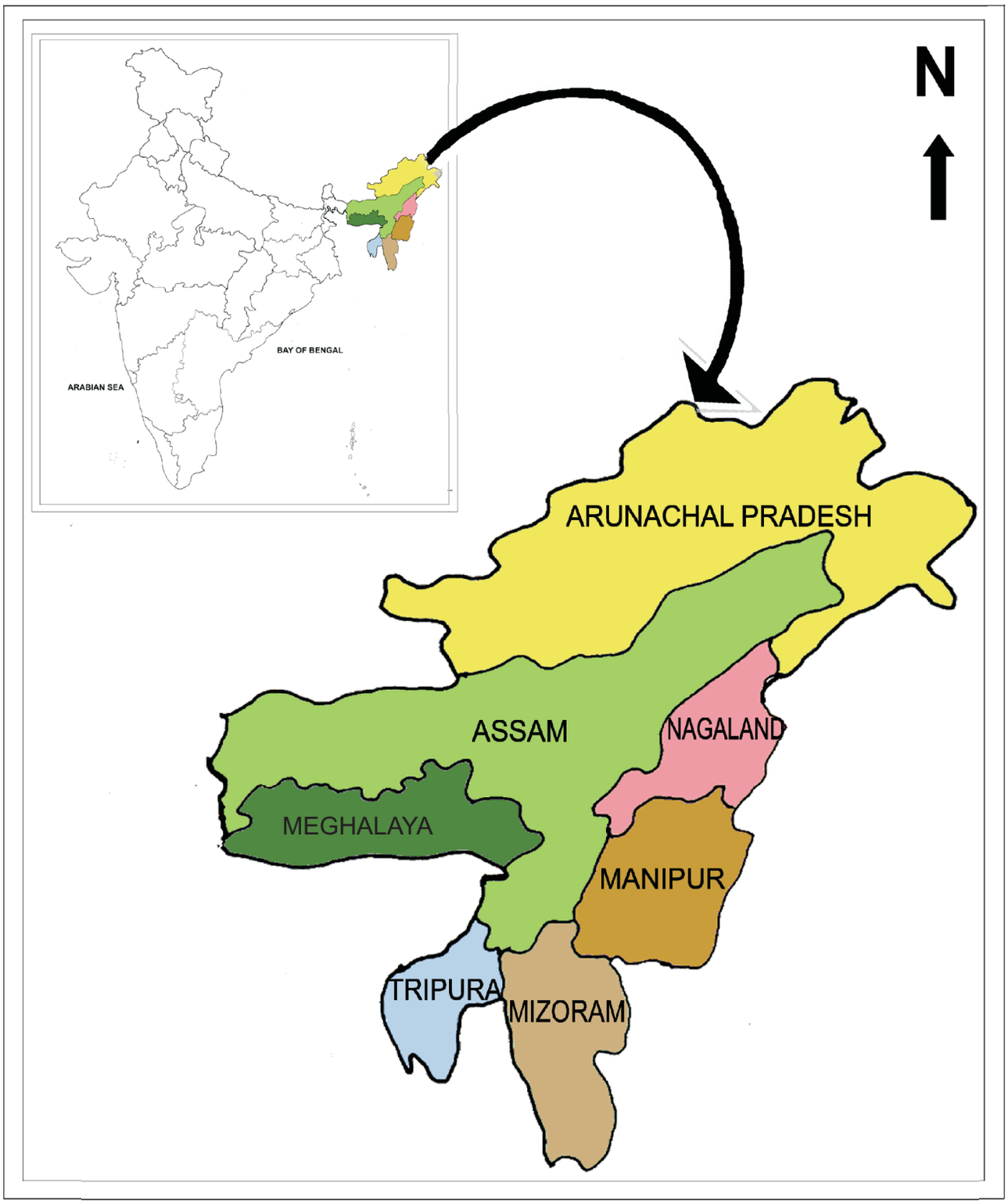
N
BAY OF BENGAL
ARABIAN SEA
ARUNACHAL PRADESH
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM

FIG: 2 : CLIMATIC CLASSIFICATION

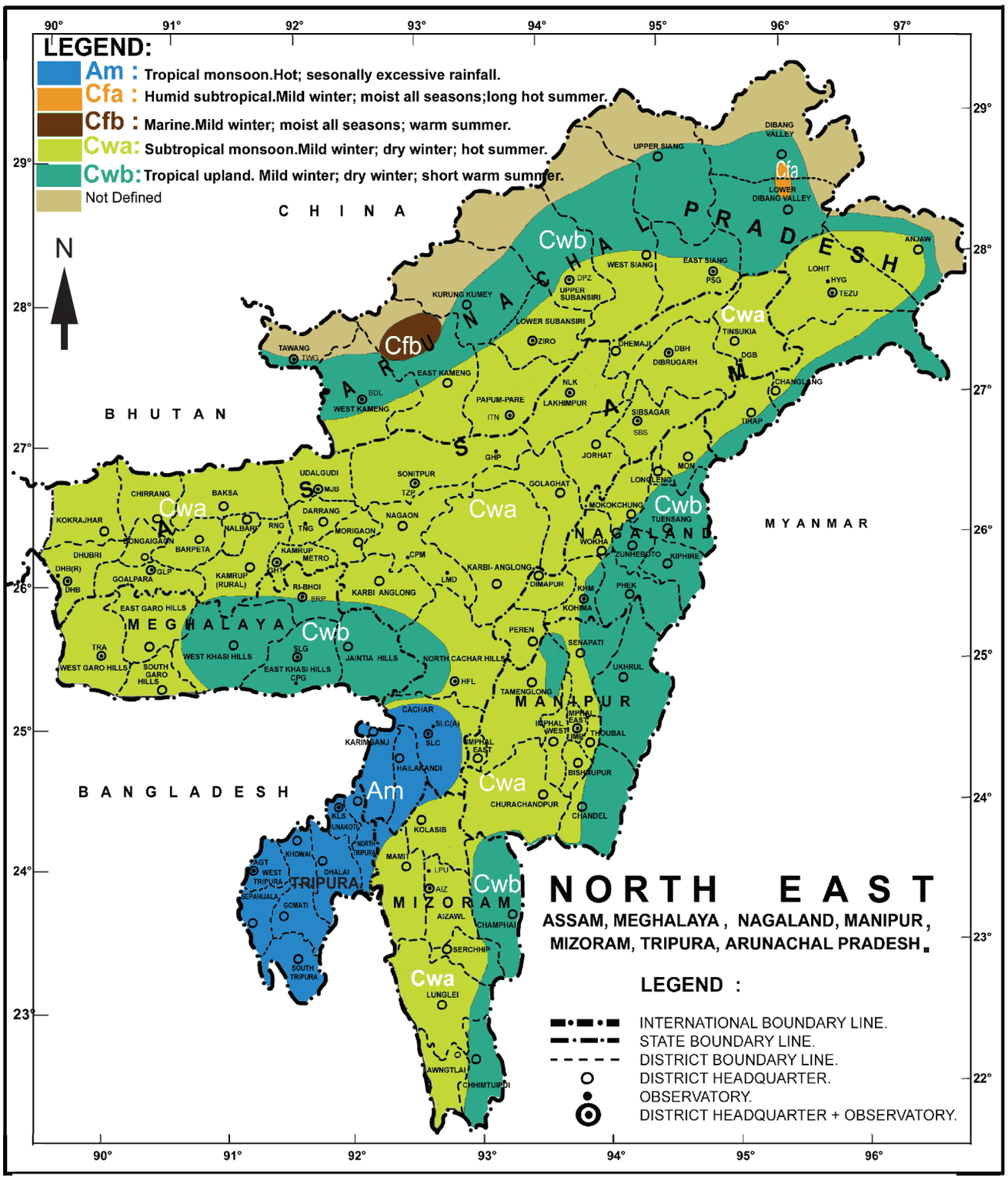

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FIG: 2(a) : MEAN MAXIMUM TEMPERATURE (°C) - MAY

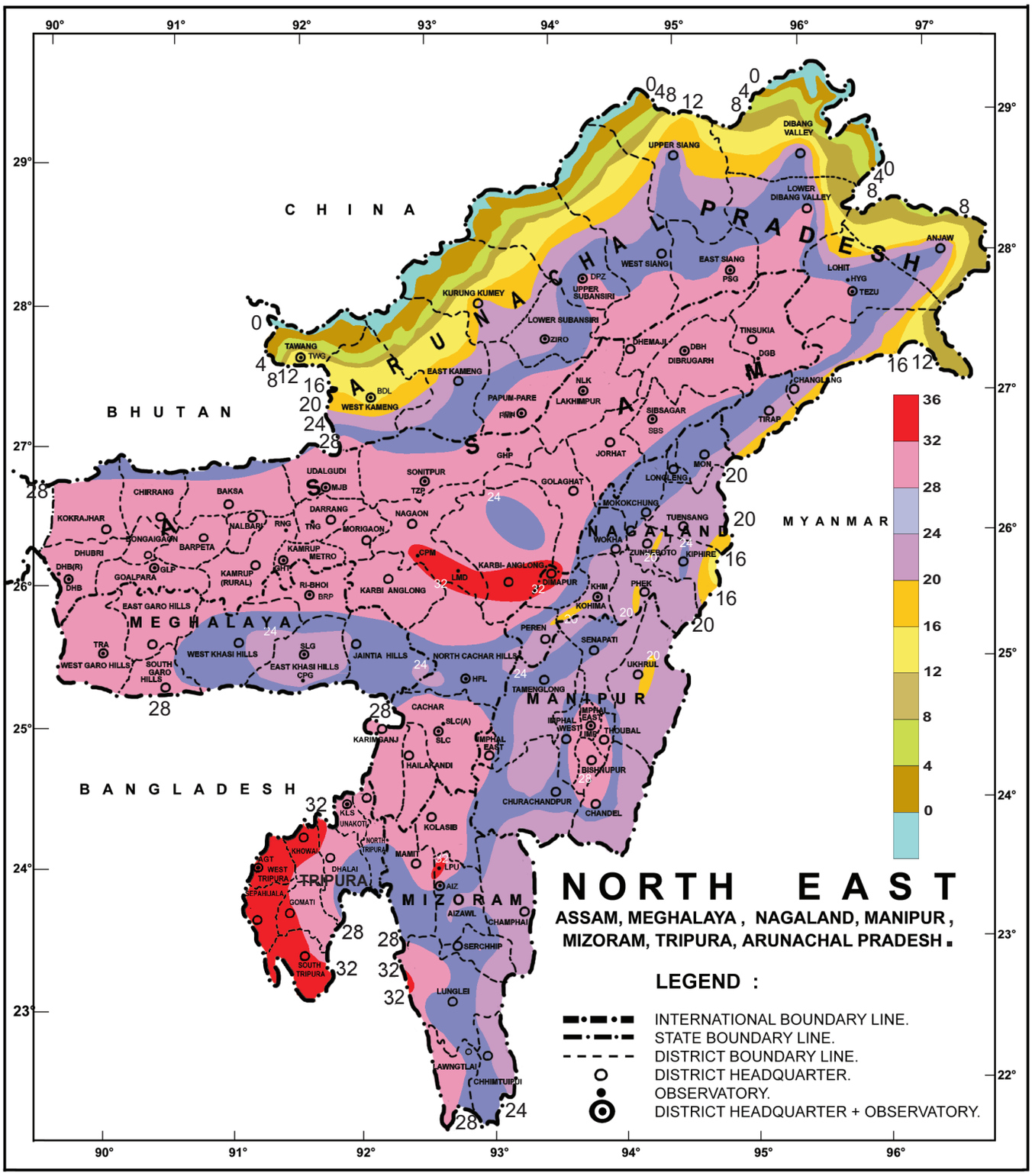

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FIG:2(b) :MEAN MAXIMUM TEMPERATURE (°C) -JULY

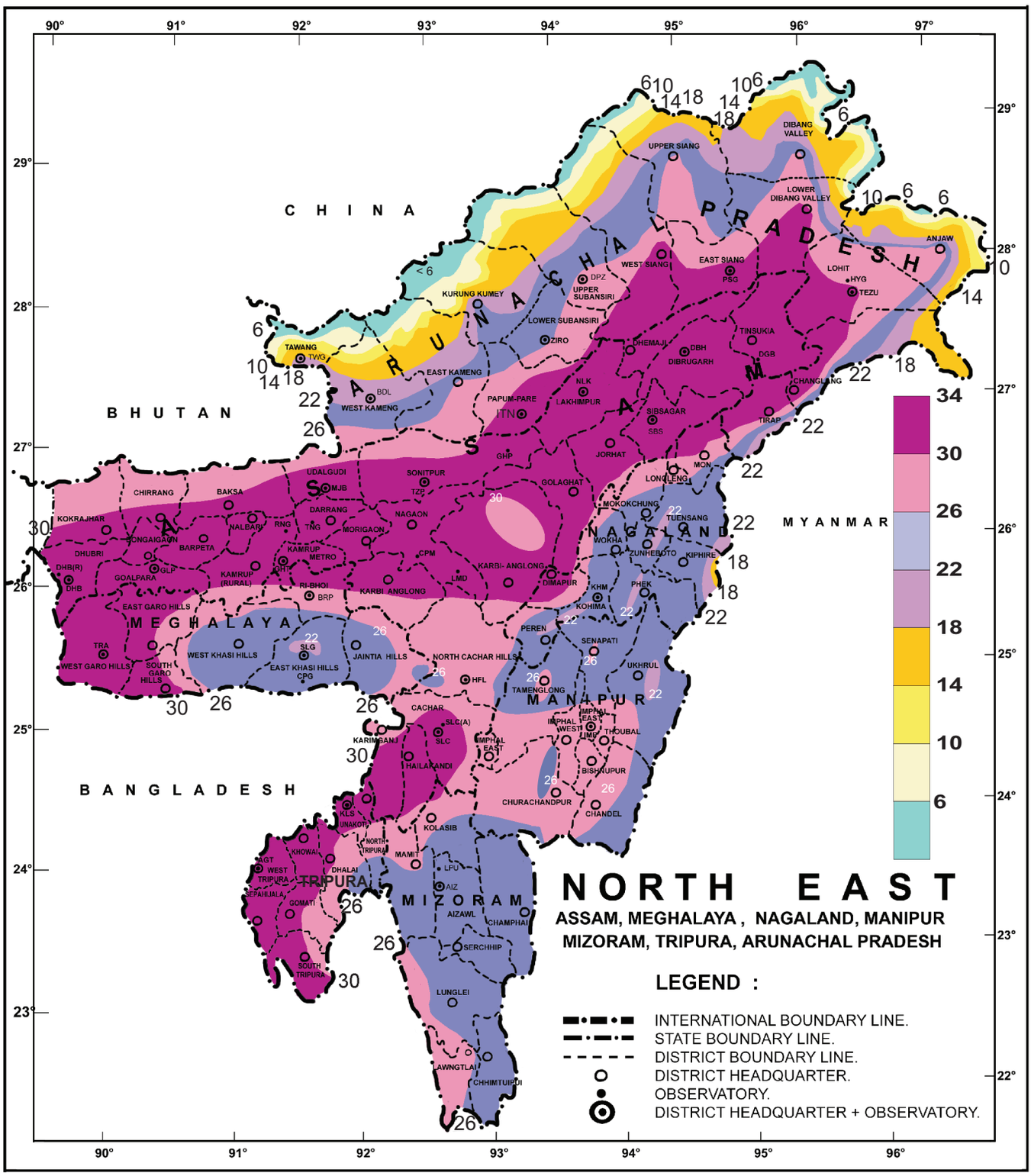

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FIG: 2(C) :MEAN MAXIMUM TEMPERATURE (°C) -OCTOBER

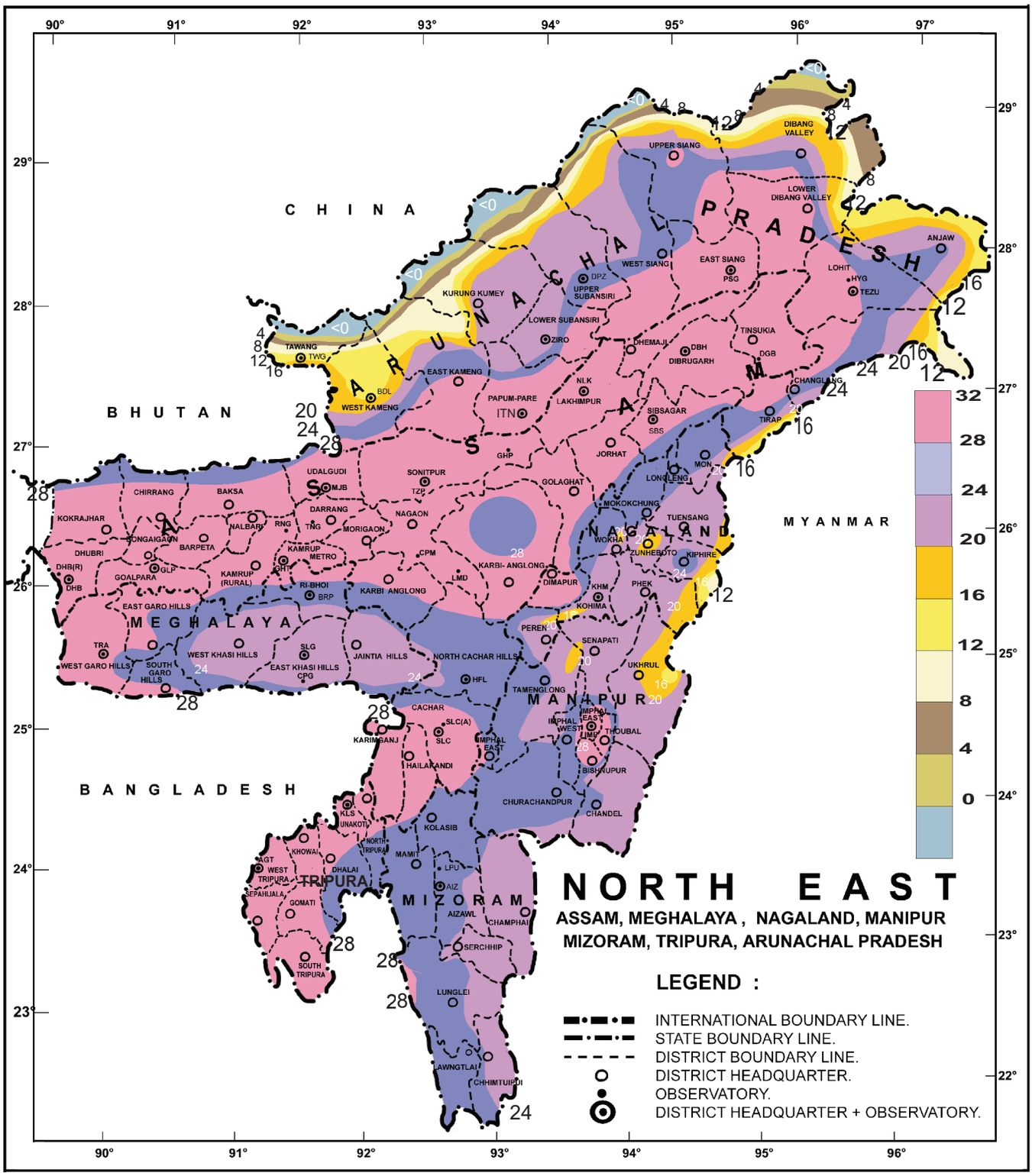

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FIG. 2(d) : MEAN MAXIMUM TEMPERATURE (°C) - JANUARY

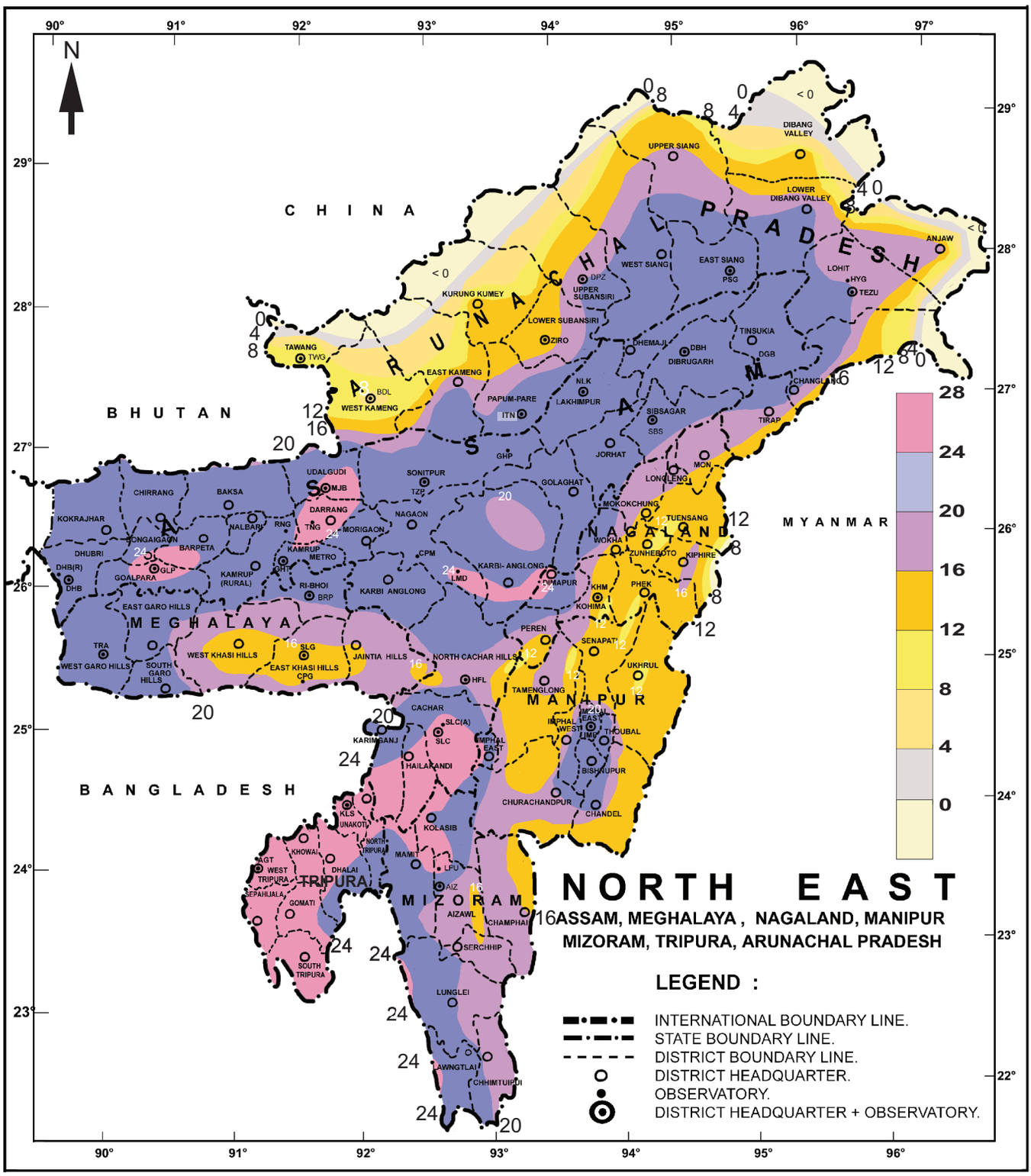

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FIG. 3(a) : MEAN MINIMUM TEMPERATURE (°C) - JANUARY

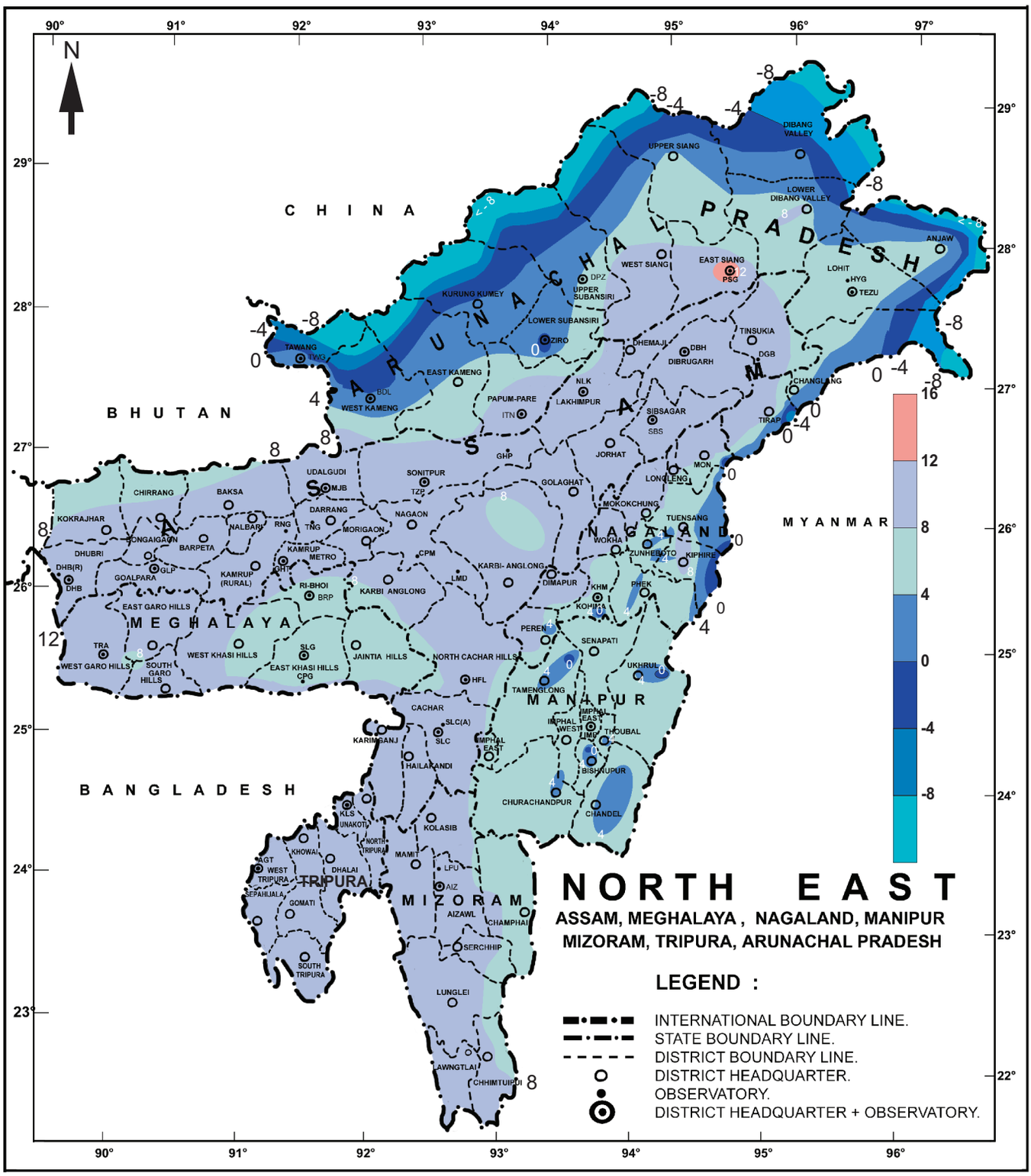

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FIG: 3(b) :MEAN MINIMUM TEMPERATURE (°C) - APRIL

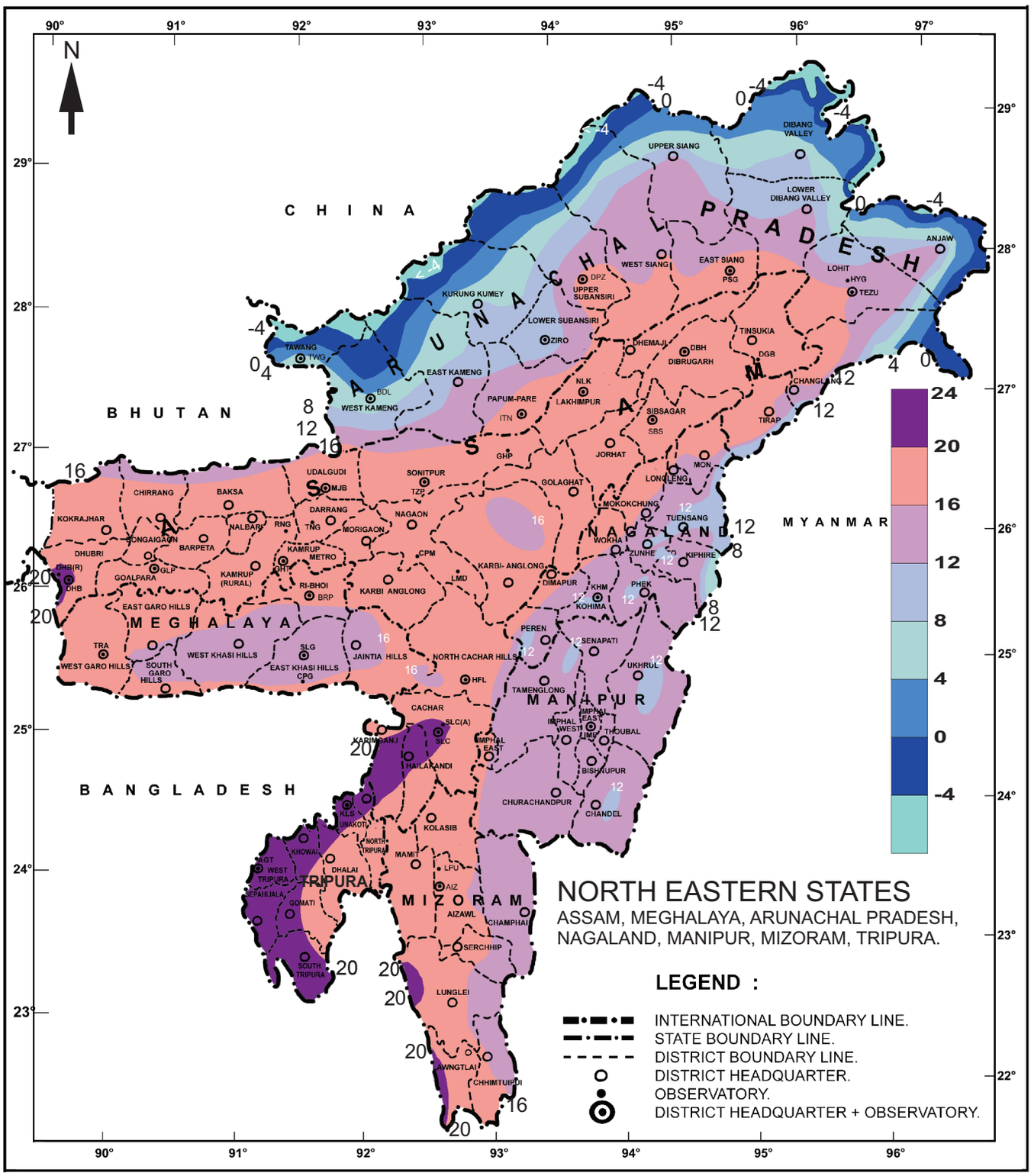

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FIG: 3(c) : MEAN MINIMUM TEMPERATURE (°C) - JULY

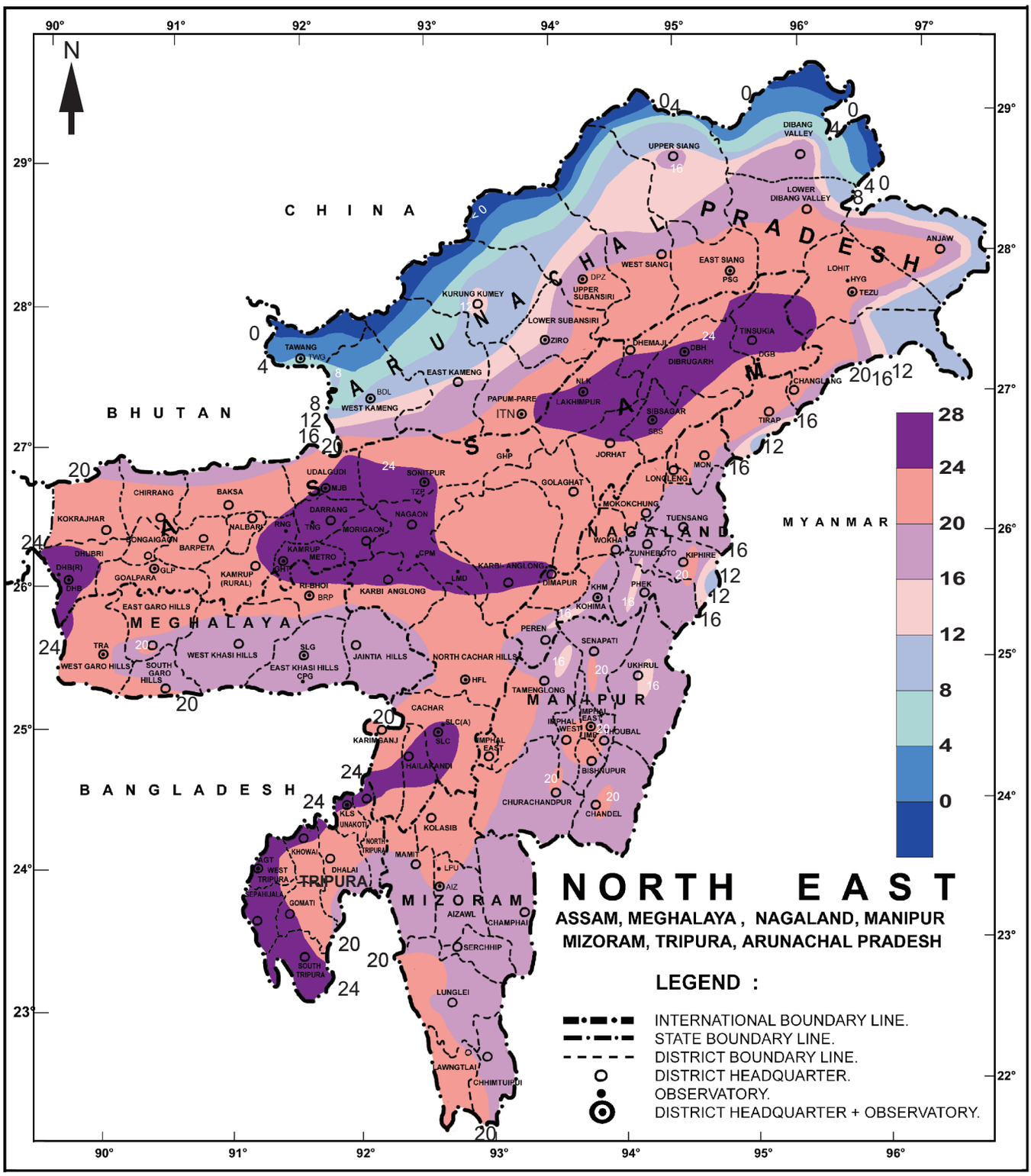

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FIG: 3(d) : MEAN MINIMUM TEMPERATURE (°C) - OCTOBER

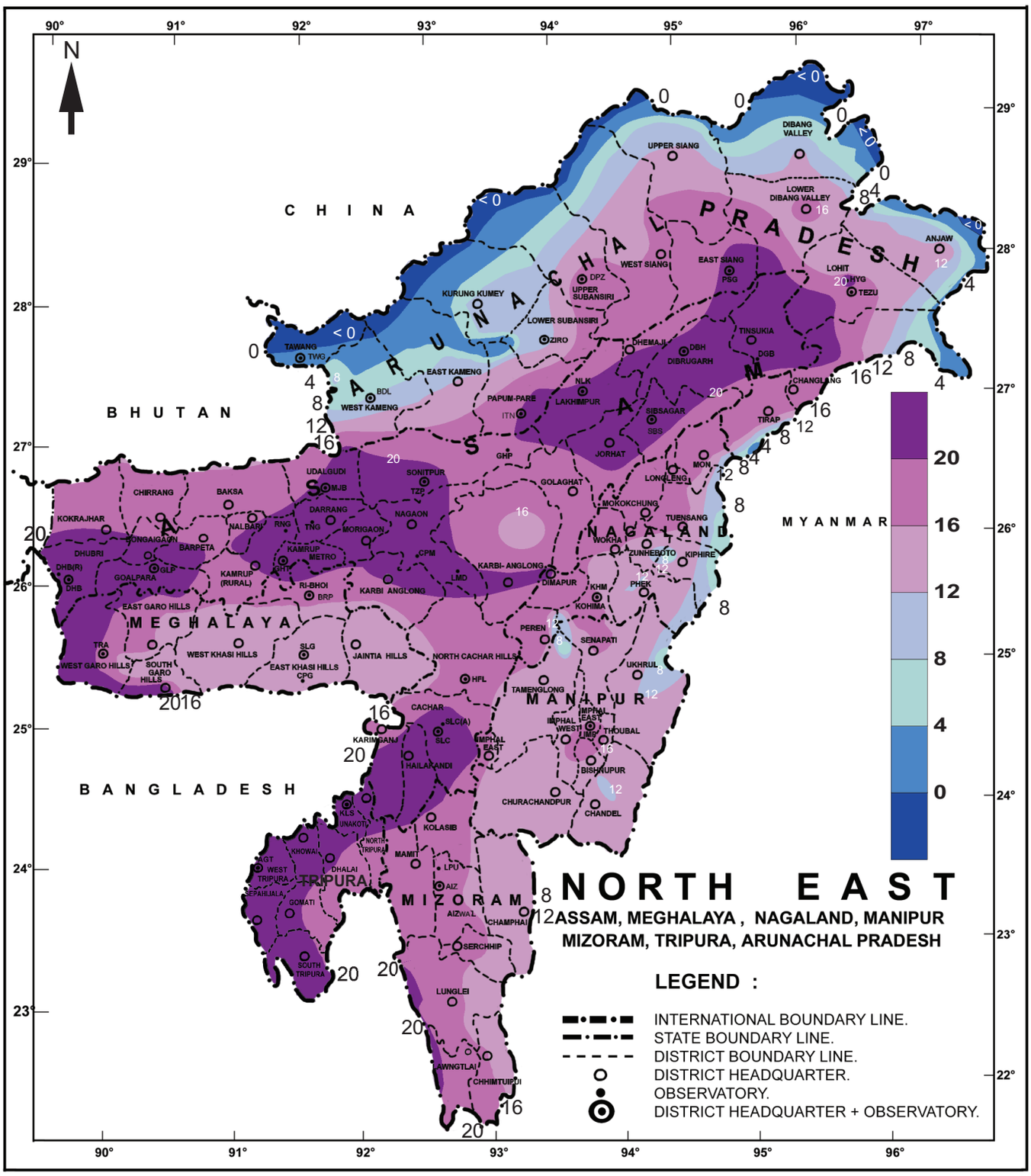

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FIG: 4 : HIGHEST MAXIMUM TEMPERATURE (°C) EVER RECORDED

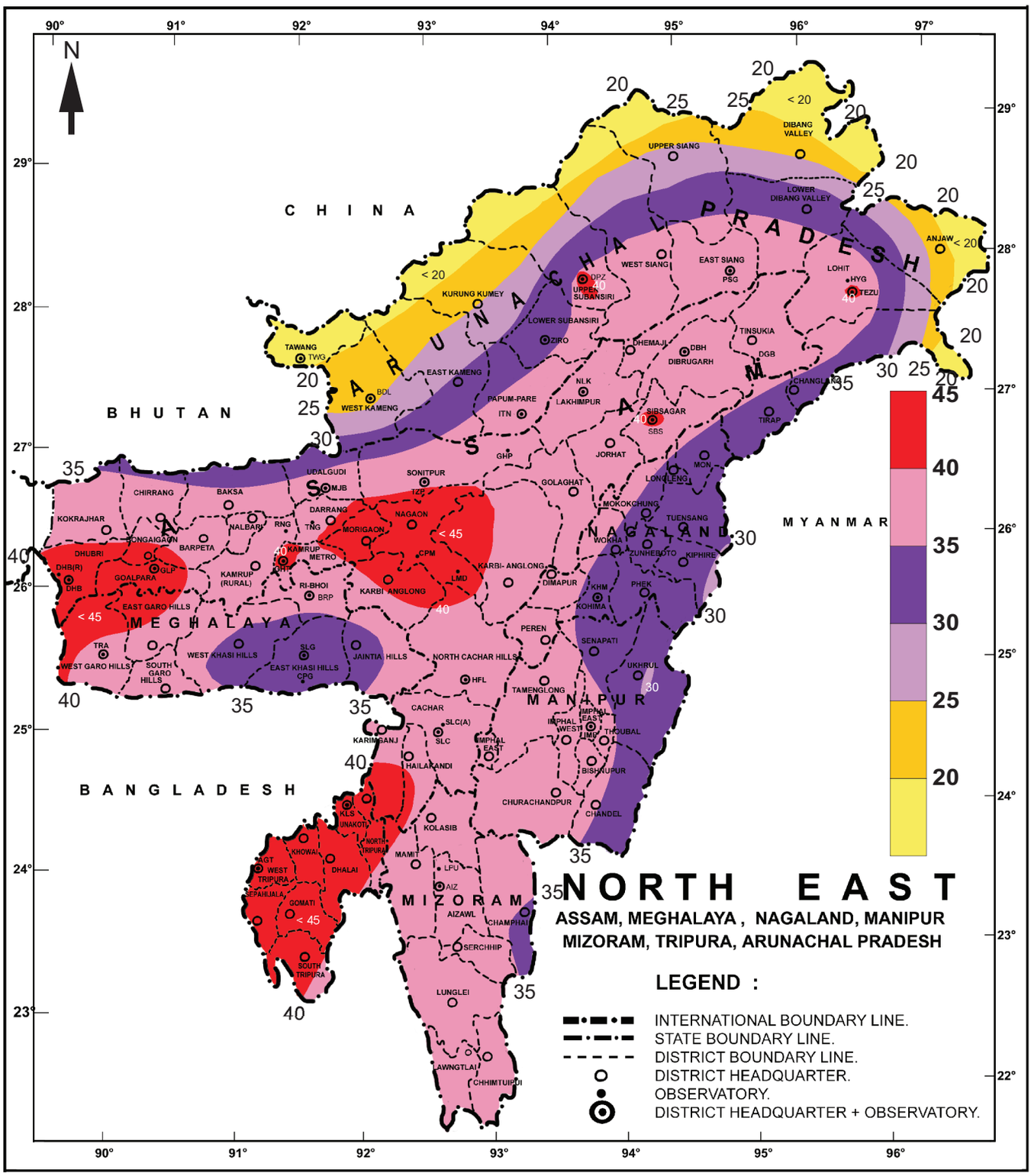

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FIG:5 : LOWEST MINIMUM TEMPERATURE (°C) EVER RECORDED

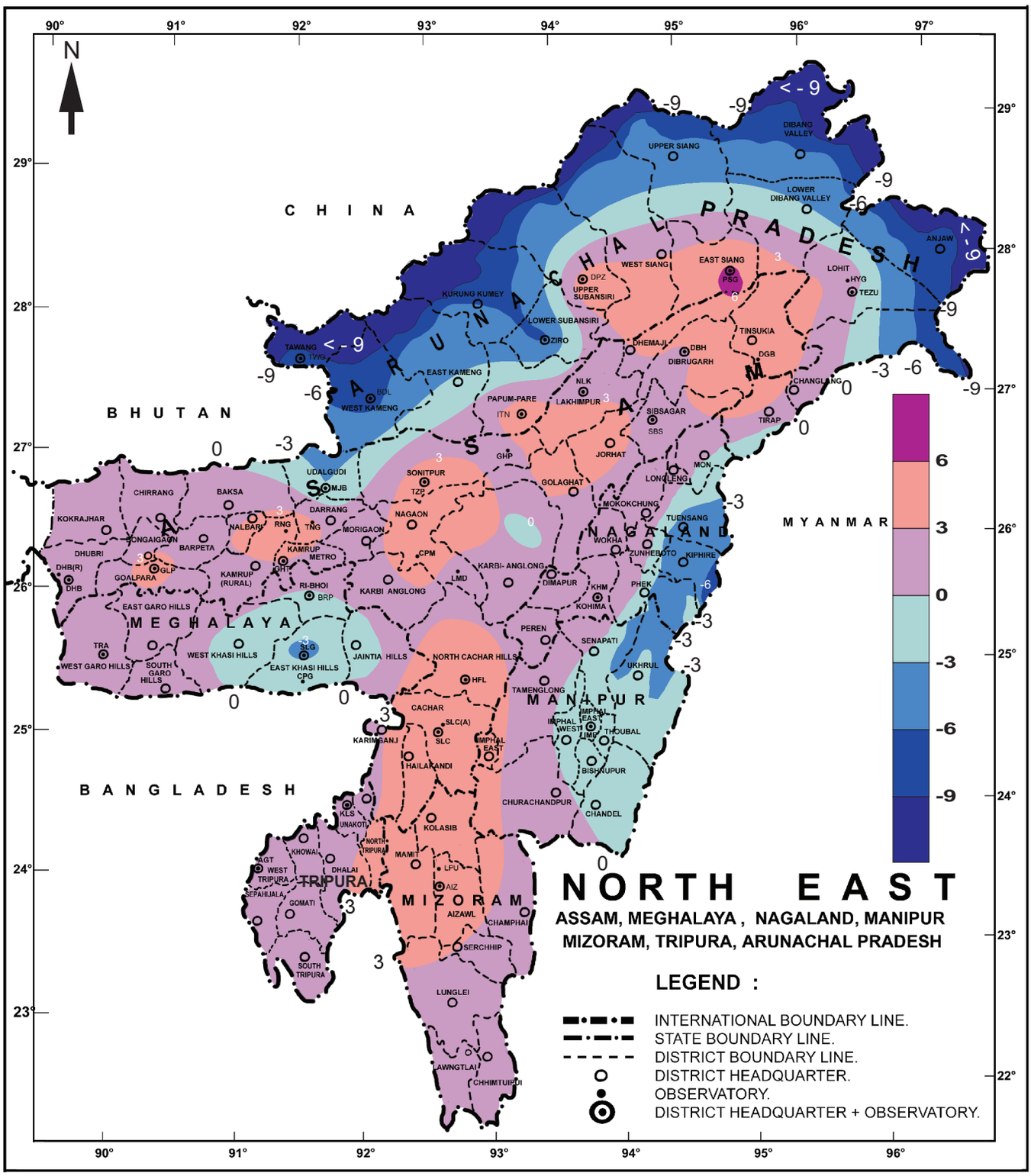

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FIG: 6 : ANNUAL NORMAL RAINFALL (cm)

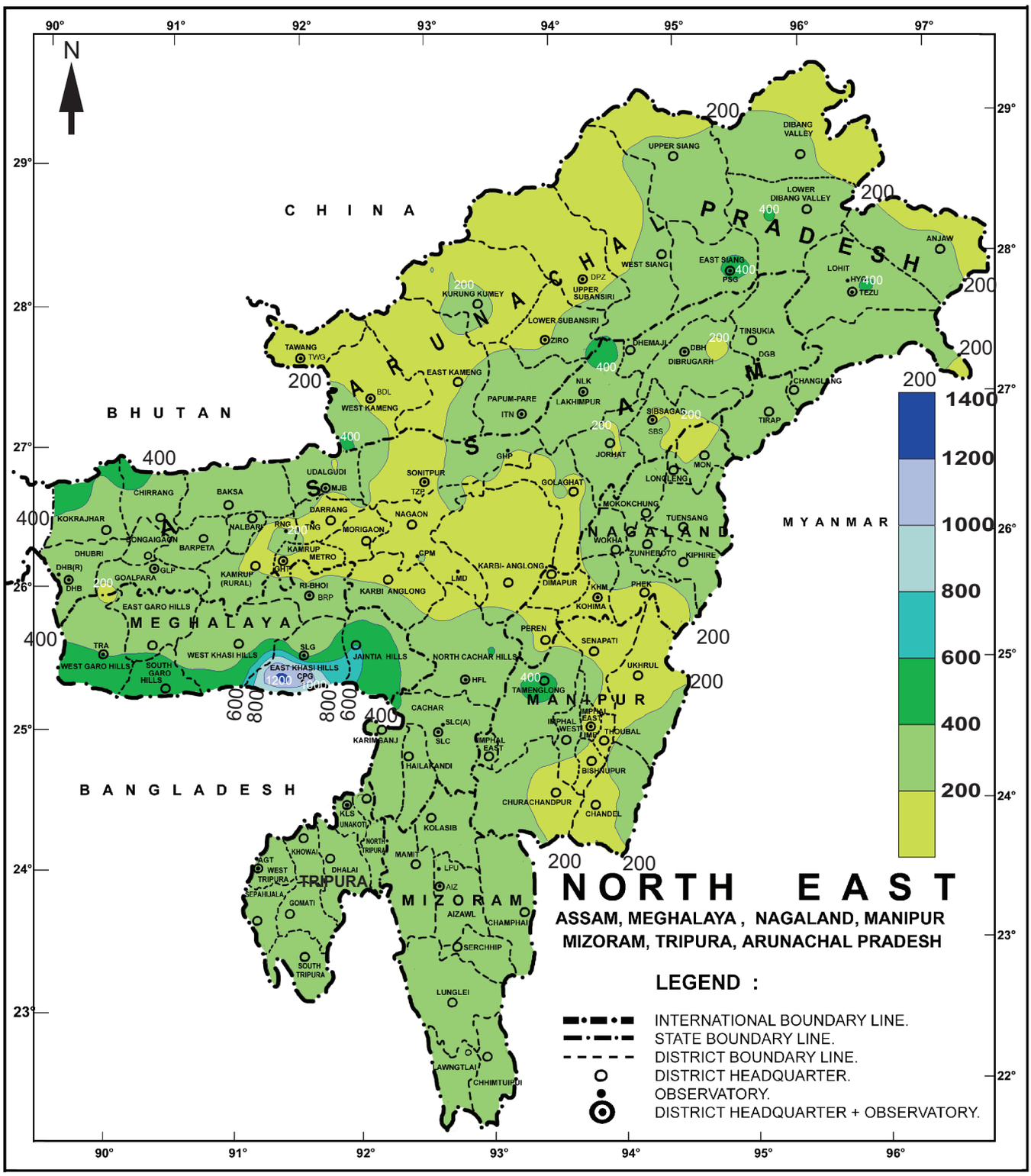

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FIG: 6(a) : SEASONAL RAINFALL (cm) - COLD WEATHER SEASON - DEC-JAN-FEB

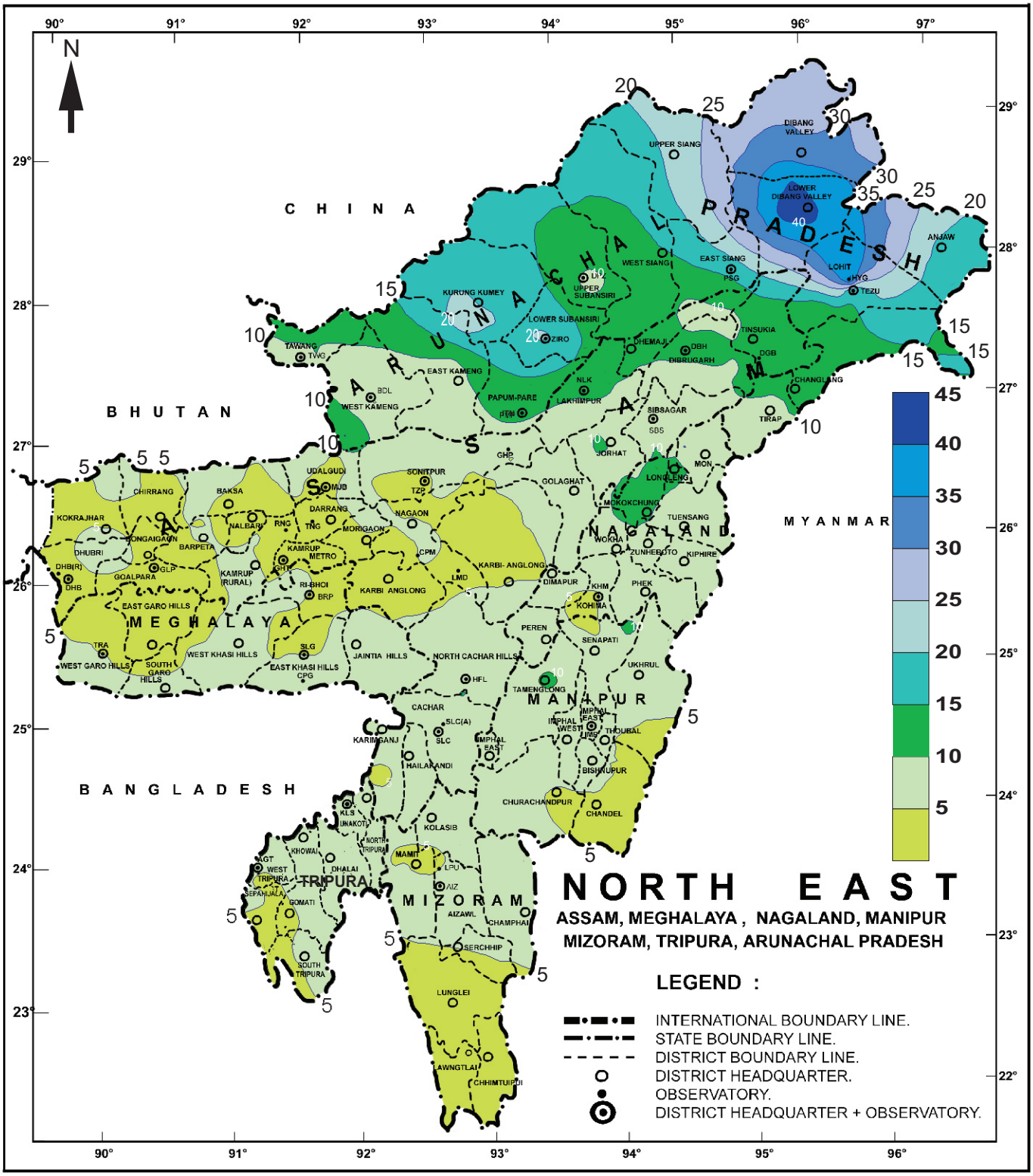

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FIG: 6(b) : SEASONAL RAINFALL (cm)- PRE-MONSOON (HOT WEATHER) SEASON-MARCH-MAY

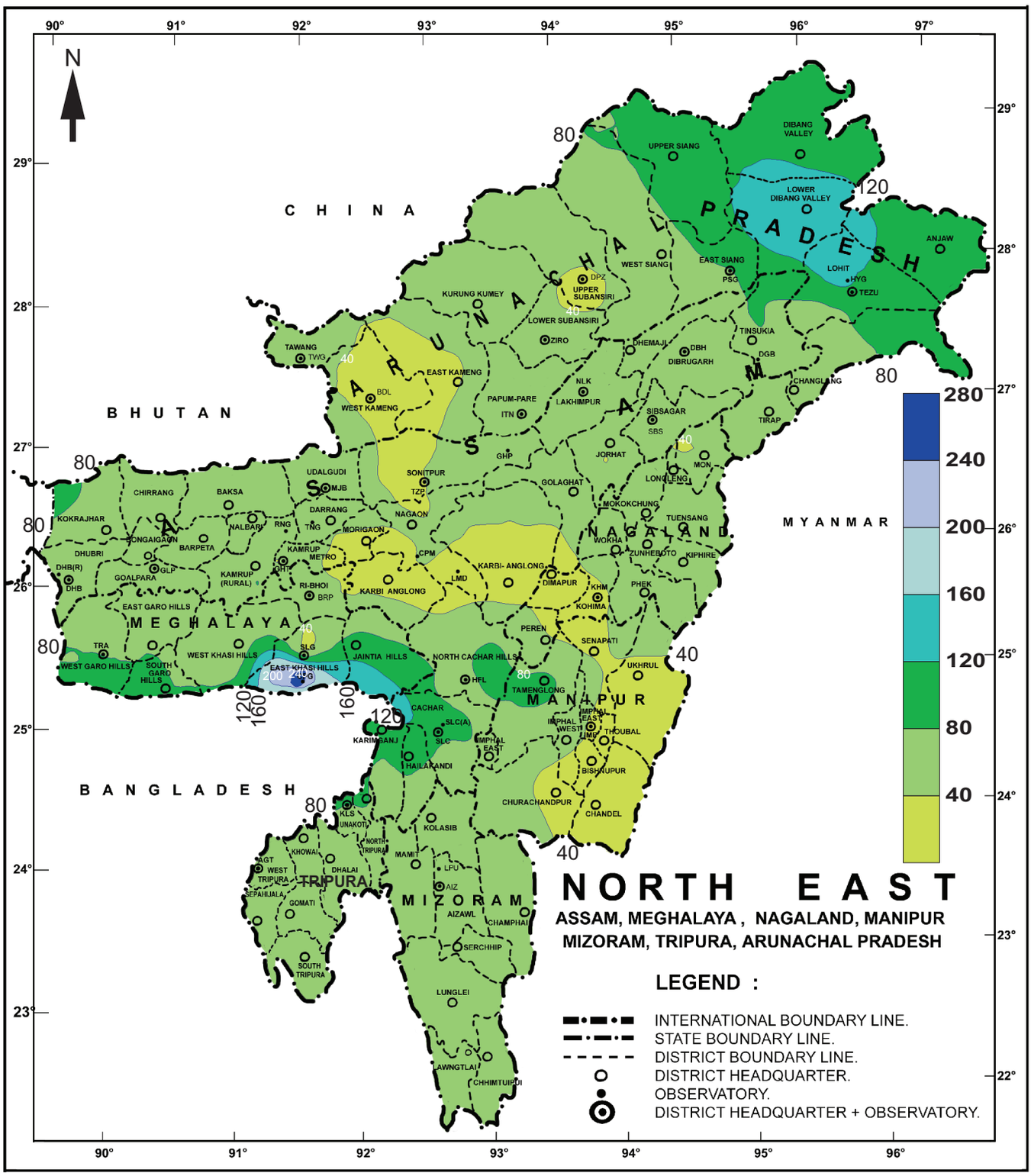

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FIG: 6(c) : SEASONAL RAINFALL (cm) - MONSOON SEASON - JUNE - SEPTEMBER

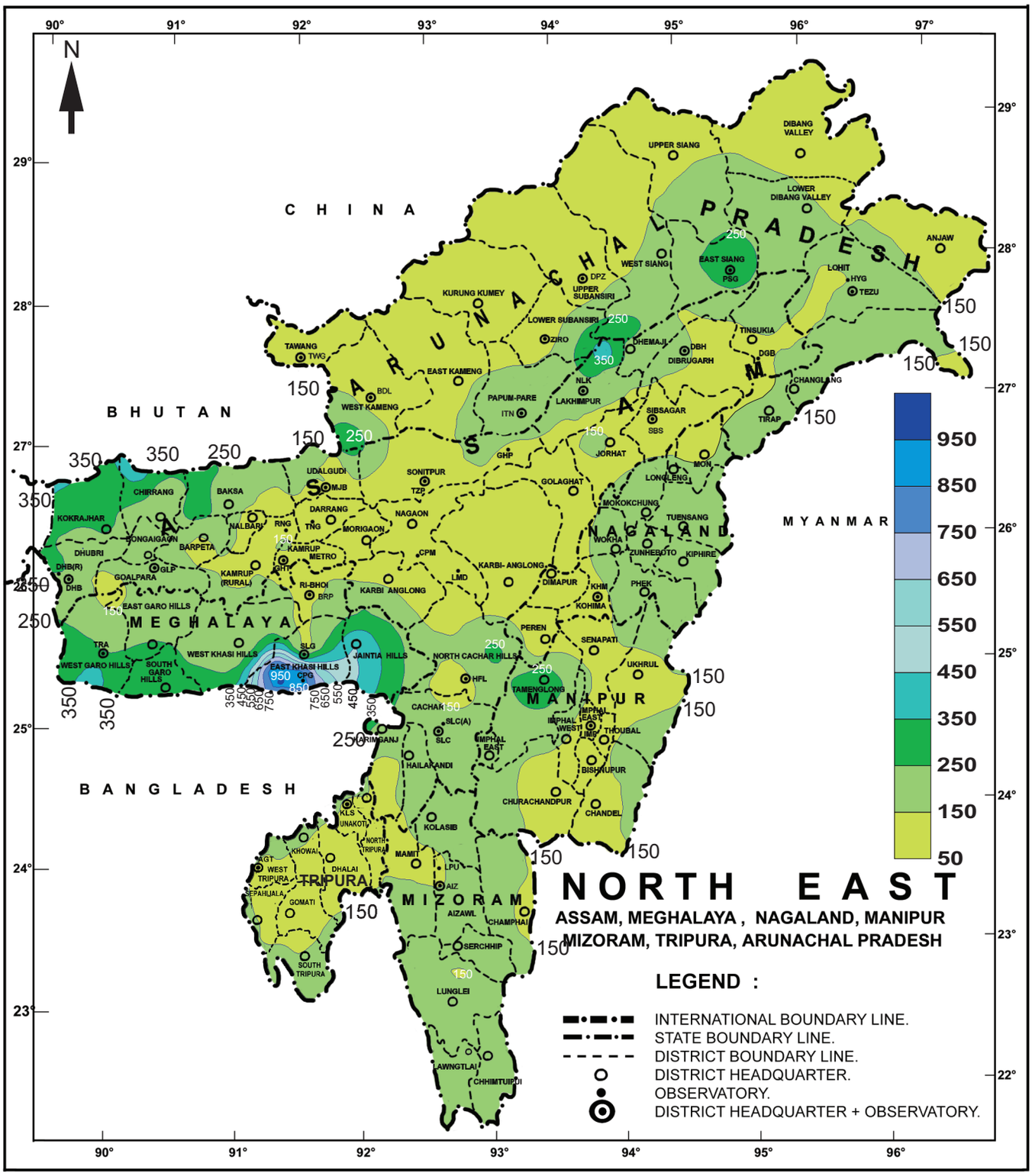

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FIG: 6(d) : SEASONAL RAINFALL (cm) - POST-MONSOON SEASON - OCTOBER-NOVEMBER

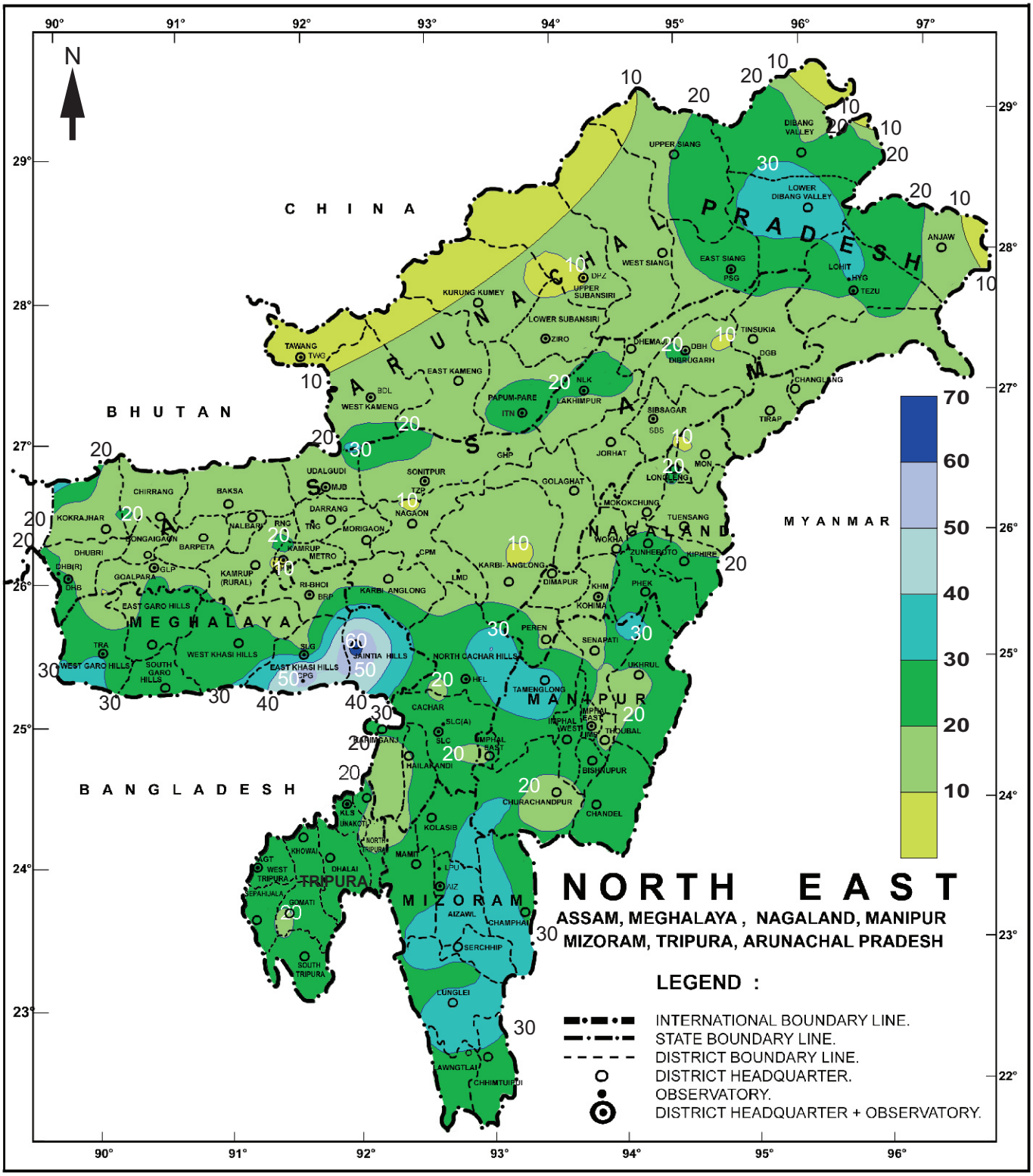

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FIG: 7(a) : DISTRICT NORMALS OF SEASONAL AND ANNUAL RAINFALL (mm) (1951-2000)
ASSAM

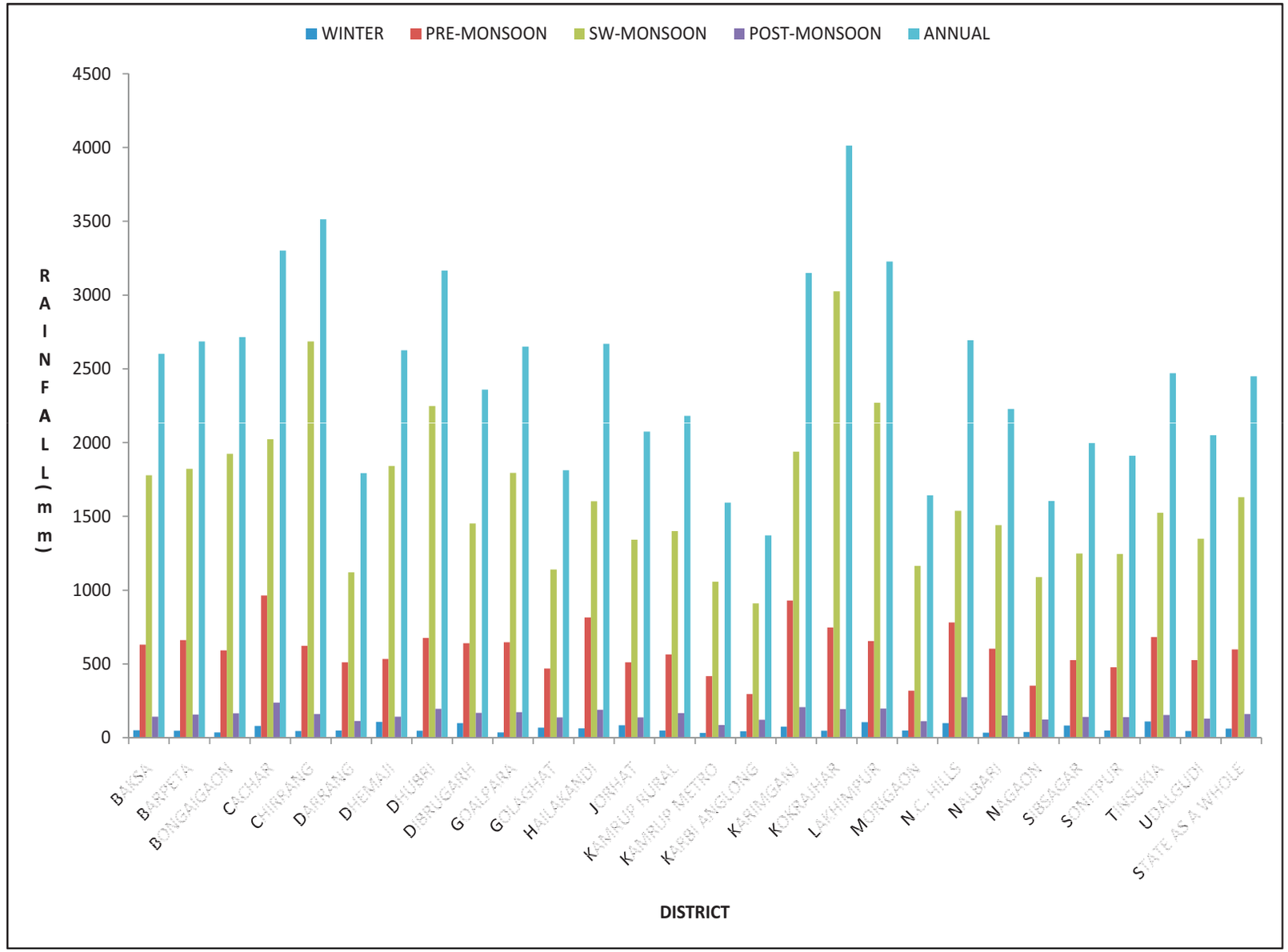

FIG: 7(b) : DISTRICT NORMALS OF SEASONAL AND ANNUAL RAINFALL (mm) (1951-2000)
MEGHALAYA

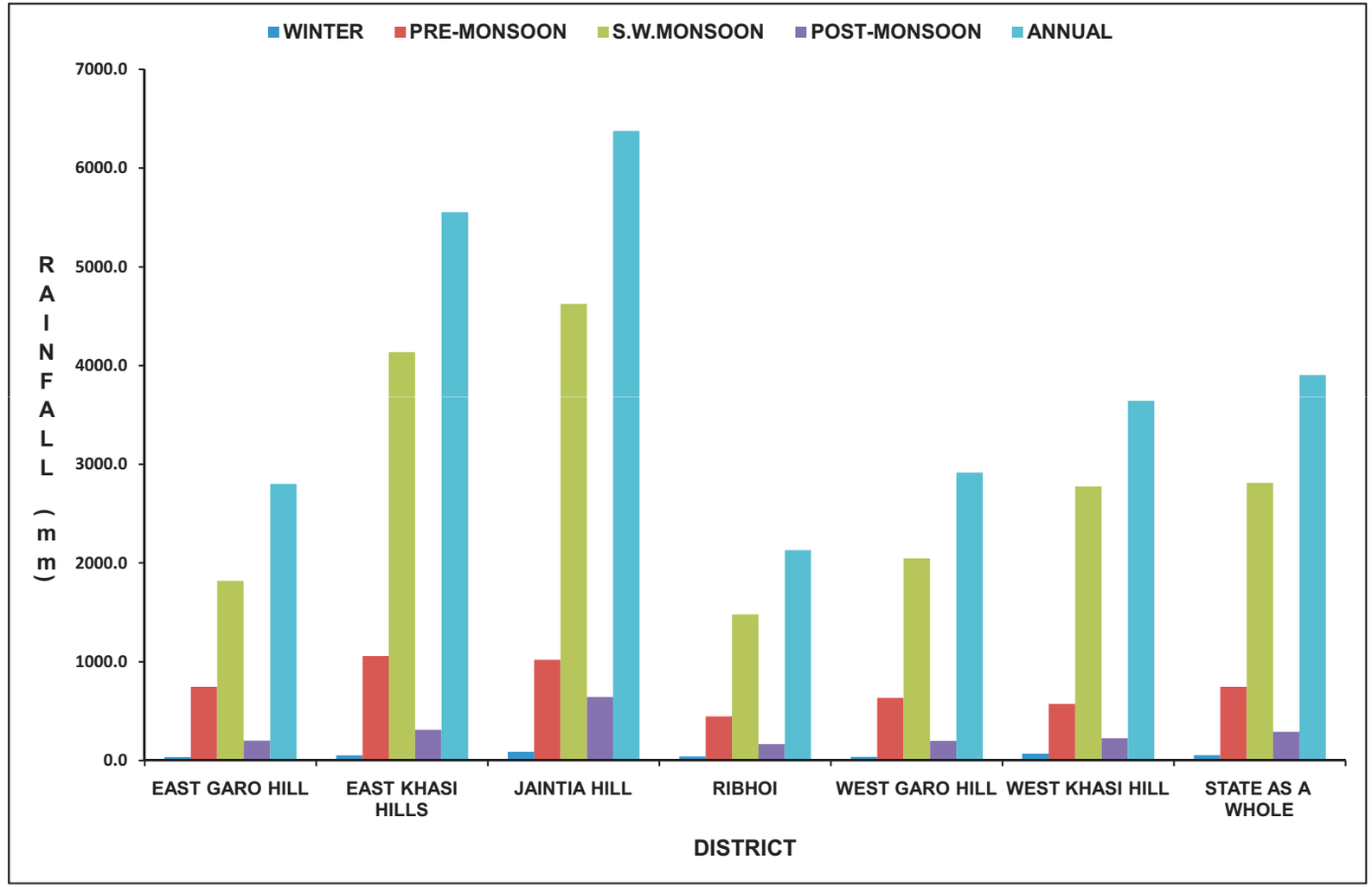

FIG: 7(c) : DISTRICT NORMALS OF SEASONAL AND ANNUAL RAINFALL (mm)
(1951-2000 OR AVAILABLE DATA SINCE 1901)
ARUNACHAL PRADESH

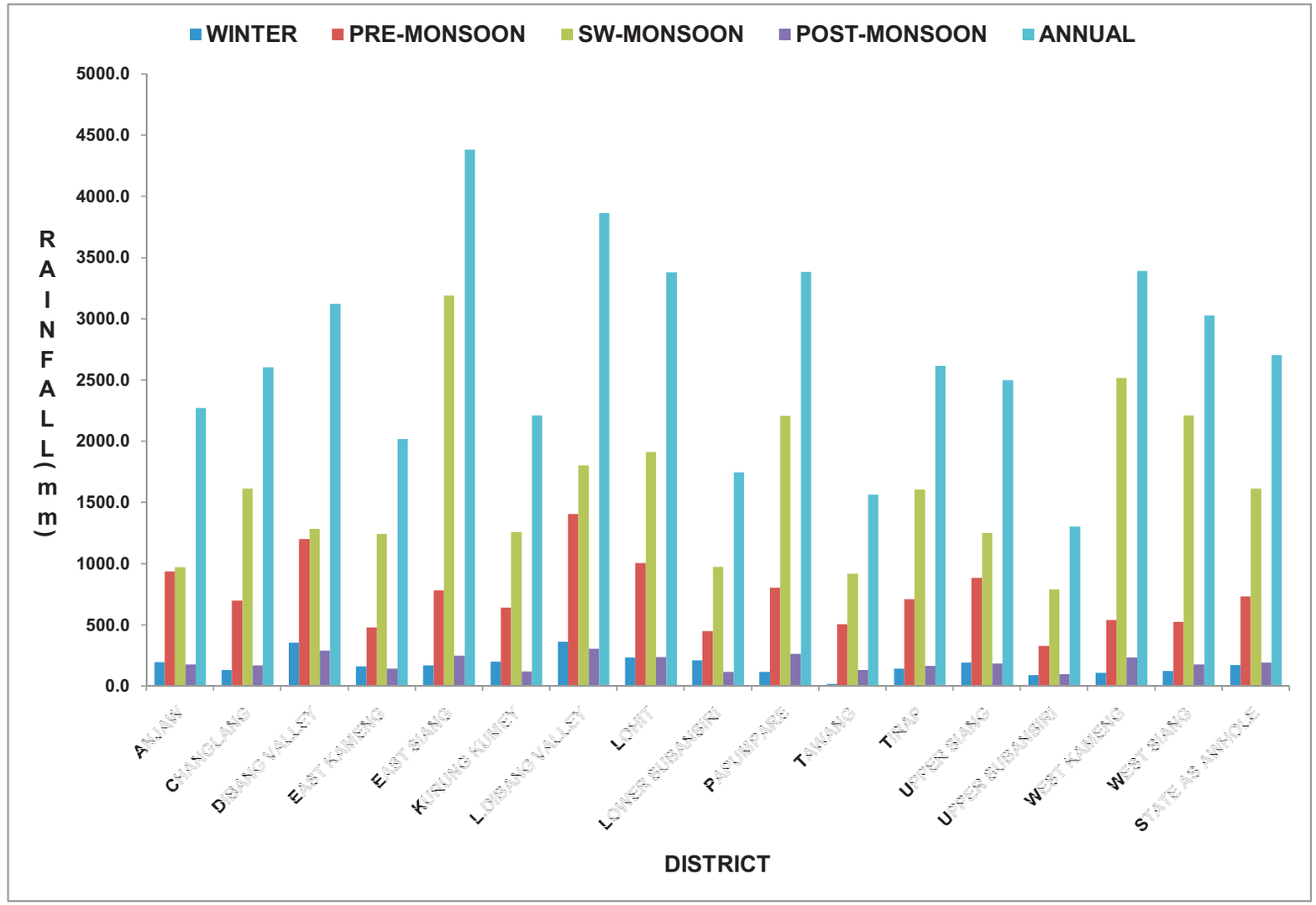

FIG: 7(d) : DISTRICT NORMALS OF SEASONAL AND ANNUAL RAINFALL (mm) (1901-2000)
NAGALAND

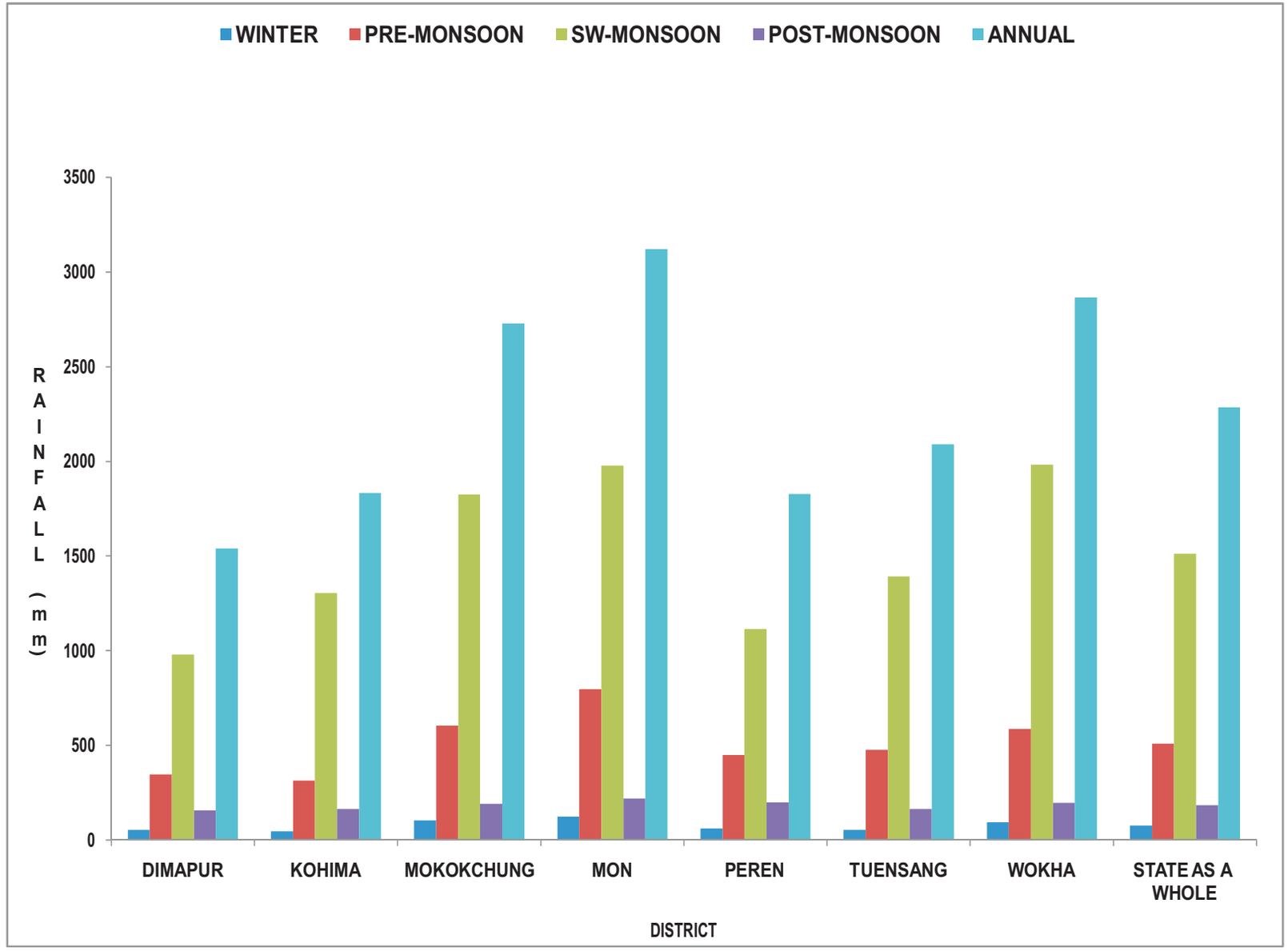

FIG: 7(e) : DISTRICT NORMALS OF SEASONAL AND ANNUAL RAINFALL (mm)
(1951-2000 OR AVAILABLE DATA SINCE 1901)
MANIPUR

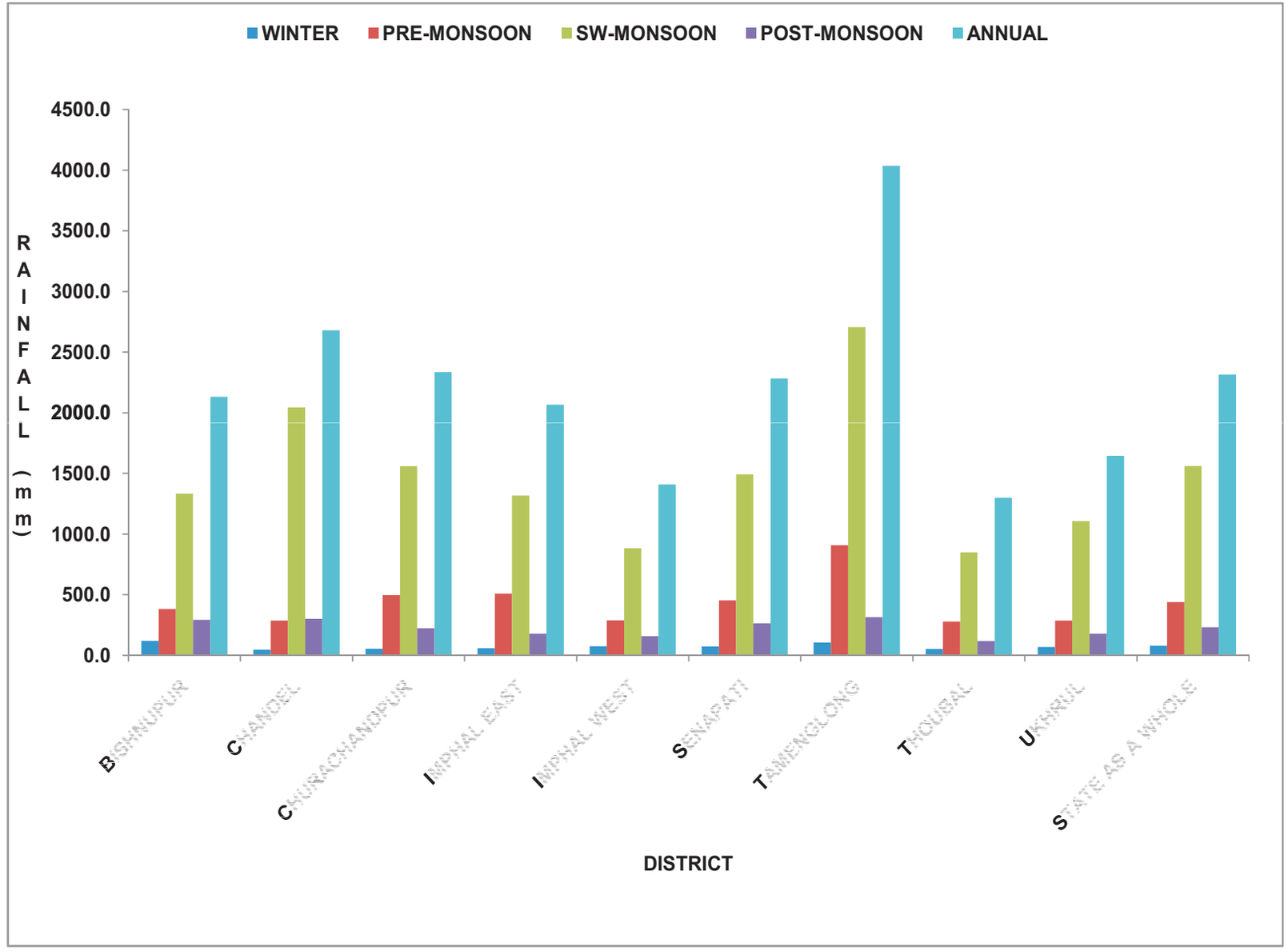

FIG: 7(f) : DISTRICT NORMALS OF SEASONAL AND ANNUAL RAINFALL (mm) (1951-2000)
MIZORAM

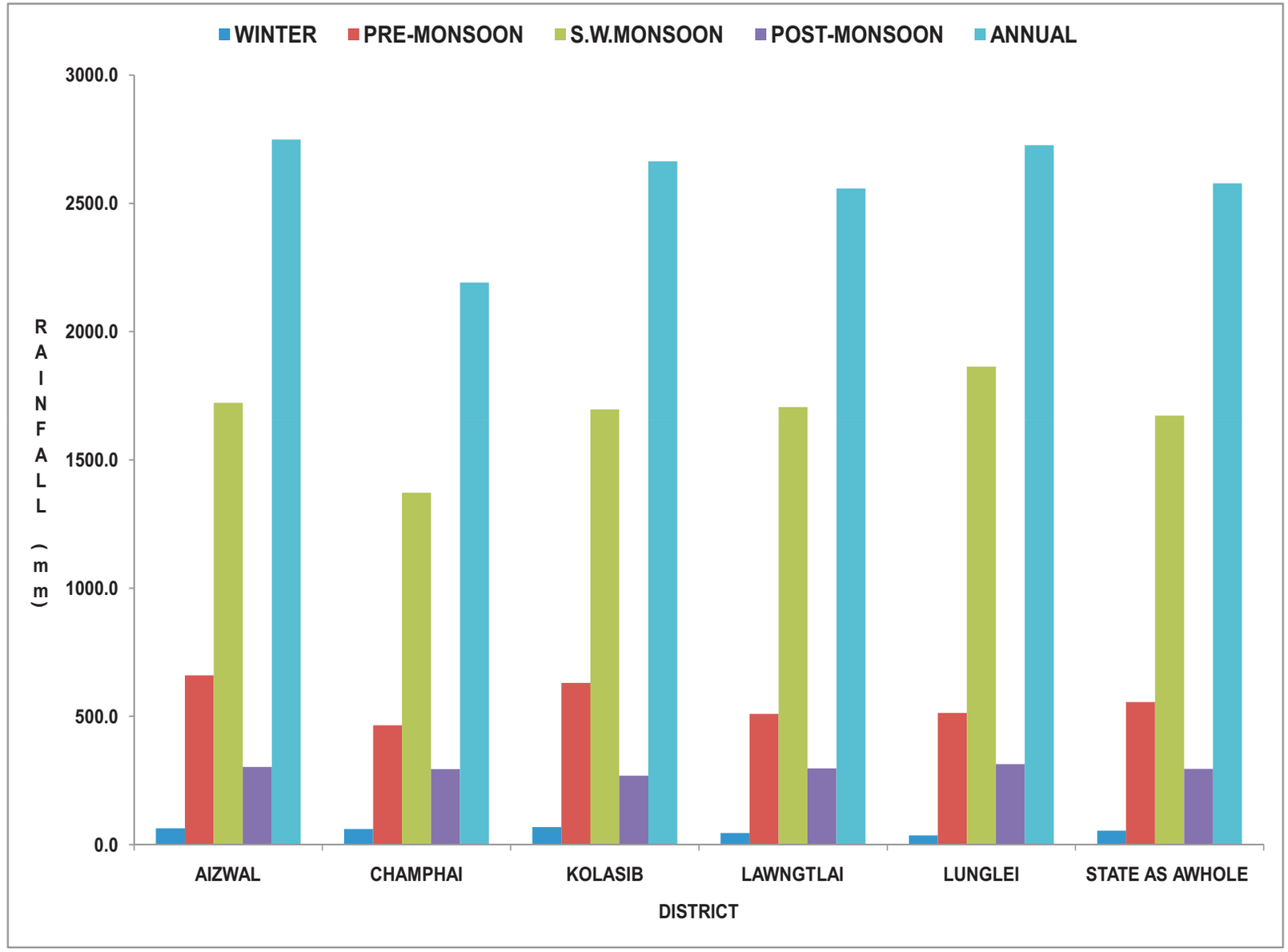

FIG: 7(g) : DISTRICT NORMALS OF SEASONAL AND ANNUAL RAINFALL (mm) (1951-2000)
TRIPURA

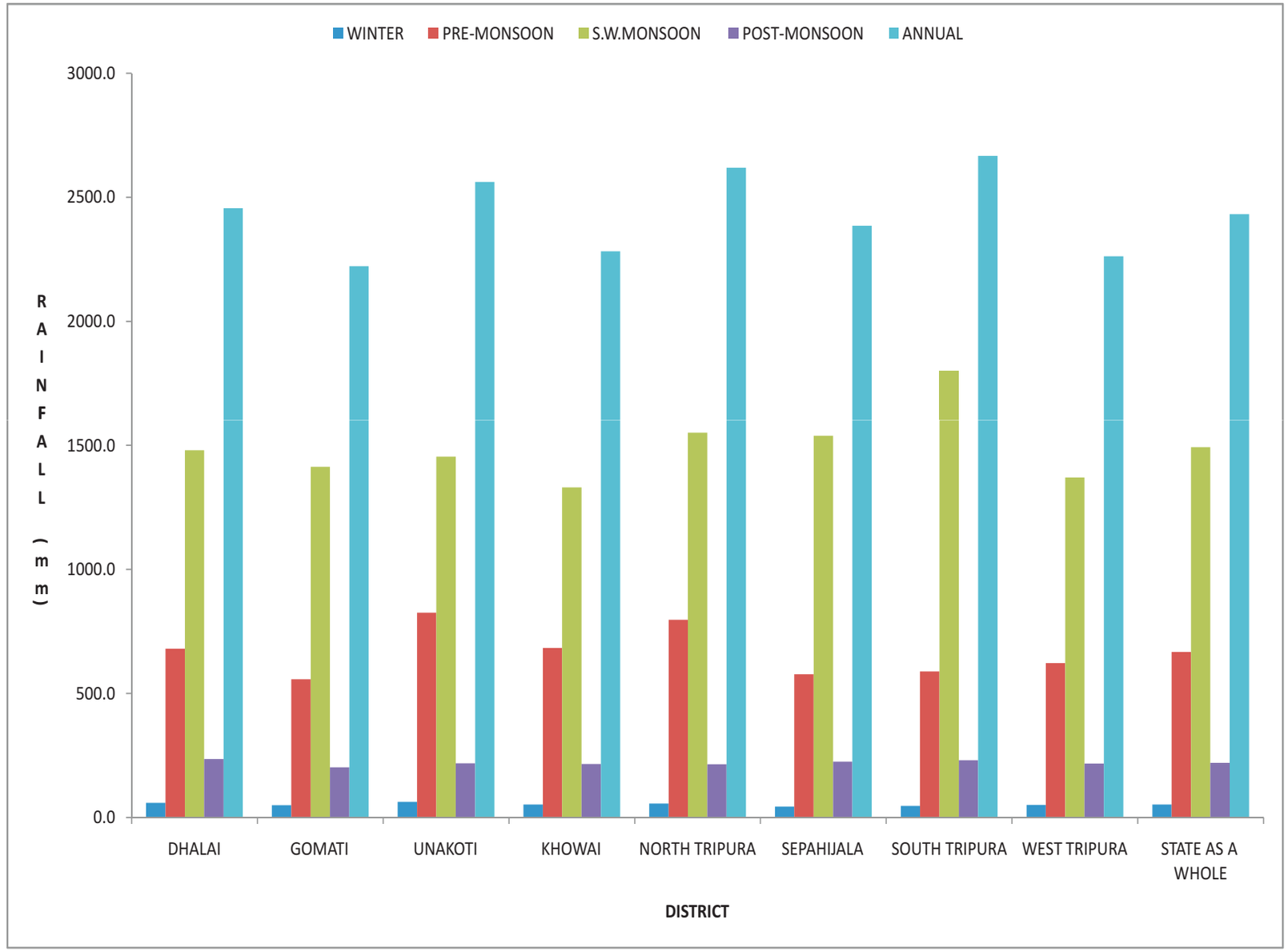

FIG: 8 : CATCHMENT AREAS WITH ANNUAL RAINFALL (mm)
(326,501,502,503,504)

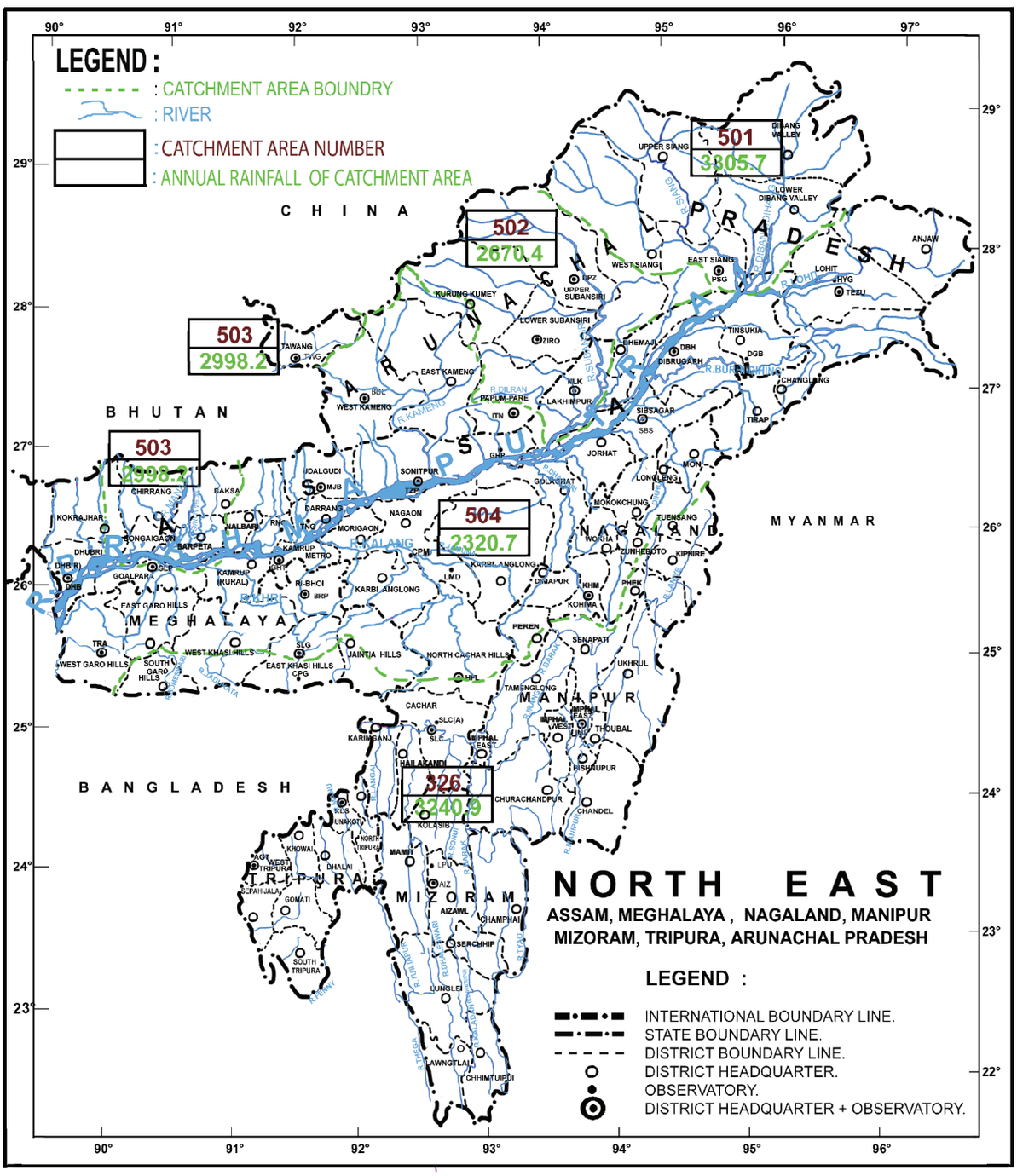

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FIG: 9 :COEFFICIENT OF RAINFALL VARIATION - ANNUAL

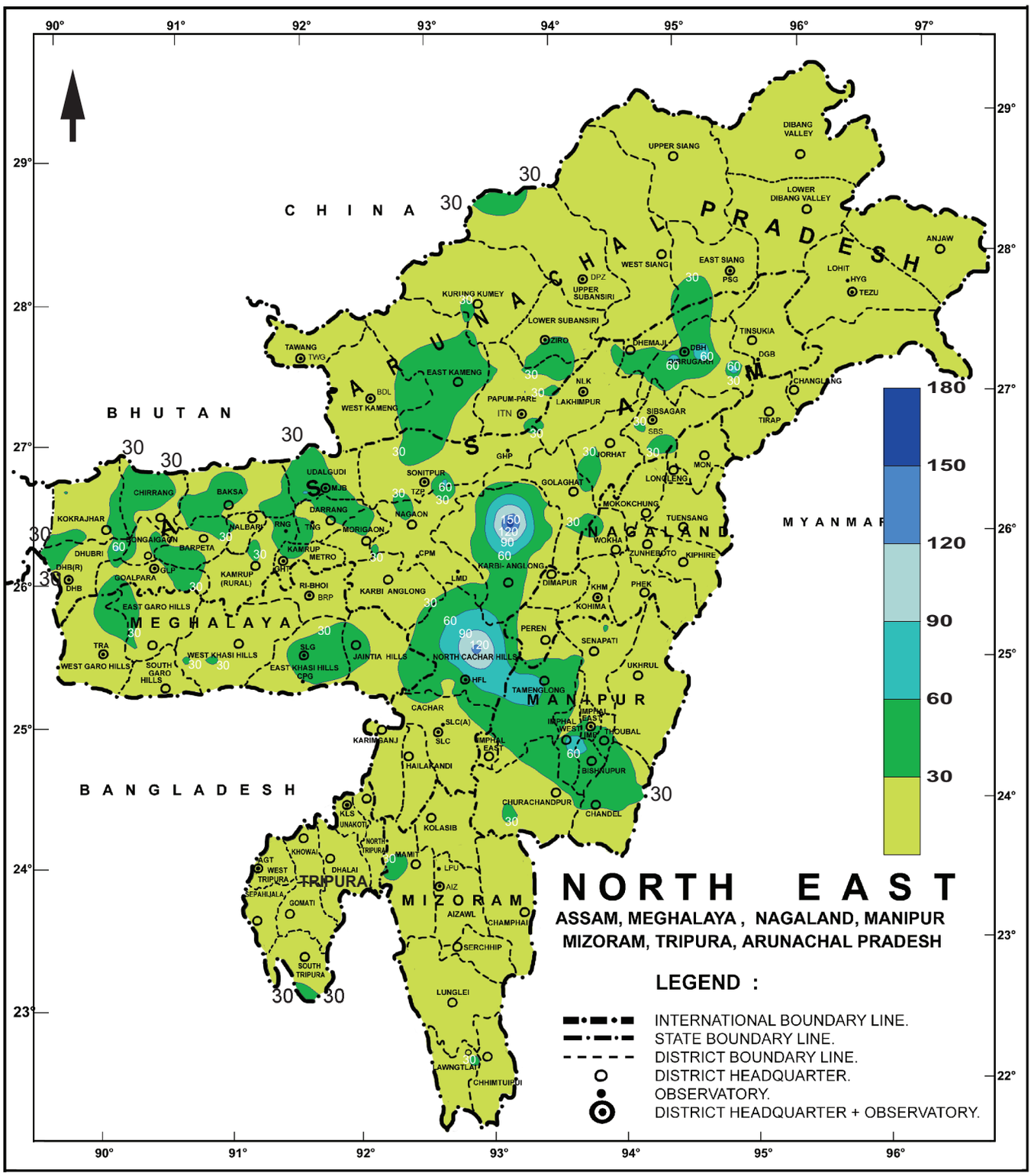

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FIG.9(a) : COEFFICIENT OF RAINFALL VARIATION PRE-MONSOON SEASON (MARCH-MAY)

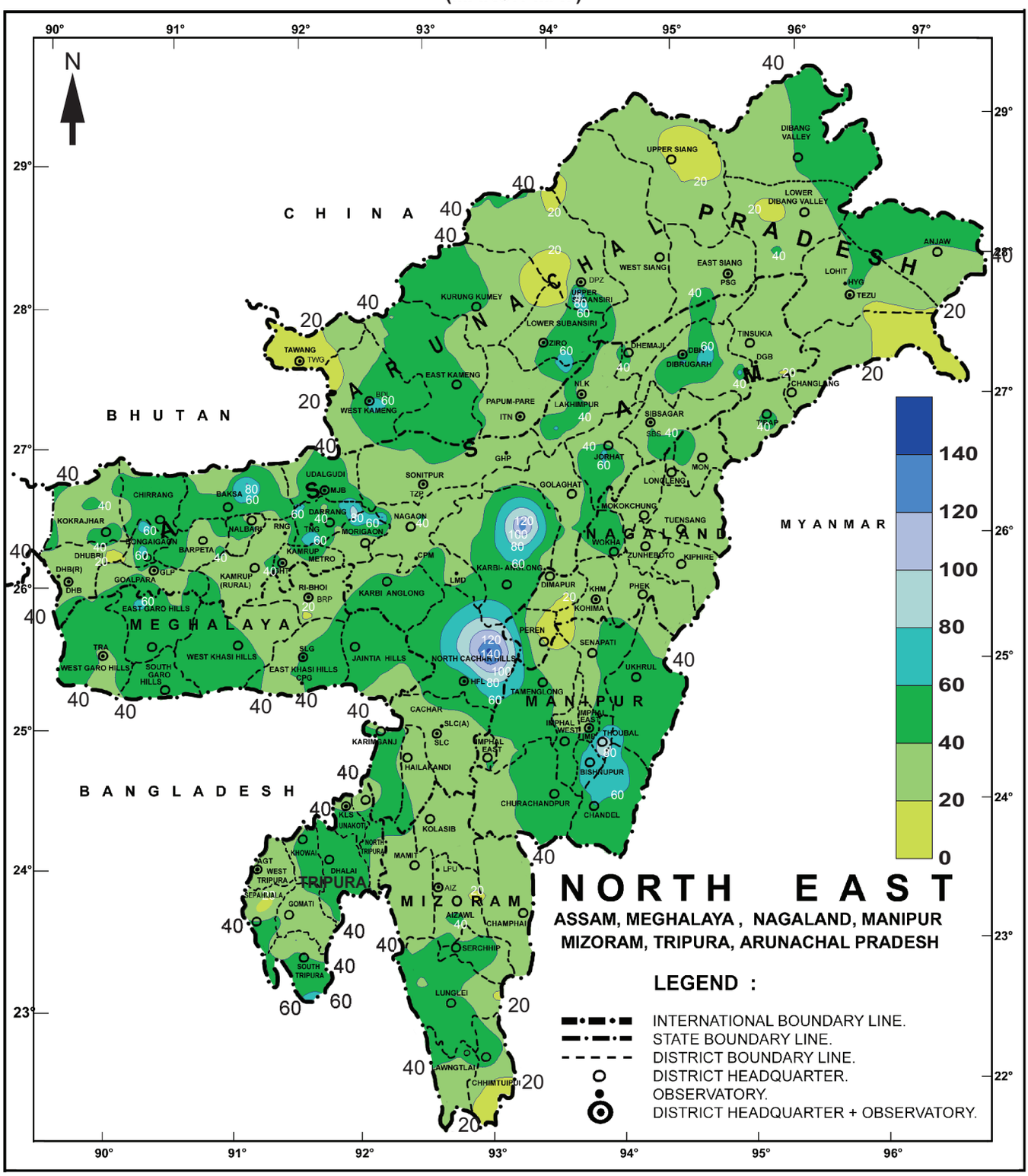

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FIG :9(b) :COEFFICIENT OF RAINFALL VARIATION - SOUTH WEST MONSOON SEASON (JUNE-SEPTEMBER)

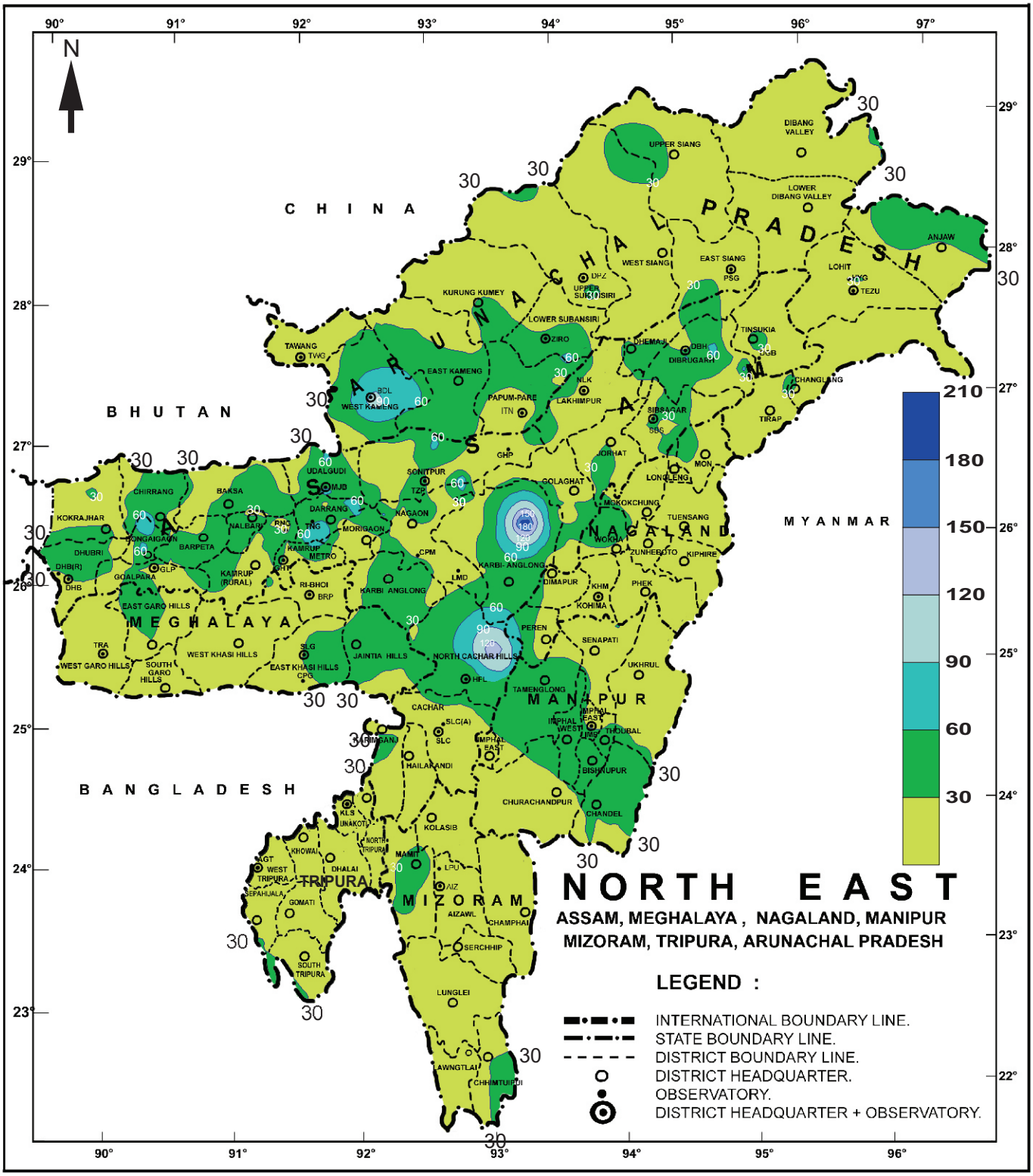

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FIG : 9(c) :COEFFICIENT OF RAINFALL VARIATION - POST-MONSOON SEASON (OCTOBER-NOVEMBER)

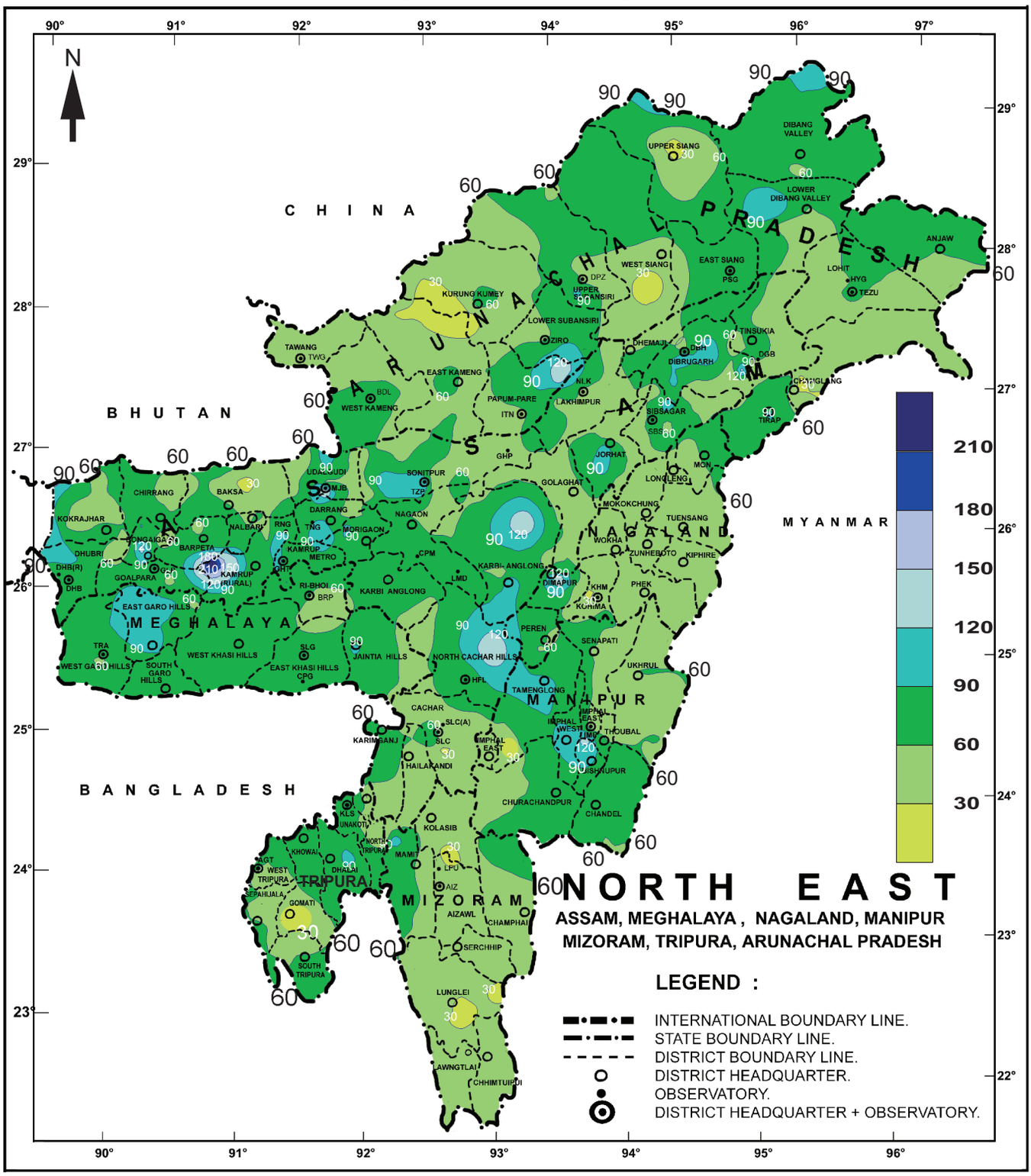

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FIG: 9(d) :COEFFICIENT OF RAINFALL VARIATION - WINTER SEASON (DECEMBER-JANUARY-FEBRUARY)

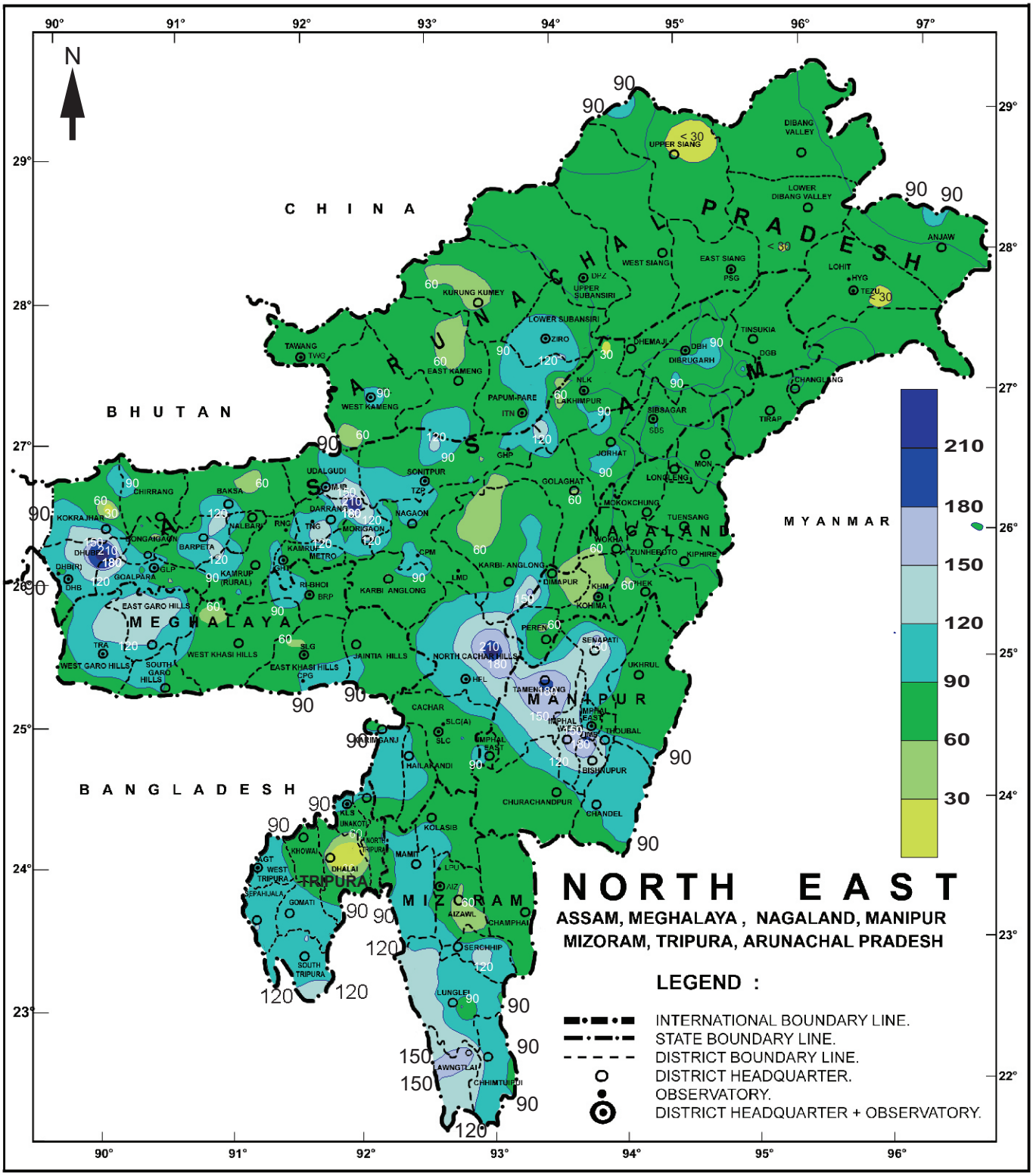

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FIG:10 :AREA AFFECTED BY DROUGHT (1951-2000)

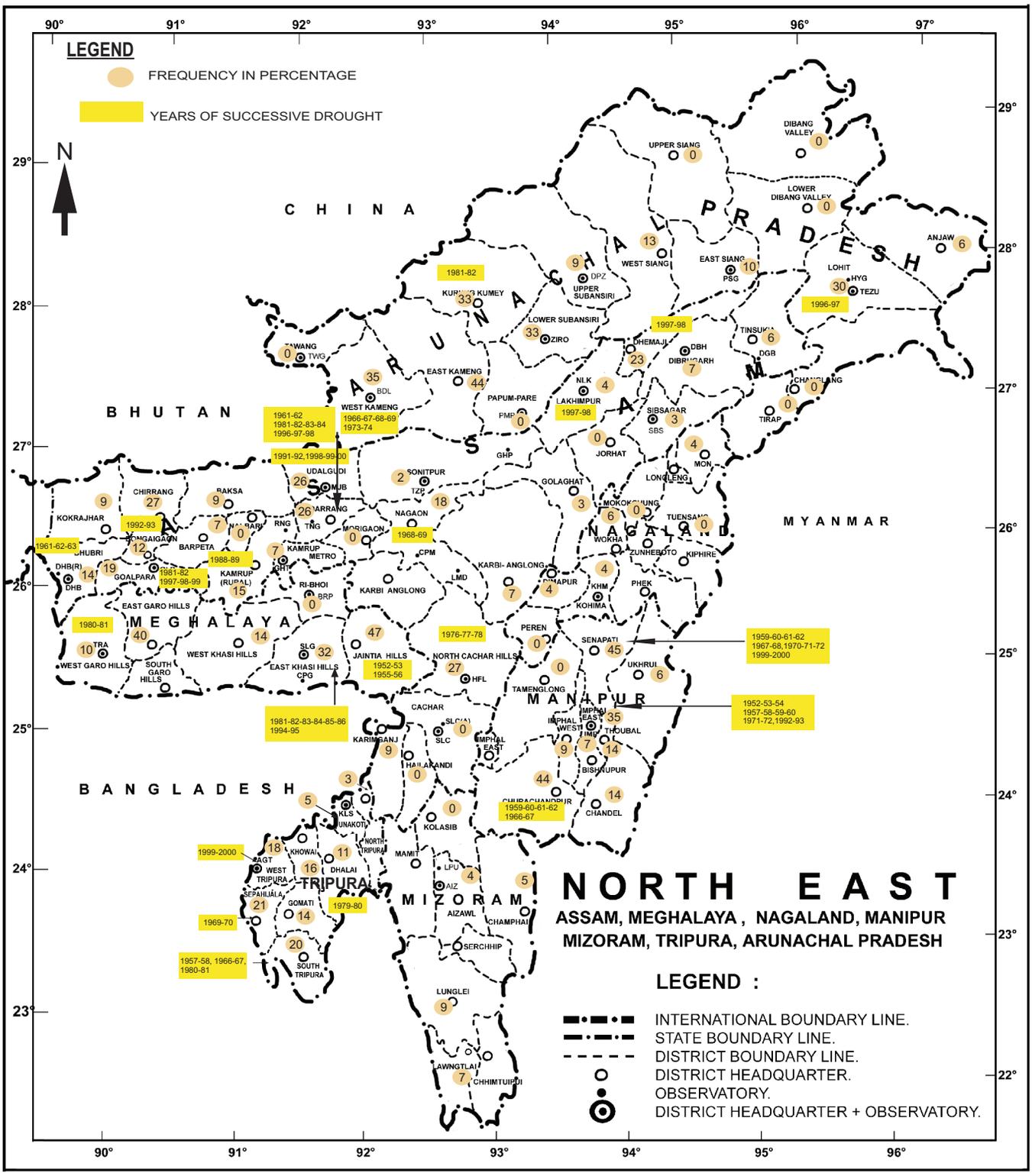

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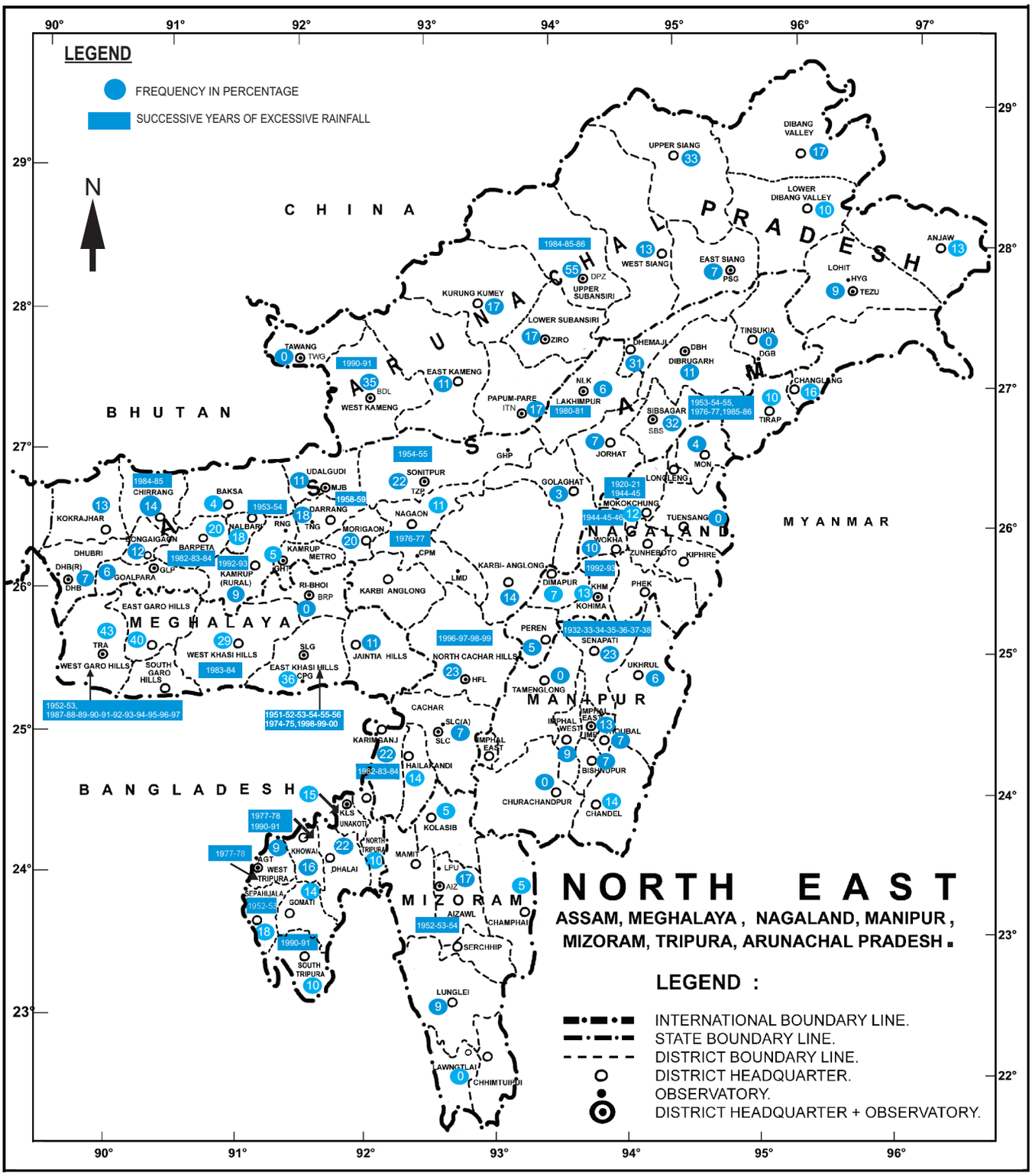
FIG: 11 :AREA AFFECTED BY EXCESSIVE RAINFAL (1951 - 2000)



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CLIMATE OF ASSAM

General Description

Assam state is located in the northeastern region of India. The state lies between 89^0 46' - 96^0 01' E longitude and 24^0 03' - 27^0 58' N latitude, and covers an area of 78,438 km². The state is bounded in the north by Bhutan and Arunachal Pradesh, in the east by Arunachal Pradesh, Nagaland and Manipur, in the south by Meghalaya and Mizoram and in the west by West Bengal, Tripura and Bangladesh.

The state can be divided into three principal geographical regions:

1. Brahmaputra Valley region in the foothills of the Himalayas in northern part of the state.
2. Barak Valley in the southern part.
3. Mikir (Karbi Anglong) and Cachar hills that divide the two valleys region.

Assam has mostly plain areas of low elevation, a large number of rivers and hills of low elevation in Karbi Anglong, North Cachar Hills and Cachar districts in the southern region. The peak height of hill in the state is about 1850 metres above mean sea level in North Cachar Hills district. Due to heavy rainfall in Eastern Himalayan and other watersheds of the north-eastern part of India, Assam has extensive rivers system consisting of Brahmaputra, Barak and other main rivers like Burhidihing, Danshiri, Subansiri, Kopili, Dihang, Disang, Dikhou, Lohit, Puthimari, Kalang, Manas, Jinjiram, Dikrang, Kulsi, Janji, Aai, Nonoi, Gangadhar, Dhanshiri, Ronganadi, Krishna, Kushiara etc.

All the rivers in Assam are liable to floods, mainly because they receive heavy rainfall within a short time in the state and its neighbourhood (Himalaya) where water runs very fast in to Assam which has mostly low elevation. These rivers are in their early stage of maturity and are very active agents of erosion. The river water collects a tremendous amount of silt and other debris from the hilly terrains and raises the level of the riverbeds. Therefore, it becomes impossible for the main channel to cope with the vast volumes of water received during the rains so that over flow water creates the floods in adjacent areas of the rivers.

Rivers

Brahmaputra river one of the biggest rivers in the world is called Yarlung Tsangpo in Tibetan language. This river originates from the Angsi Glacier located on the northern side of the Himalayas in Burang County of Tibet. The river is 3,848 km long. Brahmaputra enters India in the state of Arunachal Pradesh, where it is called Siang. It makes a very rapid descent from its original height in Tibet, and finally appears in the plains, where it is called Dihang. It flows for about 35 km and joins by Dibang and Lohit rivers at the head of the Assam Valleys where it is called Brahmaputra. This river enters Assam near Sadiya at the extreme northeast of the state and flows

westward for nearly 750 km before turning south to enter the plains of Bangladesh. The northern part of Assam is wholly occupied by the elongated valleys of the mighty Brahmaputra river. Brahmaputra valley is the dominant physical features of Assam and sometimes it becomes a cause of flood in Assam during southwest monsoon season. The river plays an important role to transform the land into a fertile zone for good agricultural productivity.

In Assam the river receives innumerable tributaries (about 60) coming out from the northern and northeastern originated Himalayan and southern hill range. The river with a well network of tributaries drains on area of 56480 square kilometer of the state accounting for 72% of its total geographical areas. Brahmaputra *river* becomes very wide sometimes as wide as 10 km in parts of Assam. It is further joined by the Kameng river in Sonitpur district. The river divides into two channels between Dibrugarh and Lakhimpur districts, the northern Kherkutia channel and southern Brahmaputra channel. The two channels join again about 100 km downstream forming the Majuli Island, which is one of the largest river islands in the world.

The Brahmaputra joins with Ganga in north of Goalundo Ghats, in Bangladesh, their combined water flow to the southeast for a distance of about 120 km as known Padma. The main body of the Padma reaches its confluence with Meghna river near Chandpur and then enters in to Bay of Bengal through Meghna estuary and lesser channels flowing through the delta.

Barak river originates from the Barail range in the Manipur hills and flows through the district of Cachar before entering Bangladesh. It is also a perennial river of the state. The river bifurcates into two streams called Surma and Kushiara at Haritikar near Bhanga in Cachar district. Further lower down the river is called Meghna and receives the combined flow of Ganga and Brahmaputra.

Dhanshiri river flows in Golaghat district of Assam and Dimapur in Nagaland from south to north before joining the Brahmaputra on its south bank. It originates from Laisang peak of Nagaland and covers the distance about 300 km in Assam.

Kushiara river flows from Cachar through Karimganj into Bangladesh from east to west. The total length of Kushiara is about 161 km and the average width is 250 m.

The orographic features play a dominant role in the climate of the state. It affects the northern parts of the state lying in foothills of Himalayan and southern parts having Mikir and Cachar hills which is also surrounded by Garo, Khasi and Jaintia hills. Assam is affected by plenty of floods, severe cold and drought.

The state comes under forecasting centre (Regional Meteorological Centre) Guwahati and meteorological subdivision: Assam and Meghalaya. There are twenty-seven districts in the state, as given below:

Sr. No.	Name	Sr. No	Name	Sr. No.	Name	Sr. No.	Name
1.	Baksa	8.	Dhubri	15.	Kamrup Rural	22.	Nalbari
2.	Barpeta	9.	Dibrugarh	16.	Karbi Anglong	23.	North Cachar Hills
3.	Bongaigaon	10.	Golaghat	17.	Karimganj	24.	Sibsagar
4.	Cachar	11.	Goalpara	18.	Kokrajhar	25.	Sonitpur
5.	Chirrang	12.	Hailakandi	19.	Lakhimpur	26.	Tinsukia
6.	Darrang	13.	Jorhat	20.	Morigaon	27.	Udalgudi
7.	Dhemaji	14.	Kamrup Metro	21.	Nagaon		

Climate

The year may be divided into four seasons. Winter season from December to February is followed by pre-monsoon or summer season from March to May. The period of June to the first week of October constitutes the southwest monsoon season, followed by post monsoon season till November.

The climate of Assam is characterized by abundant rain and humid air during southwest monsoon and latter part of summer season and cold in winter season. The period of April to mid June and October to November is mostly comfortable in almost parts of the state and sometimes weather becomes pleasant with occurrence of thundershowers during this period.

Areas in the state under each climate pattern based on Koppen's classification are shown in Fig. 2. This broad classification is based on mean annual and mean monthly values of rainfall in cm and temperature in ^{0}C. Most of the districts in the state mainly come under the climate type: Sub-tropical monsoon, mild and dry winter, hot summer (Cwa). Only 3 districts in the southern part of the state viz. Cachar, Karimganj and Hailakandi come under the climate type: Tropical monsoon, hot, seasonally excessive rainfall (Am). Hilly parts adjacent to Meghalaya state border i.e. North Cachar Hills and Karbi Anglong districts come under the climate type: Tropical Upland, Mild winter, dry winter, short warm summer (Cwb).

Sea level Pressure and Winds

The seasonal variation in atmospheric pressure over the state occurs in a systematic way with a maximum in the winter and a minimum in the southwest monsoon season. During winter, the pressure is slightly high over northeastern part and low over the central and southern parts. However, pressure in late summer and southwest monsoon season is high over southeastern part and low over northwest and central parts.

The winds are generally light and blow mainly from east or northeast direction throughout the year. Sometimes winds are calm. The westerly component is seen during the southwest monsoon season especially in the evenings. As the pressure trend changes during the pre-monsoon and southwest monsoon seasons, the winds become stronger.

October onwards, the change over in the pressure and wind pattern to winter pattern commences. Table I gives the monthly mean wind speed in kilometer per hour and predominant wind direction in the morning and evening for observatory stations in the state.

Temperature

Table II gives the mean maximum and mean minimum temperatures at the observatory stations in the state. Fig. 2(a,b,c,d) and 3(a,b,c,d) show the spatial distribution of mean maximum and mean minimum temperatures respectively for the representative months of the four seasons. Southwest monsoon period is the hottest season of the year.

Temperature begins to rise by March and steadily rises till it reaches peak in July and August. The state lies in the plains except for small hilly areas in the Karbi Anglong, North Cachar Hills and Cachar districts. The temperatures therefore, do not vary much in the state. There are mild hot in summer in the state. Mean maximum temperatures in the monsoon months are equal or slightly more than May month. The temperatures start to fall after withdrawal of the southwest monsoon by about the middle of November when the night temperatures show appreciable fall.

Mean maximum temperature in May month is about 30^0C to 33^0C in plain region of the state while; the temperature over hilly areas is about 6^0C lower as shown in Fig. 2(a). The temperature is higher over central and northwestern parts of the state.

July and August are the hottest months of the year. Mean maximum temperature in July month ranges from 31^0C to 33.7^0C in plain region while the temperature over hilly areas is about 7^0C lower as depicted in Fig. 2(b). The maximum temperature values of October are 1^0C to 2^0C lower than July month as shown in Fig.2(c). Fig. 2(d) depicts that mean maximum temperature of January is about 15^0C to 26^0C.

January is the coldest month of the year. Fig. 3(a) depicts that mean minimum temperature of January month is about 8^0C to 12^0C in plain areas and the temperature is about 4^0C to 8^0C over hilly areas and extreme northern part of the state. Mean minimum temperature of April ranges from 17.7^0C to 21^0C in increasing trend southward except hilly areas where the temperature is about 14^0C as shown in Fig. 3(b). In month July the

temperature ranges from 20.9^{0}C to 25.5^{0}C over the state except hilly areas where it is about 3^{0}C lower as shown in Fig. 3(c). From Fig. 3(d) the temperature of October month ranges from 19.0^{0}C to 23^{0}C in plain areas and it is about 4^{0}C lower in hilly areas.

The highest maximum temperature and the lowest minimum temperature ever recorded on data up to 2011 are depicted in Fig. 4 and Fig. 5 respectively. The extreme maximum temperature is high over central and western parts and less over the other parts of the state. The temperature ranges from 35.6^{0}C to 43.9^{0}C over plain areas and 2^{0}C to 4^{0}C less over hilly areas. The highest maximum temperature ever recorded at any station in the state is 43.9^{0}C at Chaparmukh in Nagaon district on 6th July 1961. The extreme minimum temperature ranges between -3.0^{0}C and 6.2^{0}C. The temperature decreases northward and over hilly areas of the state. The lowest minimum temperature ever recorded at any station of the state is -3.0^{0}C at Majbat in Udalgudi district on 22nd January 1982.

The diurnal variation of temperature increases rapidly after withdrawal of southwest monsoon and is larger in the winter season when it is around 13^{0}C to 16^{0}C and minimum in the monsoon months, in order of 6^{0}C to 9^{0}C.

Humidity

Table III gives the mean relative humidity at 0830 and 1730 HRS IST for observatory stations in the state. Assam lies in the plains of the Brahmaputra river with an average elevation of around 100 metres and is therefore, generally highly humid region throughout the year except February, March and April. There is not much diurnal variation between the mornings and afternoons throughout the year except January to March months.

The relative humidity is the highest during the period June to October when it is about 85% in the mornings and around 80% in the afternoons. In February to April months the relative humidity is the lowest around 60% to 70% during the afternoons.

Cloudiness

Table IV and IV(a) give the mean monthly and total cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 HRS IST respectively.

There is cloudiness almost throughout the year. It is generally more in mornings than afternoons. During the period May to September the skies are heavily clouded to overcast. On an average the skies are overcast for 9 to 13 days in the morning and 5 to 7 days in evening during this period. However, skies are clear for 1 to 4

days during this period. By October the cloudiness decreases and on an average around 11 to 16 days the skies are clear during November to March.

Rainfall

Table V gives the districtwise and statewise mean monthly and annual rainfall and number of rainy days (i.e. days with rainfall of 2.5 mm or more). The state of Assam has over 101 rainy days. It can be seen from this table that state is of a well rain fed region. The annual rainfall of the state is 2448.9 mm.

Fig. 6 and Fig. 6 (a to d) depict the spatial distribution of the annual and seasonal rainfall over the state respectively.

There is a large variation in average annual rainfall from place to place in the state. The rainfall in the central region mostly covered by Kamrup Metro, Morigaon, Darrang, Nagaon and Karbi Anglong districts is the least, as these areas fall in the rain shadow of the Meghalaya Plateau. It increases southwards into the Barak valley, westwards into the south Brahmaputra valley, eastwards and northwards into the east Brahmaputra valley. Kokrajhar district in the northwestern part of the state receives the highest rainfall of about 4014 mm while Karbi Anglong district receives the least around 1371.2 mm annually.

The spatial distribution of rainfall during the southwest monsoon season (Fig. 6(c)) is generally similar to that of the annual pattern (Fig. 6). In the monsoon season state receives an average rainfall of about 1629 mm. During the pre-monsoon season (March to May), the state also receives a significant rainfall with an average of about 598 mm (Fig. 6(b)) while the post monsoon season (October and November) it receives about 160 mm of rainfall (Fig. 6(d)). Winter season (December to February) receives less rainfall about 62 mm. Of the total annual rainfall, 66% is received during the southwest monsoon season whereas 24% rainfall is received during the pre-monsoon months (March to May), 7% rainfall is received in post monsoon months -October and November and 3% rainfall is received during the winter months -December to February.

The percentage of seasonal number of rainy days with respect to the annual indicate that 59% occurs during the southwest monsoon season, whereas, 28% occurs during the pre-monsoon season, 8% occurs during the post monsoon season and 5% during the winter season.

The southwest monsoon sets in by the first week of June over the entire state. June and July are the rainiest months accounting for 39% of the annual rainfall with June accounting for 19% and July accounting for 20% of the annual. The number of rainy days during the southwest monsoon season ranges from 12 to 17 with a maximum of 17 in July.

The withdrawal of the southwest monsoon begins by the first week of October and completely withdraws from the state by the middle of this month.

The most common rain giving systems over the state are depressions and cyclonic storms originating in the Bay of Bengal and entering the state through the hut Bay. Sometimes, the state, which is located in the foothills of the Himalayas, receives heavy rainfall during break in southwest monsoon over the country when the position of monsoon trough is in the north of its normal, i.e. over Assam or eastern Himalayas. In such a situation, the overflowing water from rivers creates a drastic flood in some areas of the state. The occasional winter rain, which is very vital for agriculture occurs in association with induced lows. A good amount of rainfall (598 mm) is also received in the pre-monsoon months due to thunderstorms /Norwesters and hailstorms developed with intense convective activity and cyclonic circulation with adequate moisture. Sometimes the system is developed due to thunderstorms/Norwesters.

The features of rainfall described above are also evident from Fig. 7(a), which shows the annual and seasonal rainfall for the individual districts as well as for the state and provides a measure for comparison of seasonal rainfall with the annual for both districtwise and statewise rainfall.

Table VI gives the monthly and annual rainfall for various river catchments (No. 326, 501, 502, 503 and 504) in the state. The annual rainfall of these river catchments is shown in Fig. 8. However, table VI shows the districts/parts of districts of Assam state covered by these catchments. Catchment No. 326 formed by the streams of Assam, Tripura and Manipur flowing into the Bay of Bengal, which covers parts of districts Cachar, Hailakandi, Karimganj and North Cachar Hills, receives an annual rainfall of 2867.0 mm with 137 rainy days. Catchment No.501 formed by river Brahmaputra- trans-Himalayan including river Dihang which covers district Tinsukia, receives an annual rainfall of 2293.5 mm with 108 rainy days. Catchment No. 502 formed by Subansiri river which covers the parts of the district of Lakhimpur, receives an annual rainfall of 3355.0 mm with 125 rainy days whereas catchment No. 503 formed by Manas river which covers parts of Barpeta, Baksa, Bongaigaon, Chirrang, Goalpara, Kamrup Rural and Kokrajhar districts, receives an annual rainfall of 3070.1 mm with 98 rainy days. The catchment No. 504 formed by the river Brahmaputra up to the Bangladesh border, including river Dihang, Lohit, Kameng, streams between river Subansiri and Manas and streams between Manas and Tista, (excluding Tista river and its tributaries) which covers most of the remaining districts of the state receives an annual rainfall of 2216.3 mm with 99 rainy days.

Rainfall Variability

The spatial distribution of variation of annual rainfall over Assam is depicted in Fig. 9. Coefficient of Variation (CV) which is expressed as percentage is defined as:

$$C.V. = \frac{\text{Standard deviation } (\sigma)}{\text{Normal } (N)} \times 100$$

It is observed from Fig. 9 that the values of CV of annual rainfall range between 1.3% and 160.6% over the entire state of Assam. It is of higher order over southeastern part of the state.

The spatial distribution of CV of seasonal rainfall over Assam is shown in Fig. 9(a), 9(b), 9(c) and 9(d) for: pre-monsoon season (March to May), southwest monsoon season (June to September), post monsoon season (October and November) and winter season (December to February) respectively.

It is observed that the values of CV range between 15.8% and 154.4% (Fig. 9(a)) in pre-monsoon season. The regions in the southeast of Assam exhibit the highest variability with values of CV exceeding 140% while the central and north eastern regions of the state exhibit the least CV of about 20%.

During the southwest monsoon season the rainfall variability is low with CV ranging between 2.7% and 183.8% (Fig. 9(b)). The variability is high over southeastern part of the state. However, the rainfall variability is almost even throughout the state during this season, being an average of the CV value about 40%.

During the post monsoon season the values of CV range between 11.5% and 233% (Fig. 9(c)). The central and northern parts of the state exhibit lower variability of 30% to 60%, while the variability is of higher order over the southwestern part of the state.

During the winter season the values of CV show a steep gradient with range between 1.2% and 222.7% (Fig. 9(d)). The central and northeastern part of the state exhibit lower variability of about 75% while the high variability is seen over portions of the western, northern and southern parts of the state.

As the variability of annual rainfall and seasonal rainfall during the southwest monsoon and pre-monsoon season over Assam is relatively low and as the variability of seasonal rainfall for the other two seasons is high with CV values about 220%, over some parts of the state, the contribution of southwest monsoon and pre-monsoon seasonal rainfall to the annual rainfall is more over the state.

Droughts

Meteorological drought over an area or a place may be defined as a situation when the annual rainfall over the area or place is less than 75% of the normal. It is classified as “Moderate drought” if the rainfall deficit is between 25% and 50% and “Severe drought” when it is more than 50%. Areas where frequency of drought as defined above is more than 20% of the years examined, such areas are classified as “drought areas” and areas

having drought condition for more than 40% of the years under consideration represent “chronically drought affected areas”.

Darrang, Udalgudi, North Cachar Hills, Chirrang and Dhemaji districts in the state experienced 10, 9, 8, 6 and 3 years of drought respectively out of the 39, 35, 30, 22 and 13 years under consideration during the period 1951-2000, satisfying the criteria for “drought areas”.

There is not a single district in the state during the period 1951-2000, which satisfies the criteria for “chronically drought affected areas”.

Following districts of the state were affected by drought during some year or the other during the period 1951-2000. The details of year wise occurrence of drought over each district during this 50 year period are given below. The figures within the brackets against each district indicate the number of occasions during this period when these districts were affected by drought.

Baksa (2), Barpeta (2), Bongaingaon (2), Chirrang (6), Darrang (10), Dhemaji (3), Dhubri (6), Dibrugarh (3), Goalpara (6), Golaghat (1), Kamrup Rural (5), Kamrup Metro (3), Karbi Anglong (2), Karimganj (2), Kokrajhar (2), Lakhimpur (2), North Cachar Hills (8), Nagaon (8), Sibsagar (1), Sonitpur (1), Tinsukia (2) and Udalgudi (9).

Occurrence of drought conditions in successive years is not frequent in the state. However, individual district have had successive years of drought. Severity of drought not only depends upon the order of the 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 year may not be as high as in a single year.

The following Table (i) depicts districtwise years of successive drought during the 50 year period 1951-2000.

Table (i)

Sr. No.	Name of Affected Districts	Years of Successive Drought
1.	Bongaigaon	1992-1993
2.	Darrang	1961-1962, 1981-1982-1983-1984, 1996-1997-1998
3.	Dhemaji	1997-1998
4.	Dhubri	1961-1962-1963
5.	Goalpara	1981-1982, 1997-1998-1999
6.	Kamrup Rural	1988-1989

Table (i)		
Sr. No.	**Name of Affected Districts**	**Years of Successive Drought**
7.	Lakhimpur	1997-1998
8.	Nagaon	1968-1969
9.	North Cachar Hills	1976-1977-1978
10.	Udalgudi	1991-1992, 1998-1999-2000

Fig. 10 shows the percentage frequency of drought and years of successive drought in the districts during the period 1951-2000. The following table (ii) 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 (ii)

Sr. No.	**Affected Districts**	**Years of Severe Drought (Rainfall less than 50%)**
1.	Bongaigaon	1993 (40%)
2.	Chirrang	1978 (20%)
3.	Darrang	1961, 1994 (31%)
4.	Goalpara	1982 (35%)
5.	Karimganj	1992 (47%)
6.	North Cachar Hills	1977, 1978, 1995 (35%)
4.	Sibsagar	1979 (38%)
5.	Udalgudi	1973, 2000 (40%)

It is observed that the lowest percentage annual rainfall was in Chirrang district (20% of the normal rainfall) in the year 1978. Incidence of widespread and fairly widespread drought over the state in any particular year was not very common. There were no drought conditions in the state in the following 13 years: 1952, 1953, 1955, 1956, 1959, 1964, 1966, 1970, 1974, 1980, 1985, 1987 and 1990. The districts Darrang and Udalgudi experienced the maximum number of drought conditions namely 10 and 9 years respectively during the 50 year period under consideration.

Excessive Rainfall

Rainfall sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall regions. An annual rainfall of 125% or more of the normal is considered as excessive rainfall.

Fig. 11 shows the percentage frequency of excessive rainfall years and successive years of excessive rainfall during the period 1951 - 2000. It is seen from the figure that the frequency of excessive rainfall is generally higher in the western and eastern region of the state.

Table (iii)

S. No.	District	Years of excessive Rainfall	Highest amount of Rainfall in cm	Rainfall in% of normal	Year
1.	Baksa	1988	400.6	154%	1988
2.	Barpeta	1954, 1977, 1982, 1983,1984, 1990	448.5	167%	1977
3.	Bongaigaon	1982, 1987	507.8	187%	1987
4.	Cachar	1966, 1974, 1983	426.0	129%	1983
5.	Chirrang	1980, 1984, 1985	502.5	143%	1985
6.	Darrang	1952, 1958, 1959, 1964, 1972, 1974, 1995	276.0	154%	1974
7.	Dhemaji	1983, 1987, 1995, 1999	378.1	144%	1987
8.	Dhubri	1974, 1995, 1998	487.7	152%	1995
9.	Dibrugarh	1954, 1958, 1974, 1990,1993	311.3	132%	1968
10.	Goalpara	1956, 1984	360.5	136%	1956
11.	Golaghat	1959	257.5	142%	1959
12.	Hailakandi	1959, 1991, 1993	429.8	161%	1959
13.	Jorhat	1955, 1977	265.5	128%	1977
14.	Kamrup Metro	1956, 1988	224.5	141%	1988
15.	Kamrup Rural	1984, 1992, 1993	287.9	132%	1992
16.	Karbi Anglong	1959, 1983, 1993, 1999	220.8	161%	1959
17.	Karimganj	1953, 1982, 1983, 1984, 1987	560.6	178%	1987
18.	Kokrajhar	1977, 1984, 1995	545.9	136%	1977
19.	Lakhimpur	1980, 1981, 1985	458.3	142%	1985
20.	Morigaon	1977, 1980, 1991, 1993	215.2	131%	1993
21.	Nagaon	1966, 1976, 1977, 1980, 1993	357.6	223%	1966
22.	Nalbari	1953, 1954	400.9	180%	1954
23.	North Cachar Hills	1951, 1985, 1996, 1997, 1998,1999	597.9	222%	1999
24.	Sibsagar	1953, 1954, 1955, 1957, 1963, 1973, 1976, 1977, 1983, 1985,1986	307.6	154%	1986
25.	Sonitpur	1952, 1954, 1955, 1957, 1959,1985, 1988, 1995, 1998	275.2	144%	1988
26.	Tinsukia	---	306.5	124%	1987
27.	Udalgudi	1959, 1977, 1995, 1997	354.6	173%	1995

From the above table, it is seen that during the 50 year period 1951-2000, there were 35 years in which some districts or the other in the state recorded excessive rainfall. In the year 1966, Nagaon district received the highest percentage of excessive rainfall, i.e. 223% of the annual normal rainfall. However, North Cachar Hills district received the highest rainfall 5979 mm in year 1999 which was 222% of the annual normal rainfall. In the

year 1977, maximum number of districts (i.e. 7 out of 27) of the state experienced excessive rainfall. Sibsagar district experienced maximum number of excessive rainfall years (11) while Baksa and Golaghat districts experienced excessive rainfall only in 1 year. The successive years of excessive rainfall against each district are listed below:

Successive years of Excessive Rainfall (Districtwise)

Sr. No.	Districts	Successive years of Excessive Rainfall
1.	Barpeta	1982-1983-1984
2.	Chirrang	1984-1985
3.	Darrang	1958-1959
4.	Kamrup Rural	1992-1993
5.	Karimganj	1982-1983-1984
6.	Lakhimpur	1980-1981
7.	Nagaon	1976-1977
8.	Nalbari	1953-1954
9.	North Cachar Hills	1996-1997-1998-1999
10.	Sibsagar	1953-1954-1955, 1976-1977, 1985-1986
11.	Sonitpur	1954-1955

The heaviest one day rainfall on record at any station in the state was 838.0 mm on 10th June 1988 in Maibong in North Cachar Hills district.

Cyclonic storms and depressions

Table VII depicts the total number of storms/depressions which affected the state during the period 1891- 2012. The cyclonic storms and depressions which affect India, mostly originate and/or intensify over the Bay of Bengal, mainly during the months of May to November. They usually travel northwestwards or westwards and cross the east coast of India. In general, storms and depressions become weak as they reach on the land. Assam though an inland state, the coast is about 400 km away. The state therefore does not experience the full fury of severe storms/depressions like the coastal regions. However, in association with these systems, heavy to very heavy rainfall occurs over the affected districts. During the course of their movement, they sometimes turn or recurve towards north or northeast. This point of the turning or recurving progressively shifts westwards till September. In May, these disturbances recurve while still out in Bay of Bengal. Hence, exceptionally few of them cross the coast and travel inland, affecting the weather of the state.

During the months from January to March, the state was not affected by storms/depressions even on a single occasion since 1891 to 2012, but during the remaining months, it was affected 45 times with a maximum of 13 in May. The monsoon depressions during June to September generally form over the Bay of Bengal and move westwards or northwestwards, towards Assam and Northeastern region. The Bay of Bengal storms/depressions progressively form in the lower latitudes, with the advance of the year.

Other Weather Phenomena

(a) Thunderstorms, Hailstorms and Duststorms

Convective activity is responsible for the occurrence of thunderstorms, hailstorms and dust storms in Assam. With the advance of the summer, thunderstorm activity becomes pronounced due to unequal heating of the land. When the moisture in the atmosphere is sufficient, thunderstorms or hail storms occur with association of convective clouds. The maximum number of thunderstorms occurs with approach of the monsoon current, while dust storms are mainly confined in the summer months.

Thunderstorms occurring over northeastern region of India are known as “Norwesters” (moving from the North West direction) or “Kalabaishakhi” (Highly destructive local storms occurring in the month of Baishakh). They can sometimes reach the violence of tornados. They are often accompanied by squalls often reaching speeds of 150 kmph. They usually originate in the afternoons over Bihar and neighbourhood and move eastwards over Gangetic West Bengal, however, those affecting Assam and the adjacent states originate over the northern parts of West Bengal during night or early mornings and travel southwards. Thunderstorm activity over Assam and neighbourhood is generally experienced throughout the year but is fairly high especially from March to May. Thunderstorm over Assam occurs in association with low level troughs or induced lows. Assam experiences thunderstorm activity for as high as 30 to 40 days annually.

Hailstorms occur rather rarely in the state during the months of February to May. Squalls occasionally occur in the state, mainly during the pre-monsoon and early southwest monsoon months. On an average the frequency of days of squalls and thunderstorms is a maximum at Guwahati (Bhorjar) (A). Thunderstorm activity attains its maximum in May and June. During the winter season, the state may experience thunderstorm activity resulting from low pressure areas induced due to eastward moving upper air disturbances known as “Western Disturbances”. Thunderstorm activity is the least and minimum in December.

(b) Fog

Fog is experienced during the post monsoon and winter months, when the air is still moist and is easily cooled below the dew point while rising over high elevations. Favourable conditions for formation of radiation fog

such as light to calm wind, clear skies, low temperatures etc., do exist after the withdrawal of the monsoon till March, their maximum frequency of occurrence being during the months of December and January. Fog occasionally occurs over hilly areas in Karbi Anglong, North Cachar Hills and Cachar districts during the monsoon season.

(b) Earthquakes

Assam state is prone to seismic activity and comes under seismic zone V. Details of earthquakes of intensity 5.0 or more at Richter scale having epicenter in the state are given in Table VIII. The state has experienced 43 earthquakes under moderate and high intensity during the period 1862 - 2012. Moderate to heavy damage in property and human life occurred due to these events of the earthquakes in the state as well as its neighouring regions. The state has maximum frequency (7) of earthquakes experienced in the month of December. The highest intensity earthquake was experienced of 8.7 at Richter scale having epicenter at $25^0$54' N latitude and 91^0E longitude in June 1897.

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

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
ASSAM														
Chaparmukh	a	3.2	3.7	4.4	4.6	4.3	4.7	4.4	3.8	3.9	3.2	2.9	2.8	3.8
	m	SE/E	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE/E	SE/E	
	e	NE/SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	C/SE/NE	SE	
Dhubri	a	4.8	5.6	7.7	11.0	10.1	8.6	6.9	6.6	6.4	6.9	7.4	5.7	7.3
	m	NE	NE/C	NE	NE	NE	NE/E/C	E/NE/C	NE/E/C	NE/E	NE	NE	NE	
	e	C/NE	C/E	C/NE/E	C/NE	C/NE	C/E/NE	C/NE/E	C/NE/E/SE	C/E/NE	C/NE/E	C/NE	C/NE	
Dhubri/Rupsi(A)	a	3.7	4.9	6.6	8.4	6.7	5.5	4.7	4.1	3.9	4.3	4.9	3.9	5.1
	m	NE\C	NE/E/C	NE/E	NE/E	NE/E	NE/E/C	C/E/NE/S	C/E/NE	C/NE/E	NE	NE	NE	
	e	C	C/W/SW/NE	C/W/SW	C/NE/E	C/E/NE	C/E/S/NE	C/SW/S/E	C/S/SW/E	C/E/NE/S	C/NE/E	C	C	
Dibrugarh/ Mohanbari (A)	a	2.9	4.9	6.6	7.3	5.7	5.7	5.4	4.4	4.4	3.3	2.8	2.7	4.7
	m	C/NE	NE	NE	NE	NE	NE	NE/C	C/NE	NE/C	NE	NE	NE	
	e	C	C/NE	NE/C	NE/C	C/NE	NE/C	NE/C	C/NE	C/NE	C	C	C	
Digboi	a													
	m	E/NE/W	NE/E	NE/E/N	NE/E/N	NE/E	NE/E	NE/E	NE/E	NE/E	NE/E	NE/E/N	NE/E	
	e	C/NE/N	NE/C/E	NE/E/N	NE	NE/E	NE/E/N	E/NE/N	E/NE/N	E/NE/N	C/N	C/N/NE	C/NE	
Goalpara	a	2.1	2.3	4.0	5.0	4.8	3.4	3.2	2.9	2.5	2.6	2.1	1.6	3.0
	m	C/NE	C/NE	NE	NE	NE	NE/SE	NE/SE	C/NE/SE	NE	NE	NE	C/NE	
	e	C/NE	C/NE/NW/W	C/NE/SW	NE	NE	C/NE/SE	SW/C/SE/NE	C/SW/SE/NE	C/SW/NE	C/NE	C/NE	C	
Gohpur	a	2.5	3.7	4.4	5.0	4.8	4.4	3.6	3.4	3.2	2.7	2.3	2.0	3.5
	m	E	E	E	E	E	E/NE	E	E	E	E	E	E	
	e	C/E	C/E/NE	C/NE	E	E	E	E	E/C	C/E	C/E	C/E	C/E	
Guwahati (A)/Bhorjar	a	2.0	2.7	4.0	4.9	4.1	3.4	3.1	3.1	2.7	2.6	2.3	1.8	3.1
	m	C	C/NE/E	C/NE/E	NE/C/E	NE/C	C/NE	C/NE	C/NE/E	C/NE/E	C/NE/E	C/NE/E	C	
	e	C	C/NE/W	C/NE/W	NE	C/NE	C/NE	C/W/S/S	C/S	C/W/S	C/NE	C	C	
Halflong	a													
	m	SW/NE	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW/NW	
	e	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	
Lumding	a	1.8	2.9	4.3	4.7	4.4	3.3	3.1	3.0	2.3	1.8	1.5	1.4	2.9
	m	C	C	C/E	C/E	C/E	C/E	C/E/S	C	C	C	C	C	
	e	C	C/S/W	C/S	C/S/E	C/E/S	C/E/S	C/E/S	C/S	C	C	C	C	

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
ASSAM														
Majbat	a	2.4	3.9	5.0	6.5	5.3	4.2	4.3	3.8	3.1	2.7	2.2	2.3	3.8
	m	C/NE/E	C/NE/E	NE/E	NE/E	C/NE/E	C/NE/E	C/NE/E/SW	C/E/NE/SW/W	C/E/NE	C/E/NE	C/E/NE	C/E/NE	
	e	C	C/NE	C/NE/E	C/NE/E	C/NE/E	C/NE/SW	C/SW/W/NE/E	C/SW/W	C/SW/W	C	C	C	
North Lakhimpur	a	3.0	4.2	5.4	6.5	5.6	6.1	6.3	5.1	4.7	3.4	2.5	2.5	4.6
	m	NE/C	NE/C	NE	NE	NE	NE	NE	NE/C	NE/C	NE	NE/C	NE	
	e	C/NW/NE/N	C/NE	NE	NE	NE/C	NE/C	NE/C	C/NE	C/NE	C/NE	C/NW/N	C/NW/N	
Rangia	a	3.1	4.4	5.7	6.4	5.7	5.7	4.1	4.6	4.5	4.2	3.6	3.0	4.6
	m	E	E	E	E	E	E	E/W	E	E	E	E	E	
	e	C	C/E	C/E	E/C	E	E/C	W/C/E	W/E/C	C/E/W	C/E	C	C	
Sibsagar	a	2.1	3.3	4.6	5.4	5.1	5.0	5.4	4.5	4.0	2.8	1.9	1.7	3.8
	m	C/N/NE	C/NE/N	NE/N/C	NE/N	NE/N	NE/N/C	NE/C/N	C/NE/N	C/NE/N	C/NE	C/NE	C/NE/N	
	e	C/N	C/N/NE	C/NE/N	N/NE/C	NE/N/C	C/NE/N	C/NE/N	C/NE/W	C/NE/N	C/NE	C	C	
Silchar	a	2.9	4.9	6.6	7.3	5.7	5.7	5.4	4.4	4.4	3.3	2.8	2.7	4.7
	m	C/NE	NE	NE	NE	NE	NE	NE/C	C/NE	NE/C	NE	NE	NE	
	e	C	C/NE	NE/C	NE/C	C/NE	NE/C	NE/C	C/NE	C/NE	C	C	C	
Silchar / Kumbhigram(A)	a	3.9	4.2	5.1	5.2	4.5	3.8	3.6	3.5	3.4	3.5	3.8	3.8	4.0
	m	E	E	E	E	E	E/C	C/E	C/E	E/C	E	E	E	
	e	C	C/SW	C/SW	C/E	C/E	C/SW	C/SW	C/SW	C/SW	C/SW	C	C	
Tangla	a	1.7	2.5	3.4	4.2	4.1	3.6	3.2	3.4	3.2	2.4	1.9	1.6	2.9
	m	C	C/E	C/E	C/E/SE/SW	C/W/E	C/E	C/W/E	C/E	C/E	C/E	C/E	C/SE/E	
	e	C	C	C	C/W	C/E	C	C/E	C	C/W	C	C	C	
Tezpur	a	2.8	3.7	5.5	5.7	3.6	2.5	1.8	1.4	1.5	2.0	3.1	3.0	3.1
	m	C/NE	NE/C	NE	NE	NE/C	C/NE	C/NE	C/NE	C/NE	C/NE	NE	NE/C	
	e	C/NE	C/NE	C/NE	NE/C	C/NE	C/NE	C/NE	C/NE	C/NE	C/NE	C/NE	C/NE	
State Mean	**a**	**2.8**	**3.9**	**5.2**	**6.1**	**5.3**	**4.7**	**4.3**	**3.9**	**3.6**	**3.2**	**3.0**	**2.7**	**4.1**

a Mean Wind Speed in kms per hour
m Predominant wind direction in the morning
e Predominant wind direction in the evening
C Calm

TABLE II
MEAN MAXIMUM AND MEAN MINIMUM TEMPERATURE (ºC)
ASSAM

Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Chaparmukh	Max	22.6	25.4	28.9	31.1	31.9	32.6	32.5	33.2	32.6	30.9	28.1	24.3	29.5
	Min	10.3	12.3	15.6	20.3	22.8	24.6	24.8	25.3	24.6	22.5	17.3	12.0	19.4
Dhubri	Max	22.8	26.2	31.2	31.3	30.5	31.1	31.0	31.6	31.2	30.1	26.7	23.3	28.9
	Min	11.8	13.7	17.5	20.9	22.6	24.5	25.1	25.2	24.5	22.3	17.7	12.9	19.9
Dhubri (Rupsi)(A)	Max	23.7	26.2	31.1	31.6	30.7	31.5	31.2	32.0	30.9	30.1	27.7	24.5	29.3
	Min	8.6	10.5	15.2	20.2	22.2	24.4	25.1	25.2	24.2	21.1	15.5	10.6	18.6
Dibrugarhl	Max	22.8	23.9	26.4	27.6	29.7	31.1	31.0	31.8	30.6	29.8	27.4	24.2	28.0
Mohanbari(A)	Min	9.2	12.2	15.9	18.8	21.9	24.2	24.6	24.9	23.8	20.7	15.0	10.0	18.4
Digboi	Max	22.5	23.5	27.4	29.4	29.8	31.7	32.0	32.2	31.7	29.8	27.2	23.8	28.4
	Min	10.5	12.4	15.3	18.2	20.7	23.3	23.7	23.9	23.3	20.7	16.4	11.2	18.3
Goalpara	Max	25.0	27.2	31.2	32.2	31.6	31.4	32.0	32.4	32.4	31.6	28.9	26.1	30.2
	Min	9.8	11.4	15.4	19.1	20.9	22.8	23.6	23.9	23.3	20.4	15.2	11.6	18.1
Gohpur	Max	23.1	24.6	27.8	29.0	30.2	31.3	31.9	32.0	31.5	29.9	27.4	24.1	28.6
	Min	8.2	10.9	14.4	17.7	20.5	22.9	23.5	23.7	22.7	19.8	13.9	9.1	17.3
Guwahati(A)	Max	23.6	26.0	29.8	31.0	31.0	31.9	31.8	32.2	31.5	30.3	27.7	24.6	29.3
(Bhorjar)	Min	10.6	12.2	15.9	20.0	22.5	24.9	25.5	25.5	24.5	22.0	17.0	11.9	19.4
Halflong	Max	19.7	22.2	25.4	26.5	26.7	26.8	27.2	27.3	27.5	25.7	22.8	20.1	24.8
	Min	10.4	12.3	15.8	17.7	19.2	20.5	20.9	20.9	20.6	19.0	15.2	11.6	17.0
Lumding	Max	24.6	27.1	31.6	32.8	33.1	33.2	33.7	33.7	33.0	31.3	28.3	25.6	30.7
	Min	8.2	10.5	14.6	19.0	21.5	23.8	24.3	24.4	23.5	20.9	15.4	10.4	18.0
Majbat	Max	24.2	26.3	29.7	30.4	31.1	31.7	32.2	32.7	32.1	30.6	27.9	25.1	29.5
	Min	9.5	12.3	15.7	19.3	21.6	23.7	24.5	24.7	24.0	20.7	15.6	10.9	18.5
North Lakhimpur	Max	23.0	23.8	26.7	27.8	29.8	31.2	31.0	31.8	30.6	29.9	27.7	24.4	28.1
	Min	9.1	12.1	15.7	18.9	21.7	24.1	24.5	24.7	23.6	20.7	14.5	9.8	18.3
Rangia	Max	23.6	26.1	29.3	30.4	31	31.6	32.3	32.5	32.1	30.5	27.8	24.8	29.3
	Min	10.2	12.4	15.7	19.4	22	24.1	24.8	24.8	24.2	20.9	16.1	11.8	18.9
Sibsagar	Max	23.0	24.3	27.3	29.3	29.9	31.5	32.1	32.0	31.7	29.8	27.3	24.7	28.6
	Min	10.2	13.2	16.2	19.7	22.5	24.8	25.3	25.4	24.2	21.4	16.2	12.3	19.3
Silchar	Max	24.5	26.4	29.6	30.5	31.0	31.5	31.4	31.9	31.5	30.9	29.1	26.1	29.5
	Min	12.1	14.1	17.7	21.0	23.0	24.6	25.1	25.2	24.6	22.9	18.6	13.9	20.2
Silchar/	Max	25.7	27.3	30.4	30.9	31.1	31.8	31.7	32.4	32.0	31.6	29.8	26.8	30.1
Kumbhigram(A)	Min	11.8	13.5	17.4	20.1	22.0	24.0	24.3	24.4	23.7	21.5	17.4	12.9	19.4
Tangla	Max	24.7	26.1	29.9	30.5	30.8	32	32.5	32.9	32.1	31.2	28.8	25.7	29.8
	Min	10.3	12.3	15.9	19.9	22.4	24.6	25.4	25.4	24.6	21.1	15.6	11.6	19.1
Tezpur	Max	23.6	25.8	29.6	30.2	30.9	32.0	31.9	32.3	31.4	30.7	28.3	24.6	29.3
	Min	11.4	13.7	17.0	19.9	22.1	24.6	25.1	25.3	24.5	21.7	16.8	12.5	19.6
State Mean	**Max**	**23.5**	**25.5**	**29.1**	**30.1**	**30.6**	**31.4**	**31.6**	**32.1**	**31.5**	**30.3**	**27.7**	**24.6**	**29.0**
	Min	**10.1**	**12.3**	**15.9**	**19.5**	**21.8**	**23.9**	**24.5**	**24.6**	**23.8**	**21.1**	**16.1**	**11.5**	**18.8**

TABLE III
MEAN RELATIVE HUMIDITY
ASSAM

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Chaparmukh	M	81	75	71	76	81	84	83	83	82	84	83	80	80
	E	73	67	65	71	77	80	80	80	79	79	78	75	75
Dhubri	M	87	76	68	78	85	88	89	87	88	86	83	88	84
	E	63	54	46	64	77	83	85	84	85	79	73	66	72
Dhubri (Rupsi)(A)	M	85	76	62	70	81	85	87	85	86	83	78	83	80
	E	75	61	45	58	73	78	82	82	84	82	80	80	74
Dibrugarhl/Mohanbari (A)	M	82	77	72	76	79	85	88	86	86	79	74	78	80
	E	75	69	65	71	74	78	79	78	83	84	84	81	77
Digboi	M	87	83	79	79	82	85	87	87	86	86	84	86	84
	E	78	70	67	68	76	79	80	79	80	81	78	77	76
Goalpara	M	84	78	73	80	85	88	89	89	88	84	81	85	84
	E	62	53	51	64	71	82	82	82	80	76	72	69	70
Gohpur	M	88	83	79	81	84	89	90	90	89	88	85	89	86
	E	81	73	73	76	79	84	82	84	85	84	80	83	80
Guwahati(A) (Bhorjar	M	87	76	66	73	79	83	85	83	84	83	84	87	81
	E	70	55	48	60	70	77	80	80	81	79	78	77	71
Halflong	M	75	66	63	74	81	88	89	89	88	85	82	79	80
	E	67	57	56	68	75	83	82	83	82	82	79	75	74
Lumding	M	87	80	77	79	83	87	86	87	88	89	90	90	85
	E	76	69	67	73	77	82	81	82	84	85	84	81	78
Majbat	M	81	76	72	79	80	86	87	86	86	80	76	78	81
	E	76	68	62	74	75	79	80	80	83	80	76	77	76
North Lakhimpur	M	80	77	72	77	79	85	89	87	87	79	73	77	80
	E	75	72	69	75	76	79	81	80	85	83	80	78	78
Rangia	M	78	69	65	73	79	83	83	83	81	78	75	79	77
	E	69	60	59	65	72	78	79	78	79	77	75	74	72
Sibsagar	M	87	81	74	76	83	84	86	87	85	85	84	87	83
	E	73	71	67	70	77	79	78	79	81	83	80	77	76
Silchar	M	87	81	77	81	83	88	87	87	87	85	82	85	84
	E	65	59	59	69	74	81	82	79	79	76	69	68	72
Silchar/ Kumbhigram(A)	M	74	69	68	75	79	85	87	84	84	78	73	73	77
	E	59	52	53	65	71	79	80	78	79	75	71	66	69
Tangla	M	86	79	71	77	81	84	86	85	86	82	78	85	82
	E	75	72	62	72	76	78	79	80	83	80	76	75	76
Tezpur	M	83	76	70	77	82	86	89	88	88	84	79	83	82
	E	70	60	56	68	76	79	82	80	82	82	78	75	74
State Mean	**M**	**83**	**77**	**71**	**77**	**81**	**86**	**87**	**86**	**86**	**83**	**80**	**83**	**82**
	E	**71**	**63**	**59**	**68**	**75**	**80**	**81**	**80**	**82**	**80**	**77**	**75**	**74**

M: MORNING E: EVENING

TABLE IV
MEAN CLOUD AMOUNT **(OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AT 0830 HRS IST
ASSAM

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Chaparmukh	a	18	15	14	8	1	0	0	0	0	1	8	17	82
	b	2	2	3	6	11	14	13	12	7	5	2	1	78
	c	1.6	1.8	2.1	3.6	5.0	6.2	6.3	5.9	5.2	3.9	2.4	1.5	3.8
Dhubri	a	25	22	21	13	7	2	1	1	4	14	22	27	159
	b	2	2	3	6	10	14	14	12	10	5	2	1	81
	c	1.0	1.1	1.6	3.4	4.9	6.2	6.4	6.0	5.2	3.0	1.3	0.9	3.4
Dhubri (Rupsi)(A)	a	20	15	17	7	2	1	0	0	0	6	16	21	105
	b	1	2	2	4	8	12	15	10	9	4	1	1	69
	c	1.5	1.7	1.9	4	5.3	6.3	6.7	6.2	6	3.6	1.6	1.1	3.8
Dibrugarh/	a	7	4	4	1	0	0	0	0	0	1	3	7	27
Mohanbari{A)	b	2	3	4	6	8	11	15	11	9	4	1	1	75
	c	3.3	4.4	4.7	5.5	6	6.7	7.1	6.8	6.4	4.7	3.2	2.7	5.1
Digboi	a	9	7	11	6	9	5	5	5	5	6	14	18	100
	b	5	6	5	7	8	10	11	9	7	9	3	4	84
	c	3.4	3.9	3.9	4.5	4.9	5.8	5.8	5.8	5.4	4.7	2.9	2.5	4.5
Goalpara	a	23	22	20	14	7	2	1	2	4	12	20	24	151
	b	6	3	6	10	17	22	22	20	16	10	5	4	141
	c	2	1.4	2.2	3.6	5.4	7	6.7	6.6	5.6	3.7	1.9	1.7	4
Gohpur	a	5	3	5	1	0	0	0	0	0	1	2	6	23
	b	4	4	6	11	11	15	14	15	11	6	3	3	103
	c	3.1	3.7	3.9	5.3	5.4	6.1	6.4	6.5	5.9	4.3	3.3	3	4.7
Guwahati(A) (Bhorjar)	a	12	13	14	6	1	0	0	0	0	1	4	9	60
	b	1	1	2	4	7	9	9	7	6	3	2	1	52
	c	2.3	2.3	2.6	4.1	5.4	6.4	6.7	6.4	5.9	4.4	3.2	2.2	4.3
Halflong	a	18	18	16	7	3	1	1	1	2	2	5	15	89
	b	2	1	3	7	12	17	18	16	10	10	8	2	106
	c	1.8	1.7	2.2	3.8	5.3	6.4	6.6	6.2	5.4	4.9	3.7	1.9	4.2
Lumding	a	24	19	22	15	12	6	4	6	6	12	18	24	168
	b	2	2	2	3	5	9	5	7	4	5	3	1	48
	c	1.1	1.3	1.6	2.6	3.5	4.5	4.7	4.7	4.1	3.2	1.7	1.1	2.8
Majbat	a	7	4	5	2	1	0	2	1	2	4	10	11	49
	b	3	2	2	4	10	10	10	10	9	6	3	2	71
	c	2.5	2.8	2.7	4.1	5.2	6.0	6.3	5.8	5.2	3.7	2.3	2.0	4.1
North Lakhimpur	a	6	2	2	0	0	0	0	0	0	1	5	8	24
	b	2	3	3	7	8	13	17	12	11	5	1	2	84
	c	3.1	4.3	4.6	5.8	6	6.6	7.1	6.7	6.6	4.7	2.9	2.7	5.1

TABLE IV (Contd.)
MEAN CLOUD AMOUNT **(OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AT 0830 HRS IST
ASSAM

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Rangia	a	25	21	19	11	4	1	0	0	1	12	19	22	135
	b	0	1	2	5	6	9	9	6	6	4	2	1	51
	c	1	1.2	1.9	3.6	4.8	5.9	6.1	5.8	5.2	3.2	1.6	1.4	3.5
Sibsagar	a	10	7	9	4	2	0	0	0	0	1	5	7	45
	b	12	11	10	12	19	20	21	21	16	12	8	12	174
	c	4.8	4.5	4.4	5.3	6.5	7.2	7.4	7.3	6.7	5.6	4.5	4.8	5.8
Silchar	a	19	15	14	4	1	0	0	0	0	2	7	14	76
	b	1	2	3	4	7	8	10	7	5	4	1	1	53
	c	1.8	2.2	2.8	4.5	5.3	6.4	6.5	6.3	5.8	4.4	2.7	1.7	4.2
Silchar /	a	15	14	10	3	1	0	0	0	0	4	8	11	66
Kumbhigram(A)	b	1	1	3	5	8	12	13	9	7	4	1	1	65
	c	1.6	2	3	4.5	5.2	6.3	6.8	6.4	5.9	3.7	2.4	1.7	4.1
Tangla	a	22	19	18	13	7	4	4	4	6	15	18	21	151
	b	2	2	2	4	9	12	11	7	6	3	2	1	61
	c	1.2	1.7	1.6	3.1	4.3	4.9	5.2	5.0	4.3	2.4	1.4	1.2	3.0
Tezpur	a	16	11	12	6	3	2	1	2	2	6	14	17	92
	b	1	2	2	5	7	9	10	8	8	4	2	1	59
	c	2	2.7	3.1	4.5	5.3	5.8	6.6	5.8	5.7	3.7	2.2	1.8	4.1
State Mean	**a**	**16**	**13**	**13**	**7**	**3**	**1**	**1**	**1**	**2**	**6**	**11**	**16**	**89**
	b	**3**	**3**	**4**	**6**	**10**	**13**	**13**	**11**	**9**	**6**	**3**	**2**	**81**
	c	**2.2**	**2.5**	**2.8**	**4.2**	**5.2**	**6.2**	**6.4**	**6.1**	**5.6**	**4.0**	**2.5**	**2.0**	**4.1**

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.

TABLE IV A
MEAN CLOUD AMOUNT **(OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AT 1730 HRS IST
ASSAM

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Chaparmukh	a	18	12	7	2	1	0	0	0	1	2	8	18	69
	b	1	1	2	3	4	6	7	5	5	3	1	0	38
	c	1.5	2.3	2.9	3.8	4.2	5.5	5.8	5.3	5.0	3.4	2.0	1.4	3.6
Dhubri	a	27	24	25	19	12	3	1	1	5	18	24	27	186
	b	0	1	1	2	3	6	6	6	5	2	1	0	33
	c	0.7	0.8	1.0	2.2	3.4	5.3	5.7	5.8	4.7	2.2	1.1	1.0	2.8
Dhubri	a	18	14	18	7	2	1	0	0	0	5	15	19	99
(Rupsi)(A)	b	1	1	1	2	4	5	6	4	3	2	1	1	31
	c	1.2	1.5	1.5	3.2	4.2	5.4	6	5.8	5.2	2.9	1.4	1	3.3
Dibrugarh/	a	2	1	1	0	0	0	0	0	0	0	2	3	9
Mohanbari{A)	b	2	2	2	3	3	3	3	2	2	2	1	1	26
	c	3.3	4.5	4.9	5.5	5.4	5.6	5.7	5.3	5.1	3.9	2.9	2.6	4.6
Digboi	a	14	14	10	5	9	9	7	9	7	9	14	14	121
	b	5	4	4	5	6	7	6	5	5	6	3	4	60
	c	3	3.1	3.8	4.4	4.3	4.9	5	4.9	5.2	4	2.8	2.6	4
Goalpara	a	25	23	21	16	10	2	2	4	6	18	22	28	177
	b	2	2	4	7	11	19	19	18	14	5	3	1	105
	c	1.1	1.2	1.8	2.9	4.3	6.2	6.5	6.1	5.1	2.5	1.2	0.7	3.3
Gohpur	a	3	2	2	0	0	0	0	0	0	1	2	6	16
	b	3	3	4	7	5	8	5	6	5	4	2	2	54
	c	2.8	3.6	4.1	5.1	4.7	5.4	5.5	5.4	5.3	3.6	2.8	2.6	4.2
Guwahati(A)	a	4	4	6	2	0	0	0	0	0	0	1	4	21
(Bhorjar)	b	1	1	1	1	2	4	3	3	3	2	1	1	23
	c	3.2	3.1	3.3	4.1	4.8	6	6.2	6.1	5.8	4.1	3.1	2.7	4.4
Halflong	a	15	16	14	7	4	2	1	2	3	3	7	17	91
	b	1	1	3	5	7	12	13	9	6	5	4	0	66
	c	1.9	1.9	2.4	3.7	4.3	5.7	5.7	5.6	4.9	3.8	2.8	1.5	3.7
Lumding	a	20	13	14	8	7	6	4	6	5	12	18	22	135
	b	2	2	3	4	4	6	5	5	5	3	2	1	42
	c	1.5	2.3	2.8	3.5	3.7	4.4	4.5	4.0	4.3	2.8	1.6	1.2	3.1
Majbat	a	5	3	3	2	1	0	0	0	2	3	7	8	34
	b	1	1	2	3	5	6	5	5	6	4	2	2	42
	c	2.3	2.7	3.0	3.7	4.1	5.1	4.9	4.8	4.5	3.2	2.2	2.0	3.5
North	a	3	1	1	0	0	0	0	0	0	0	4	6	15
Lakhimpur	b	2	2	2	3	4	4	5	3	4	3	1	1	34
	c	3.5	4.5	4.6	5.5	5.3	5.7	5.9	5.3	5.5	4.1	2.9	2.8	4.6

TABLE IV A (Contd.)
MEAN CLOUD AMOUNT **(OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AT 1730 HRS IST
ASSAM

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Rangia	a	26	22	20	6	4	1	0	0	2	18	21	26	146
	b	0	0	1	2	2	4	4	3	3	2	1	0	22
	c	1	1.3	1.8	2.9	3.4	4.8	5	4.6	4.3	2.3	1.5	0.8	2.8
Sibsagar	a	9	5	5	3	1	0	1	0	0	1	5	5	35
	b	6	7	7	9	10	12	10	8	7	7	4	5	92
	c	3.1	4.1	4.7	5.4	5.7	6.4	6.2	6	5.2	4.3	3.2	3	4.8
Silchar	a	17	11	11	4	2	1	0	0	0	3	9	16	74
	b	1	2	2	2	5	7	8	5	4	3	1	1	41
	c	1.3	2.3	2.7	3.9	4.9	5.9	6.4	6	5.4	3.4	2	1.1	3.8
Silchar/	a	16	13	11	3	2	0	0	0	0	5	10	14	74
Kumbhigram(A)	b	1	1	1	4	4	8	8	6	4	3	2	1	43
	c	1.6	2	2.4	4.1	4.4	5.8	6.1	6	5.2	3.1	2.2	1.4	3.7
Tangla	a	24	20	18	12	8	5	4	3	4	13	19	19	149
	b	1	1	2	2	4	4	4	3	3	3	1	1	29
	c	1.2	1.3	1.7	2.9	3.3	3.8	3.9	4.1	3.9	2	1.2	1.1	2.5
Tezpur	a	13	9	8	4	4	2	2	3	3	6	10	15	79
	b	1	1	1	2	2	3	3	2	3	1	1	1	21
	c	1.8	2.6	3.3	4.2	4.4	5	5.2	4.8	4.8	3	1.9	1.6	3.6
State Mean	**a**	**14**	**12**	**11**	**6**	**4**	**2**	**1**	**2**	**2**	**7**	**11**	**15**	**85**
	b	**2**	**2**	**2**	**4**	**5**	**7**	**7**	**5**	**5**	**3**	**2**	**1**	**45**
	c	**2.0**	**2.5**	**2.9**	**3.9**	**4.4**	**5.4**	**5.6**	**5.3**	**5.0**	**3.3**	**2.2**	**1.7**	**3.7**

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.

TABLE V
MEAN RAINFALL (MM) AND NUMBER OF RAINY DAYS
ASSAM

DISTRICT		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Baksa	a	13.6	26.0	59.1	168.3	403.9	526.0	541.5	369.1	341.5	122.8	19.5	10.3	2601.6
	b	1.4	2.3	4.4	10.4	14.2	16.0	17.3	13.2	11.8	5.4	1.2	0.9	98.5
Barpeta	a	14.7	22.1	60.9	196.2	403.7	575.9	580.3	368.6	297.5	140.4	15.7	9.6	2685.6
	b	1.3	1.7	3.8	9.7	14.5	15.7	15.7	11.8	10.1	5.8	1.1	0.7	91.9
Bongaigaon	a	7.0	22.7	47.7	166.9	377.0	555.2	629.0	425.2	314.1	152.8	11.5	6.2	2715.3
	b	0.9	1.9	3.8	10.0	14.5	16.8	16.2	13.6	11.6	6.0	0.9	0.6	96.8
Cachar	a	15.4	47.9	188.0	307.4	467.7	589.0	568.4	483.4	382.5	203.3	33.7	15.7	3302.4
	b	1.3	2.8	7.7	12.7	16.2	20.7	23.2	20.0	15.7	8.0	1.9	0.8	131.0
Chirrang	a	9.4	18.7	52.8	173.3	397.1	714.1	925.3	492.1	554.7	131.3	28.1	17.0	3513.9
	b	1.1	1.7	3.2	8.8	13.4	18.0	20.0	13.3	13.8	5.1	1.9	1.3	101.6
Darrang	a	14.9	25.5	65.7	151.3	294.6	388.1	316.9	226.5	188.6	93.2	19.6	7.6	1792.5
	b	1.4	1.8	4.4	9.3	13.6	14.7	13.7	10.9	9.3	5.4	1.4	0.7	86.6
Dhemaji	a	26.1	60.8	69.6	137.1	327.2	481.8	507.8	471.2	381.4	130.2	12.5	20.0	2625.7
	b	2.7	5.2	7.1	9.4	13.7	14.9	16.3	15.3	12.8	5.9	0.9	1.7	105.9
Dhubri	a	15.6	26.4	50.0	181.6	443.6	680.7	702.7	507.3	357.0	181.7	14.5	5.5	3166.6
	b	0.9	1.3	2.6	8.1	14.4	16.6	17.0	14.1	10.7	5.2	0.8	0.3	92.0
Dibrugarh	a	29.2	51.6	116.0	221.5	302.8	359.9	463.7	350.9	277.2	143.2	24.3	18.3	2358.6
	b	3.0	4.7	8.5	12.9	14.3	17.2	20.2	15.6	13.0	8.0	2.2	2.0	121.2
Goalpara	a	19.7	11.1	50.8	171.6	425.1	579.9	540.7	354.6	319.1	157.3	16.5	4.4	2650.8
	b	1.2	1.1	3.4	8.4	15.4	18.5	17.5	14.1	11.4	6.3	0.9	0.4	98.6
Golaghat	a	18.1	33.5	69.0	151.0	249.5	295.9	336.1	286.7	221.0	114.4	22.5	15.6	1813.3
	b	1.9	3.2	5.4	9.8	12.7	15.3	16.3	13.7	11.7	6.1	1.6	1.5	99.2
Hailakandi	a	8.7	42.1	144.8	239.8	430.3	473.6	437.4	387.4	304.4	153.7	35.7	11.7	2669.6
	b	0.9	2.6	5.6	9.7	15.1	19.0	20.4	18.2	15.1	7.2	1.8	0.5	116.1
Jorhat	a	24.6	45.1	79.3	175.3	255.7	300.4	413.4	343.9	284.0	112.2	25.3	14.7	2073.9
	b	2.1	4.1	6.4	10.9	13.0	14.7	18.7	15.1	13.1	6.0	1.7	1.3	107.1
Kamrup	a	16.5	19.5	63.9	162.3	338.9	450.5	406.5	313.1	230.6	149.5	16.6	13.3	2181.2
Rural	b	1.3	1.6	4.3	8.9	14.6	15.7	15.1	13.6	10.2	5.4	1.1	0.9	92.7
Kamrup Metro	a	11.8	14.6	50.5	128.5	238.0	298.9	313.0	263.3	182.1	76.0	10.1	5.3	1592.1
	b	1.1	1.5	4.0	8.1	13.9	14.6	14.6	12.0	9.3	4.2	1.0	0.5	84.8
KarbiAnglong	a	11.9	21.8	53.2	98.6	144.3	220.7	258.9	231.4	199.6	97.1	23.5	10.2	1371.2
	b	1.1	2.0	4.5	7.5	9.2	11.6	13.3	12.4	10.4	5.6	1.7	0.9	80.2

TABLE V (Contd.)
MEAN RAINFALL (MM) AND NUMBER OF RAINY DAYS
ASSAM

DISTRICT		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Karimganj	a	12.0	48.4	152.6	269.3	507.3	597.0	538.2	471.2	333.1	179.9	26.8	13.8	3149.6
	b	1.0	2.3	5.8	10.4	15.0	18.5	21.3	19.3	14.0	7.0	1.3	0.7	116.6
Kokrajhar	a	11.7	26.7	50.3	221.8	475.1	797.1	1026.3	642.3	560.4	169.0	24.8	8.3	4013.8
	b	0.9	1.8	2.8	9.5	15.0	18.4	20.5	15.7	14.1	5.8	1.6	0.6	106.7
Lakhimpur	a	29.5	51.3	81.8	177.1	395.9	589.9	713.1	515.1	451.7	168.9	28.6	24.3	3227.2
	b	2.9	4.6	6.5	11.1	14.9	18.6	21.0	16.5	14.3	7.2	2.1	2.0	121.7
Morigaon	a	16.2	26.8	50.6	107.8	159.8	291.8	333.7	318.2	220.4	97.0	14.1	6.3	1642.7
	b	1.1	2.2	4.4	8.4	11.4	14.8	17.2	15.1	12.0	4.8	1.0	0.7	93.1
N.C. hills	a	22.9	56.8	153.1	216.3	412.0	451.4	400.2	389.4	297.2	238.9	35.4	19.7	2693.3
	b	1.1	2.6	5.7	8.4	12.6	13.8	13.5	12.1	8.7	5.6	1.6	0.8	86.5
Nalbari	a	9.9	15.3	66.7	210.6	326.1	489.4	429.1	298.8	222.8	130.4	19.2	9.1	2227.4
	b	0.7	1.4	4.3	10.9	13.6	15.6	15.2	12.1	10.0	6.3	1.5	0.9	92.5
Nagaon	a	11.9	20.2	49.6	104.5	199.2	280.5	307.3	303.6	197.6	103.6	19.0	6.7	1603.7
	b	1.2	1.8	4.1	7.6	11.7	14.6	15.3	13.6	10.9	5.8	1.5	0.7	88.8
Sibsagar	a	23.1	47.8	93.9	167.0	265.0	298.4	400.7	329.9	220.1	114.3	25.6	11.7	1997.5
	b	2.3	4.4	7.0	9.9	13.3	14.9	18.0	14.8	11.6	6.1	2.0	1.2	105.5
Sonitpur	a	17.3	23.6	52.5	133.7	291.0	358.8	379.2	291.8	215.9	119.5	20.1	7.4	1910.8
	b	1.3	2.0	3.8	8.5	13.4	15.0	14.2	12.1	10.4	5.8	1.3	0.8	88.6
Tinsukia	a	32.5	58.6	135.2	223.6	323.7	399.9	502.3	354.9	268.1	130.7	22.9	19.0	2471.4
	b	3.6	5.9	9.5	12.8	15.1	18.2	20.2	14.9	12.2	7.7	2.1	2.0	124.2
Udalgudi	a	16.8	22.0	60.0	153.6	312.2	483.9	368.1	268.0	229.1	113.3	15.8	7.1	2049.9
	b	1.4	2.1	4.3	9.0	13.5	14.7	14.5	11.6	10.2	6.1	1.2	0.7	89.3
State Mean	**a**	**17.1**	**32.9**	**80.4**	**178.4**	**339.6**	**464.0**	**494.3**	**372.6**	**298.3**	**138.0**	**21.6**	**11.8**	**2448.9**
	b	**1.5**	**2.6**	**5.1**	**9.7**	**13.8**	**16.2**	**17.3**	**14.3**	**11.8**	**6.1**	**1.5**	**1.0**	**100.7**

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE-VI

MEAN RAINFALL(mm) OVER DIFFERENT RIVER CATCHMENTS OF ASSAM STATE

Sr.No	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1	Streams of Assam, Tripura , Manipur,Mizoram, Meghalaya and Nagaland flowing in to the Bay of Bengal. (catchment No.326)												
	Districts/Parts of districts of Assam within this catchment:- CACHAR, HAILAKANDI, KARIMGANJ, N.C.HILLS												
a	14.6	46.0	160.8	263.3	437.7	498.5	483.1	410.8	323.8	180.6	32.5	15.5	2867.0
b	3.1	4.6	8.4	12.6	16.6	19.9	22.0	19.3	15.5	8.9	3.7	2.8	137.3
2	Brahmaputra-trans-Himalayan,includingRiver Dihang. (catchment No.501)												
	Districts/Parts of districts of Assam within this catchment:- TINSUKIA												
a	16.7	59.1	115.6	221.4	308.7	478.9	449.2	322.1	197.3	99.0	16.9	8.6	2293.5
b	2.7	4.6	9.0	11.1	15.3	18.5	17.9	12.0	8.4	5.1	2.2	1.1	107.9
3	River Subansiri. (catchment No.502)												
	Districts/Parts of districts of Assam within this catchment:- LAKHIMPUR												
a	33.5	52.9	84.4	166.3	418.2	649.0	685.6	543.7	494.6	171.4	29.5	25.8	3355.0
b	3.1	4.6	6.7	10.8	15.4	19.4	21.4	17.2	14.9	7.5	2.1	2.2	125.3
4	River Manas (catchment No.503)												
	Districts/Parts of districts of Assam within this catchment:- BARPETA, BAKSA, BONGAIGAON, CHIRRANG, GOALPARA, KAMRUP RURAL, KOKRAJHAR												
a	12.2	23.1	55.9	194.2	412.8	650.1	715.8	452.0	382.8	143.1	17.7	10.2	3070.1
b	1.1	1.7	3.6	9.8	14.5	17.0	17.4	13.2	11.8	5.7	1.3	0.8	97.8
5	River Brahmaputra upto Bangladesh border ,including River Dihang,River Lohit,River Kameng,streams betweenRiver Subanslri and Manas and between Manas and Tista,excluding Tista and its tributaries. (catchment No.504)												
	Districts/Parts of districts of Assam within this catchment:-												
	DARRANG ,DHEMAJI ,DHUBRI, DIBRUGARH, GOALPARA, GOLAGHAT, JORHAT, KAMRUP RURAL, KAMRUP METRO, KARBI-ANGLONG, LAKHIMPUR, N.C.HILLS, NALBARI, NAGAON, SIBSAGAR, SONITPUR, TINSUKIA, UDALGUDI, KOKRAJHAR, MORIGAON.												
a	19.0	31.0	71.5	163.3	304.8	405.9	448.6	341.3	267.5	131.0	21.1	11.4	2216.3
b	1.7	2.7	5.1	9.5	13.4	15.6	16.7	13.8	11.4	6.1	1.5	1.0	98.7

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE – VII

STORMS AND DEPRESSIONS AFFECTING ASSAM STATE

DURING 1891 – 2012

MONTH	NO. OF STORMS/ DEPRESSIONS	MONTH	NO. OF STORMS/ DEPRESSIONS	MONTH	NO. OF STORMS/ DEPRESSIONS
January	NIL	May	13	September	7
February	NIL	June	9	October	8
March	NIL	July	NIL	November	6
April	1	August	NIL	December	1
				TOTAL	**45**

TABLE - VIII

DETAILS OF EARTHQUAKES OF INTENSITY OF 5.0 OR MORE AT RICHTER SALE HAVING EPICENTER WITHIN ASSAM STATE DURING THE PERIOD 1862-2012

MONTHS	YEARS	FREQUECY	EARTHQUAKE OF HIGHEST INTENSITY			EPICENTRE			
			INTENSITY AT RICHTER SCALE	DEPTH IN KM	YEAR	LAT -N		LONG-E	
						DEG	MIN	DEG	MIN
JANUARY	1869, 1924	2	7.5		1869	24	30	92	30
FEBRUARY	1951, 1983, 2005	3	5.8		1951	27	30	95	30
MARCH	1946, 1948, 1984, 2006	4	5.6		1946	26	24	92	36
APRIL	1898, 1938, 1989	3	6.3		1898	24	48	92	48
MAY	1941, 1997	2	5.9		1941	26	42	93	6
JUNE	1897, 1936, 1991	3	8.7		1897	25	54	91	0
JULY	1971, 2005	2	5.4		1971	26	25	93	9
AUGUST	1950, 1968, 2009	3	6.0		1950	25	0	93	0
SEPTEMBER	1984, 1987, 1990	3	5.2	28.0	1984	26	29	92	9
			5.2	58.0	1987	23	38	93	25
			5.2	57.0	1990	26	35	92	40
OCTOBER	1926, 1943, 1962, 1985, 1999	5	7.2		1943	26	48	94	0
NOVEMBER	1915, 1932, 948, 1961, 1977, 2006	6	6.0		1948	26	48	94	0
DECEMBER	1946, 1915, 1957, 1965, 1984, 1986, 1998	7	6.0		1846	27	0	94	0
TOTAL		**43**							

BAKSA DISTRICT

The climate of this district is characterized by mild hot in summer and cold in winter and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer season from March to May, associated with thunderstorms. Southwest monsoon season is from June to about the beginning of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 4 raingauge station for a period ranging from 14 to 25 years. The details of 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 2601.6 mm. During the monsoon season (June to September), the district receives rainfall of about 68% of its annual rainfall. July is the rainiest month with an average rainfall of 541.5 mm. The annual rainfall from year to year in the district has some variation. In the pre-monsoon months; March to May the district receives rainfall about 24% of its annual rainfall. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 154% of the normal occurred in year 1988, while the lowest annual rainfall was 71% of the normal occurred in 1994. In this fifty year period, there were four years in which the annual rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 2101 mm and 3100 mm in 17 years out of 23.

On an average there are 99 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 88 at Tamulpur (Hydro) to 112 at Choki (Hydro). The heaviest rainfall recorded in 24 hours at Choki Hydro in the district was 370.0 mm on 15 September 1984.

TEMPERATURE

There is no meteorological observatory in the district. The description of climatic conditions for this district is based on the meteorological parameters of the neighbouring observatory Majbat in the district of Udalguri. The winter season starts from the end of November when both day and night temperatures begin to decrease. January is the coldest month of the year with mean maximum temperature of about 24°C and mean minimum temperature of about 10°C. During winter season the district may experience cold spells when the temperatures may drop to 0°C or even less. Temperatures begin to rise steadily by the beginning of March and reach its maximum value in August. The mean maximum temperature in August is about 33°C and the mean minimum temperature is about 25°C. During summer and monsoon seasons maximum temperature may reach up to 37°C on individual days. The temperatures during southwest monsoon season are sometimes higher than

in the summer season. The weather sometimes becomes unpleasant due to damp heat especially in between two spells of rain. The weather becomes gradually cool after withdrawal of the southwest monsoon and pleasant during post monsoon season.

HUMIDITY

The atmosphere is generally humid throughout the year, particularly during the southwest monsoon season, when the relative humidity is high above 80%. During the period winter and summer months, relative humidity is around 60% to 70% more particularly in the afternoons.

CLOUDINESS

Skies are heavily clouded to overcast during the southwest monsoon season. During the rest of the year, skies are generally clear or lightly clouded. In the cold season and later part of summer seasons, skies are sometimes heavily clouded when the district is affected by western disturbances and thunderstorms. Cloudiness increases generally after mid-April.

WINDS

Winds are generally light throughout the year except for short spells of strong winds during thunderstorms in the period of March to May when winds are moderate or strong throughout the year. Southwesterly and westerly winds appear in June and strengthen as the monsoon season progresses, especially in the afternoons.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions from the Bay of Bengal which move into Assam do not reach the district to affect its weather. Thunderstorms occur throughout the year. Its frequency is more in latter part of summer early part of southwest monsoon season. Fog occasionally occurs on a few days during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
BAKSA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Tamulpur (Hydro)	21	a	7.7	19.0	51.7	163.0	380.1	443.7	379.6	259.2	257.3	89.1	13.9	6.7	2071.0	132 (1984)	71 (1981)	168.2	27 May 1988
		b	0.9	1.7	3.6	10.9	14.4	15.3	15.3	10.4	10.1	4.1	0.9	0.7	88.3				
Choki (Hydro)	14	a	12.5	30.0	60.7	192.9	453.4	597.8	818.3	534.7	548.4	165.5	21.7	20.7	3456.6	142 (1988)	66 (1986)	370.0	15 Sep 1984
		b	1.4	2.5	4.3	10.2	14.5	16.9	20.8	16.8	15.0	6.6	1.5	1.2	111.7				
Goibargaon (Hydro)	25	a	13.7	30.4	58.5	179.0	358.8	504.6	476.3	329.4	276.6	113.5	20.9	11.5	2373.2	144 (1995)	63 (1986)	254.2	28 May 1988
		b	1.3	2.7	4.5	11.3	23.8	15.8	16.6	12.9	11.2	5.4	1.2	1.2	97.9				
Melabazar (Hydro)	15	a	20.5	24.7	65.7	138.3	423.4	557.7	491.9	353.2	283.6	123.2	21.5	2.3	2506.0	146 (1998)	69 (1994)	276.6	14 Sep 1984
		b	1.9	2.2	5.0	9.1	14.2	16.1	16.5	12.8	11.0	5.4	1.0	0.4	95.6				
Baksa (District)		a	13.6	26.0	59.1	168.3	403.9	526.0	541.5	369.1	341.5	122.8	19.5	10.3	2601.6	154 (1988)	71 (1994)		
		b	1.4	2.3	4.4	10.4	14.2	16.0	17.3	13.2	11.8	5.4	1.2	0.9	98.5				

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
BAKSA
(Data 1976-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1801 – 1900	2	2401 – 2500	3	3001 – 3100	2	3601 – 3700	0
1901 – 2000	0	2501 – 2600	2	3101 – 3200	1	3701 – 3800	0
2001 – 2100	2	2601 – 2700	2	3201 – 3300	0	3801 – 3900	0
2101 – 2200	2	2701 – 2800	2	3301 – 3400	0	3901 – 4000	0
2201 – 2300	1	2801 – 2900	1	3401 – 3500	0	4001 – 4100	1
2301 – 2400	1	2901 – 3000	1	3501 – 3600	0		

(Data available for 23 years)

BARPETA DISTRICT

The climate of this district is characterized by cold in winter, mild hot in summer and humid in monsoon season. The year may be divided into four seasons. Winter season is from December to February and is followed by summer (pre-monsoon) season associated with thunderstorms from March to May. The period of June to the first week of October is of southwest monsoon season. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 10 raingauge stations for the period ranging from 10 to 25 years. The details of 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 2685.6 mm. During the monsoon season June to September, the district receives rainfall about 68% of its annual rainfall. June and July are the rainiest months with an average rainfall of 578.1 mm. In pre-monsoon months March to May, the district receives rainfall about 25% of its annual rainfall. The variation in annual rainfall from year to year is large and annual rainfall varies from place to place. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 167% of the annual normal occurred in year 1977, while the lowest annual rainfall of 70% of the normal occurred in 1967. In the fifty year period 1951-2000, the rainfall was less than 80% of the normal in 4 years and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 2101 mm and 3300 mm in 20 years out of 30.

On an average there are 92 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 75 at S.D.A.O. Pathsala to 115 at Doomni.

The heaviest rainfall recorded in 24 hours at any station in the district was 605.2 mm at Mathungari on 02 June 1997.

TEMPERATURE

There is no meteorological observatory in this district. The description of climate which follows is based on the data of neighbouring meteorological observatory Rangia in the Kamrup Rural district. The cold season sets in the district towards the end of November when both day and night temperatures begin to drop. January is the coldest month with the mean minimum temperature about 10°C and the mean maximum temperature about 24°C. During winter season minimum temperature may go down to 7°C on individual days. Temperatures begin to rise steadily from the beginning of March and reach its maximum in July and August. The mean maximum temperature in these two months is about 32°C and the mean minimum temperature is about 25°C. The

monsoon season is the period with the highest temperatures when maximum temperature may reach up to 38°C on individual days. Sometimes the weather becomes unpleasant due to the damp heat especially in between two spells of rain. The weather becomes gradually cool after withdrawal of the southwest monsoon and pleasant during post monsoon season.

HUMIDITY

The atmosphere is humid throughout the year with average relative humidity of about 75%. In the monsoon season the relative humidity is about 80%.The relative humidity is less about 60% to 70% during the period February to April.

CLOUDINESS

The skies are heavily clouded or overcast during the southwest monsoon months; June to September and the latter part of the pre-monsoon season (April-May). The skies are lightly to moderately clouded during the rest of the year. In the cold season skies may become obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms during the period; March to May when they are stronger. Easterly winds blow in the district throughout the year. In the southwest monsoon season sometimes westerly winds are also observed in the afternoon.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are frequent during the period March to September. Fog is observed in the morning on some days during post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
BARPETA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Barpeta	23	a	14.1	48.7	47.8	188.3	422.1	440.6	437.7	301.7	222.5	132.4	13.1	9.6	2278.6	159	75	258.4	26 Jun 1997
		b	1.4	2.2	3.5	9.3	15.0	14.9	14.5	11.4	9.3	5.3	0.9	0.5	88.2	(1998)	(1959)		
Beky Rly. Bridge	25	a	10.1	25.9	59.0	191.1	397.2	549.6	598.7	414.3	368.6	139.5	18.9	9.5	2782.4	147	72	287.2	01 Jul 1987
		b	1.0	2.0	4.1	10.5	15.2	5.2	18.8	13.9	13.0	6.0	1.5	0.8	103.0	(1984)	(1978)		
Chenga	10	a	25.7	29.2	46.5	134.8	467.5	511.4	596.5	285.2	218.8	104.9	6.8	1.9	2429.2	133	52	238.0	25 May 1999
		b	1.1	1.7	3.3	8.4	14.2	13.9	13.6	10.3	7.6	4.9	0.7	0.1	79.8	(1993)	(1997)		
F.t.S. Pat Bousi	12	a	13.0	17.5	61.5	182.1	409.7	327.5	339.9	223.4	210.8	179.4	19.2	2.6	1986.6	144	72	447.0	05 Jul 1987
		b	1.2	1.1	4.2	9.8	14.8	12.7	11.9	8.3	6.3	5.7	1.1	0.5	77.6	(1987)	(2000)		
Mathungari	25	a	9.3	28.7	48.5	160.1	386.2	838.4	882.4	645.0	555.7	142.7	21.9	15.2	3734.1	144	55	605.2	02 Jun 1997
		b	1.0	2.5	4.1	6.7	14.5	18.6	19.9	15.0	13.3	5.7	1.7	1.3	107.3	(1977)	(1999)		
S.D.A.O. Pathsala	11	a	10.9	26.8	36.8	177.9	339.4	518.1	380.3	267.5	245.4	132.	15.4	5.0	2156.4	154	40	181.0	05 Oct 1994
		b	1.0	1.6	2.7	7.3	11.1	15.5	13.1	9.1	8.2	4.9	0.7	0.3	75.5	(1992)	(1999)		
Sarbhog	18	a	7.3	18.0	44.8	180.4	313.7	421.4	534.0	272.2	316.8	104.7	16.4	9.1	2238.8	153	58	199.0	22 Aug 1983
		b	0.7	1.5	2.9	9.2	12.2	13.9	17.6	11.2	11.8	4.6	1.3	0.3	87.2	(1993)	(1986)		
Doomni	11	a	27.1	7.9	124.4	195.8	576.9	839.8	718.3	459.8	357.9	203.9	22.6	16.2	3550.6	127	53	297.4	08 Aug 1951
		b	2.6	1.1	6.5	10.0	20.1	18.3	18.5	14.5	13.4	7.8	1.5	1.1	115.4	(1954)	(1967)		
Hajua (Hydro)	10	a	10.6	14.5	41.0	308.7	367.4	759.5	496.3	499.6	282.3	130.4	10.7	17.9	2398.0	133	-	217.2	29 May 1977
		b	1.2	2.7	2.2	13.5	14.8	18.5	15.0	14.5	12.0	6.8	1.3	1.0	103.5	(1977)			
Patacharkuchi	10	a	18.5	3.6	98.8	243.1	356.9	552.8	818.9	317.5	196.5	132.8	12.1	8.5	2760.0	169	70	406.4	22 Jun 1889
		b	1.4	0.8	4.1	9.1	13.0	14.9	13.7	9.5	6.5	6.3	0.7	1.0	81.0	(1992)	(1957)		
Barpeta (District)		a	14.7	22.1	60.9	196.2	403.7	575.9	580.3	368.6	297.5	140.4	15.7	9.6	2685.6	167	70		
		b	1.3	1.7	3.8	9.7	14.5	15.7	15.7	11.8	10.1	5.8	1.1	0.7	91.9	(1977)	(1967)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
BARPETA
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1801 - 1900	1	3201 - 3300	1
1901 - 2000	1	3301 - 3400	3
2001 - 2100	2	3401 - 3500	1
2101 - 2200	1	3501 - 3600	0
2201 - 2300	2	3601 - 3700	0
2301 - 2400	2	3701 - 3800	0
2401 - 2500	2	3801 - 3900	0
2501 - 2600	0	3901 - 4000	0
2601 - 2700	1	4001 - 4100	1
2701 - 2800	1	4101 - 4200	0
2801 - 2900	3	4201 - 4300	0
2901 - 3000	2	4301 - 4400	0
3001 - 3100	2	4401 - 4500	1
3101 – 3200	3		

(Data available for 30 years)

BONGAIGAON DISTRICT

The climate of this district has features that are intermediate between the North Bengal plains and Assam Valley. The climate of the district is characterized by cold in winter and mild hot in summer and humid throughout the year. The year may be divided into four seasons. Winter season is from December to February. The next three months March to May are considered as summer (pre-monsoon) season which is associated with thunderstorm activities. Southwest monsoon season is from June to the first week of October. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for the period ranging from 12 to 23 years. The details of 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 2715.3 mm. During the monsoon season (June to September), the district receives rainfall about 71% of the annual rainfall. July is the rainiest month with an average rainfall of 629.0 mm. The pre-monsoon months (March to May) contribute rainfall of about 22% of its annual rainfall. The variation in the annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 187% of the normal occurred in year 1987, while the lowest annual rainfall which was 40% of the normal occurred in 1993. In this fifty year period, there were 2 years in which the annual rainfall in the district was less than 80% of the normal and they were consecutive also. It is seen from Table 2 that the annual rainfall was between 2201 mm and 3300 mm in 12 years out of 17. On an average there are 97 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 88 at N. Salmara to 106 at Panbari (Hydro). The heaviest rainfall recorded in 24 hours at any station in the district was 320.4 mm at Panbari (Hydro) on 12 August 1995.

TEMPERATURE

There is no meteorological observatory in the district at Bongaigaon. The description of the climate which follows is based on the records of neighbouring meteorological observatories at Dhubri and Dhubri (Rupsi). The cold season sets in from the end of November when both the day and night temperatures drop rapidly and this drop continues till January. January is the coldest month with the mean maximum temperature about 23°C and mean minimum temperature about 10°C. In the wake of western disturbances spells of cold weather occurs in the district when the minimum temperature may drop up to 3°C on individual days. From about the end of February the temperatures begin to rise and attain its maximum in August. During April the mean maximum temperature is about 31°C and the mean minimum temperature is about 22°C. In April and May months maximum temperature may reach

up to 39°C on individual days. With the onset of the southwest monsoon season, the day temperatures remain a little higher than in the summer season, the night temperatures are also higher than in the summer season. Sometimes weather becomes oppressive with high temperatures and humidity between two spells of rain. August is the hottest month with mean maximum temperature about 32°C and mean minimum temperature about 25°C. Temperatures decrease progressively after withdrawal of the southwest monsoon October and weather becomes gradually cool and pleasant during post monsoon season.

HUMIDITY

The air is humid throughout the year. In the monsoon season relative humidity is about 85%. During the months; January to April, the relative humidity is comparatively less especially in the afternoon when it is between 45% and 70%. In the rest of the year it is at about 80% or more.

CLOUDINESS

Skies are generally heavily clouded to overcast in the southwest monsoon season and latter part of pre-monsoon season. During the rest of the year light to moderate clouded skies are common. In winter season skies are sometimes obscured in the morning due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light to moderate throughout the year. Sometimes winds are strong during thunderstorms in pre-monsoon season. Northeasterly or easterly winds are the most common throughout the year. In the afternoons, during the monsoon season, southerly winds blow on some days. Southwesterly or westerly winds are also common in February and March especially in the afternoons.

SPECIAL WEATHER PHENOMENA

Some of the cyclonic storms and depressions from the Bay of Bengal in the monsoon and post monsoon seasons which move towards north Bengal affect the district and its neighbourhood causing heavy rains and high winds. Thunderstorms generally occur throughout the year, but they are more frequent in the period; April to September. Thunderstorms, sometimes violent and similar to the Norwesters of Bengal occur in the period March to May. Fog occasionally occurs on few days in the post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
BONGAIGAON

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Panbari (Hydro)	23	a	9.9	31.9	57.5	183.3	442.1	626.4	776.7	486.5	396.8	170.3	18.9	11.7	3212.0	137	79	320.4	12 Aug 1995
		b	0.9	2.4	4.5	10.7	15.2	17.1	19.1	14.2	13.6	5.9	1.2	0.9	105.7	(1993)	(1981)		
N.Salmara	12	a	4.1	13.6	37.8	150.5	311.8	483.9	481.3	364.0	231.4	135.2	4.0	0.6	2218.2	229	49	303.3	01 Jul 1987
		b	0.8	1.4	3.2	9.4	13.7	16.6	13.3	13.1	9.6	6.1	0.5	0.2	87.9	(1987)	(1993)		
Bongaigon (District)		a	7.0	22.7	47.7	166.9	377.0	555.2	629.0	425.2	314.1	152.8	11.5	6.2	2715.2	187	40		
		b	0.9	1.9	3.8	10.0	14.5	16.8	16.2	13.6	11.6	6.0	0.9	0.6	96.8	(1987)	(1993)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
BONGAIGAON
(Data 1978-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1001 – 1100	1	2401 – 2500	0	3801 – 3900	0
1101 – 1200	0	2501 – 2600	1	3901 – 4000	0
1201 – 1300	0	2601 – 2700	2	4001 – 4100	0
1301 – 1400	0	2701 – 2800	2	4101 – 4200	0
1401 – 1500	0	2801 – 2900	1	4201 – 4300	0
1501 – 1600	0	2901 – 3000	1	4301 – 4400	0
1601 – 1700	0	3001 – 3100	0	4401 – 4500	0
1701 – 1800	0	3101 – 3200	2	4501 – 4600	0
1801 – 1900	1	3201 – 3300	1	4601 – 4700	0
1901 – 2000	0	3301 – 3400	1	4701 – 4800	0
2001 – 2100	0	3401 – 3500	1	4801 – 4900	0
2101 – 2200	0	3501 - 3600	0	4901 – 5000	0
2201 – 2300	2	3601 – 3700	0	5001 – 5100	1
2301 – 2400	0	3701 – 3800	0		

(Data available for 17 years)

CACHAR DISTRICT

The climate of this district is characterized by abundant rains in monsoon months, moderate temperature and humid air in summer and monsoon period and cold in winter. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The monsoon season is followed by post monsoon season.

RAINFALL

Records of rainfall in the district are available for 9 raingauge stations for the period ranging from 10 to 34 years. The details of 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 3302.4 mm. During the monsoon season June to September, the district receives rainfall about 61% of the annual rainfall. June and July are the rainiest months with an average rainfall of 578.7 mm. The summer rains in the period March to May mostly as thundershowers constitute about 29% of the annual rainfall. The variation in annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 129% of the annual normal occurred in year 1983, while the lowest annual rainfall which was 75% of the normal occurred in 1995. In this fifty year period, there were 5 years in which the annual rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 2701 mm and 3900 mm in 35 years out of 46.

On an average there are 131 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 120 at Dholai (Hydro) to 138 at Bikrampur.

The heaviest rainfall recorded in 24 hours at any station in the district was 457.2 mm at Bikrampur on 08 July 1915.

TEMPERATURE

There are two meteorological observatories in the district namely Silchar and Silchar (Khumbhigram (A)). The description of the climate is based on the records of meteorological parameters of these observatories which may be taken as representative of the climatic conditions of the district as a whole. From about the middle of November, both day and night temperatures begin to decrease, the drop being more rapid in case of night temperatures. January is the coldest month with the mean maximum temperature about 25°C and the mean minimum temperature about 12°C. On individual days in the cold season, the minimum temperature may go down to 6°C. The temperature begins to rise from about the beginning of March. The weather in the latter half of

summer season is rather uncomfortable due to the dampness in the air although the temperatures are not much high. The day temperatures seldom become oppressive while the nights are cool in the period March to May. The frequent thundershowers during this period reduce the temperatures to some extent. The onset of the southwest monsoon early in June does not lower the day temperatures as in other parts of India, while the day and night temperatures in this season are even higher than in the rest of the year. August is the warmest month with an average of maximum temperature 32.2°C and minimum temperature 24.8°C. The temperatures may be 3 - 4°C lower over hilly areas i.e. northern part of the district. The day and night temperatures begin to decrease after withdrawal of the monsoon by the first week of October and weather becomes gradually cool and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Silchar (Kumbhigram (A)) observatory was 39.8°C on 01 May 1960 and the lowest minimum temperature ever recorded was 5.0°C on 10 February 1905 at Silchar observatory. .

HUMIDITY

The air is much humid throughout the year, being particularly high during the southwest monsoon season when the relative humidity is above 80%. The air is comparatively less humid during February and March, particularly in the afternoon when the humidity is less than 60%.

CLOUDINESS

The skies are heavily clouded to overcast during the period May to September. The cloudiness decreases thereafter and in the cold season the skies are lightly to moderately clouded. The cloudiness increases from March.

WINDS

Winds are generally light to moderate throughout the year except in association with thunderstorms in the summer season when the winds are strong for short spells. Winds are generally easterly or northeasterly throughout the year. Southwesterly wind is seen in afternoon during the monsoon season. Sometimes wind is calm particularly in the afternoon.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year but they are frequent in the summer season. Thunderstorms in summer season are sometimes associated with hail and squall. Fog occasionally occurs on a few days throughout the year except in the summer season.

Table 3, 4, 5 and 6 and 3(a), 4(a), 5(a) and 6(a) give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Silchar and Silchar (Kumbhigram (A)) observatories.

TABLE - 1

NORMALS AND EXTREMES OF RAINFALL
CACHAR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Amroghat (Hydro)	25	a	13.1	41.1	139.6	232.7	358.6	540.7	559.4	538.9	395.2	170.2	29.8	12.0	3031.3	140	75	380.0	27 Aug 2000
		b	1.4	2.4	6.4	10.8	14.8	20.2	23.7	19.2	16.7	7.5	2.2	1.0	126.3	(2000)	(1995)		
Badarpur	13	a	18.1	40.6	268.6	266.3	709.8	687.0	596.7	535.3	492.5	258.0	13.8	15.1	3901.8	164	70	299.0	07 Aug 1993
		b	1.1	2.6	7.0	11.0	18.5	21.0	24.3	21.2	16.0	9.7	1.3	0.7	134.4	(1993)	(1997)		
Bikrampur	14	a	14.5	34.5	227.2	486.8	651.1	684.9	793.6	582.3	428.9	234.0	15.1	17.2	4170.1	114	80	457.2	08 Jul 1915
		b	1.2	2.8	8.9	15.2	18.8	21.1	25.1	20.4	14.7	7.8	1.3	0.9	138.2	(1983)	(1981)		
Dewan	10	a	26.2	33.4	147.9	300.7	525.0	650.7	628.4	444.7	364.6	233.3	57.4	7.2	3419.5	119	92	242.8	07 Jun 1913
		b	2.0	2.8	8.4	13.2	18.7	22.5	23.1	19.6	14.4	9.3	2.3	0.8	137.1	(1966)	(1954)		
Dholai (Hydro)	24	a	9.2	48.3	172.3	237.8	331.5	483.5	478.4	427.4	334.2	169.1	32.4	9.8	2733.9	130	72	188.2	30 Jul 1989
		b	0.8	2.2	7.1	10.7	14.2	19.1	22.0	18.3	15.7	7.6	1.9	0.7	120.3	(1993)	(1979)		
Lakhipur (Hydro)	24	a	14.9	60.6	186.8	311.4	368.3	515.9	541.7	467.2	357.6	174.5	35.6	15.4	3049.9	133	78	258.0	27 Apr 1989
		b	1.2	3.5	8.4	13.5	15.1	20.3	22.9	20.0	16.5	7.7	2.0	1.0	132.1	(1983)	(1997)		
S..D. A.O. Silchar	11	a	11.0	70.5	213.6	335.1	388.4	494.2	404.5	420.4	327.4	154.1	31.9	42.8	2893.9	141	93	215.2	18 Jun 1995
		b	1.0	3.2	7.5	14.1	13.2	19.6	20.5	20.2	15.8	5.6	1.8	1.0	123.5	(1983)	(2000)		
Silchar (Obsy)	34	a	15.8	51.7	173.8	267.3	465.5	589.6	530.5	445.2	360.6	215.3	41.0	8.1	3164.4	141	68	290.3	30 May 1893
		b	1.2	3.1	7.3	12.2	16.3	21.6	23.7	20.5	15.5	8.3	2.0	0.5	132.2	(1966)	(1951)		
Silchar (A) (Obsy)	32	a	16.0	50.5	162.6	328.9	411.2	654.7	582.6	488.8	381.7	221.3	46.5	13.7	3358.5	137	81	350.6	02 Jun 1974
		b	1.6	3.0	8.0	13.9	15.8	21.1	23.6	20.3	15.8	8.9	2.6	0.8	135.4	(1961)	(1967)		
Cachar (District)		a	15.4	47.9	188.0	307.4	467.7	589.0	568.4	483.4	382.5	203.3	33.7	15.7	3302.4	129	75		
		b	1.3	2.8	7.7	12.7	16.2	20.7	23.2	20.0	15.7	8.0	1.9	0.8	131.0	(1983)	(1995)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
CACHAR
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
2401 – 2500	1	3401 – 3500	7
2501 – 2600	3	3501 – 3600	3
2601 – 2700	2	3601 – 3700	0
2701 – 2800	2	3701 – 3800	1
2801 – 2900	4	3801 – 3900	0
2901 – 3000	5	3901 – 4000	1
3001 – 3100	5	4001 – 4100	1
3101 – 3200	2	4101 – 4200	2
3201 – 3300	2	4201 – 4300	1
3301 – 3400	4		

(Data available for 46 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(SILCHAR)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	24.5	12.1	31.0	31-01-2005	5.6	21-01-1899	87	65
February	26.4	14.1	35.0	25-02-1912	5.0	10-02-1905	81	59
March	29.6	17.7	39.3	22-03-1995	8.3	01-03-1927	77	59
April	30.5	21.0	39.4	16-04-1937	13.2	02-04-1990	81	69
May	31.0	23.0	39.1	25-05-2006	15.6	12-05-1886	83	74
June	31.5	24.6	37.9	16-06-2008	19.3	09-06-1990	88	81
July	31.4	25.1	39.4	28-07-1896	19.0	08-07-1965	87	82
August	31.9	25.2	39.0	16-08-2006	19.4	11-08-1906	87	79
September	31.5	24.6	38.3	09-09-1887	16.8	29-09-1990	87	79
October	30.9	22.9	36.7	03-10-1944	14.4	28-10-1990	85	76
November	29.1	18.6	35.0	29-11-1900	10.6	24-11-1902	82	69
December	26.1	13.9	31.7	04-12-1996	6.1	19-12-1966	85	68
Annual	29.6	20.4	39.4	16-04-1937	5.0	10-02-1905	84	72

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (SILCHAR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	19	15	14	4	1	0	0	0	0	2	7	14	69
b	1	2	3	4	7	8	10	7	5	4	1	1	53
c	1.8	2.2	2.8	4.5	5.3	6.4	6.5	6.3	5.8	4.4	2.7	1.7	4.2
1730 HOURS IST													
a	17	11	11	4	2	1	0	0	0	3	9	16	68
b	1	2	2	2	5	7	8	5	4	3	1	1	41
c	1.3	2.3	2.7	3.9	4.9	5.9	6.4	6	5.4	3.4	2	1.1	3.8

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (SILCHAR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	2.9	4.9	6.6	7.3	5.7	5.7	5.4	4.4	4.4	3.3	2.8	2.7	4.7
Direction in morning	C/NE	NE	NE	NE	NE	NE	NE/C	C/NE	NE/C	NE	NE	NE	
Direction in evening	C	C/NE	NE/C	NE/C	C/NE	NE/C	NE/C	C/NE	C/NE	C	C	C	

TABLE - 6
Special Weather Phenomena (SILCHAR)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.2	1.2	3.2	7.6	8.3	6.1	4.7	3.7	4.3	1.7	0.3	0.0	41.3
Hail	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Dust storm	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
Fog	3.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	1.1	5.0
Squall	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6

TABLE – 3(a)
Normals of Temperature and Relative Humidity
(SILCHAR/ KUMBHIGRAM(A))

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	25.7	11.8	31.1	27-01-1982	6.2	19-01-1964	74	59
February	27.3	13.5	33.7	28-02-1978	6.4	06-02-1983	69	52
March	30.4	17.4	38.3	26-03-1973	10.3	11-03-1979	68	53
April	30.9	20.1	38.4	18-04-1960	13.6	07-04-1971	75	65
May	31.1	22.0	39.8	01-05-1960	17.6	04-05-1972	79	71
June	31.8	24.0	37.8	30-06-1978	19.9	27-06-1987	85	79
July	31.7	24.3	38.0	10-07-1973	20.0	06-07-1981	87	80
August	32.4	24.4	38.6	15-08-1978	19.6	31-08-1985	84	78
September	32.0	23.7	37.9	09-09-1982	18.9	30-09-1957	84	79
October	31.6	21.5	37.5	15-10-1985	15.4	31-10-1957	78	75
November	29.8	17.4	35.3	01-11-1983	11.3	21-11-1961	73	71
December	26.8	12.9	31.9	03-12-1972	8.1	31-12-1983	73	66
Annual	30.1	19.5	39.8	01-05-1960	6.2	19-01-1964	77	69

TABLE – 4(a)
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(SILCHAR/KUMBHIGRAM(A))

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	15	14	10	3	1	0	0	0	0	4	8	11	66
b	1	1	3	5	8	12	13	9	7	4	1	1	65
c	1.6	2	3	4.5	5.2	6.3	6.8	6.4	5.9	3.7	2.4	1.7	4.1
1730 HOURS IST													
a	16	13	11	3	2	0	0	0	0	5	10	14	74
b	1	1	1	4	4	8	8	6	4	3	2	1	43
c	1.6	2	2.4	4.1	4.4	5.8	6.1	6	5.2	3.1	2.2	1.4	3.7

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE – 5(a)
Mean Wind Speed and Predominant Wind Direction
(SILCHAR/KUMBHIGRAM(A))

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	3.9	4.2	5.1	5.2	4.5	3.8	3.6	3.5	3.4	3.5	3.8	3.8	4.0
Direction in morning	E	E	E	E	E	E/C	C/E	C/E	E/C	E	E	E	
Direction in evening	C	C/SW	C/SW	C/E	C/E	C/SW	C/SW	C/SW	C/SW	C/SW	C	C	

TABLE – 6(a)
Special Weather Phenomena
(SILCHAR/KUMBHIGRAM(A))

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.2	1.4	5.0	9.9	9.8	8.1	4.0	5.0	4.9	2.5	0.2	0.3	51.3
Hail	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Dust storm	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.5
Fog	0.3	0.4	0.1	0.0	0.1	0.3	0.4	0.7	0.9	0.5	0.0	0.3	3.7
Squall	0.0	0.0	0.1	0.5	0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.0	1.2

CHIRRANG DISTRICT

The climate of this district is characterized by abundant rains in monsoon months, mild hot in summer, cold in winter and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer (pre-monsoon) season from March to May and is associated with thunderstorms. Southwest monsoon season is from June to the first week of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 3 raingauge stations for a period ranging from 11 to 27 years. The details of 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 3513.9 mm. During the monsoon season (June to September), the district receives rainfall about 76% of its annual rainfall. July is the rainiest month with an average rainfall of 925.3 mm. In the pre-monsoon months (March to May) the district receives rainfall about 18% of the annual rainfall. The annual rainfall from year to year in the district has large variation. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 143% of the normal occurred in year 1985, while the lowest annual rainfall was 20% of the normal occurred in 1978. In this fifty year period, there were 6 years in which the annual rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 2801 mm and 4200 mm in 12 years out of 22.

On an average there are 102 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 97 at Kuklung (Hydro) to 104 at Bijni.

The heaviest rainfall recorded in 24 hours at Bijni in the district was 452.0 mm on 24 July 1987.

TEMPERATURE

There is no meteorological observatory in the district. The description of climatic conditions for this district is based on the records of meteorological parameters recorded at Majbat observatory of the neighbouring district of Udalguri. The cold season starts from the beginning of December when both day and night temperatures begin to decrease. January is the coldest month of the year with mean maximum temperature about 24°C and mean minimum temperature about 10°C. In this season the district may experience cold spells of weather and sometimes minimum temperature may drop to 0°C on individual days. The day and night temperatures begin to rise steadily by March and this rise continues till the end of August. Both the temperatures during the southwest monsoon season are sometimes higher than in summer season. The highest values of mean temperatures are experienced in the month of July and August, when the mean maximum temperature is

about 33°C and mean minimum temperature is about 25°C. Sometimes the weather becomes unpleasant due to damp heat especially between two spells of rain. During summer and monsoon seasons maximum temperature may reach up to 37°C on individual days. The weather becomes gradually cool after withdrawal of the southwest monsoon and pleasant during post monsoon season.

HUMIDITY

The air is humid throughout the year, particularly during the southwest monsoon season, when the relative humidity is high above 80%. During the winter and summer seasons, the humidity is comparatively less around 75%.

CLOUDINESS

Skies are heavily clouded to overcast during the southwest monsoon season. Skies are mostly clear or lightly clouded after withdrawal of monsoon season. In winter season and latter part of summer seasons, skies are sometimes heavily clouded when the district is affected by western disturbances and thunderstorms. Cloudiness generally increases after mid-April.

WINDS

Winds are generally light throughout the year except for short spells of thunderstorms in the period of March to May when they are moderate or strong. Winds generally blow from east and northeast direction throughout the year however, southwesterly or westerly winds blow during southwest monsoon season.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions from the Bay of Bengal which move into Assam do not reach the district to affect its weather. Thunderstorms occur throughout the year. Its frequency is more in latter part of summer and early part of southwest monsoon season. Fog occasionally occurs on a few days during the winter months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
CHIRRANG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Bijni	27	a	14.7	18.3	63.7	184.5	469.6	615.5	624.4	365.1	325.0	137.7	27.7	12.2	2858.4	170	62	452.0	24 Jul 1987
		b	1.5	1.4	4.3	9.5	16.1	18.0	18.3	13.9	12.4	5.8	1.7	0.7	103.6	(1984)	(1971)		
Hatisar (Hydro)	11	a	5.5	22.3	48.7	179.2	352.6	1017.7	1456.0	716.4	879.7	158.8	26.7	18.7	4882.2	151	81	375.0	23 Jul 1979
		b	0.7	2.0	2.3	6.5	11.2	19.6	22.2	14.2	16.5	4.8	1.8	1.7	103.5	(1981)	(1982)		
Kuklung (Hydro)	11	a	8.1	15.6	46.1	156.2	369.2	509.0	695.4	394.7	459.3	97.4	30.0	20.2	2801.2	156	26	316.0	15 May 1981
		b	1.0	1.8	3.1	10.3	13.0	16.3	19.5	11.7	12.4	4.8	2.1	1.5	97.5	(1984)	(1978)		
Chirrang (District)		a	9.4	18.7	52.8	173.3	397.1	714.1	925.3	492.1	554.7	131.3	28.1	17.0	3513.9	143	20		
		b	1.1	1.7	3.2	8.8	13.4	18.0	20.0	13.3	13.8	5.1	1.9	1.3	101.6	(1985)	(1978)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
CHIRRANG
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
701 – 800	1	2901 – 3000	0
801 – 900	0	3001 – 3100	1
901 – 1000	0	3101 – 3200	1
1001 – 1100	0	3201 – 3300	0
1101 – 1200	0	3301 – 3400	0
1201 – 1300	0	3401 – 3500	2
1301 - 1400	0	3501 – 3600	2
1401 - 1500	0	3601 – 3700	3
1501 - 1600	0	3701 – 3800	0
1601 – 1700	0	3801 – 3900	0
1701 – 1800	1	3901 – 4000	0
1801 – 1900	0	4001 – 4100	0
1901 - 2000	0	4100 – 4200	1
2001 – 2100	1	4201 – 4300	1
2101 - 2200	0	4301 - 4400	1
2201 - 2300	0	4401 - 4500	1
2301 – 2400	1	4501 – 4600	0
2401 – 2500	1	4601 – 4700	0
2501 – 2600	1	4701 – 4800	0
2601 – 2700	0	4801 – 4900	0
2701 – 2800	0	4901 - 5000	0
2801 – 2900	2	5001 – 5100	1

(Data available for 22 years)

DARRANG DISTRICT

The climate of this district is characterized by mild cold in winter, mild hot in summer and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer (pre-monsoon) season associated with thunderstorms from March to May. Southwest monsoon season is from June to beginning of October. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 5 raingauge stations for the period ranging from 10 to 41 years. The details of 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 1792.5 mm. During the monsoon season (June to September), the district receives rainfall about 62% of the annual rainfall. June is the rainiest month with an average rainfall of 388.1 mm. In pre-monsoon months (March to May) the district receives rainfall about 29% of the annual rainfall. The variation in annual rainfall from year to year is large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 154% of the normal occurred in year 1974, while the lowest annual rainfall which was 31% of the normal occurred in 1994. In this fifty year period there were 15 years in which annual rainfall in the district was less than 80% of the normal. During the same period there was one occasion each when such a low rainfall occurred in three, four and five consecutive years. It is seen from Table 2 that the annual rainfall was between 1401 mm and 2200 mm in 17 years out of 39.

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On an average there are 87 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 77 at Tongani to 95 at Kopati/Kaupati and Orangajuli.

The heaviest rainfall recorded in 24 hours at any station in the district was 283.2 mm at Orangajuli on 09 July 1915.

TEMPERATURE

There is one meteorological observatory in the district at Tangla. The description of climate which follows is based on meteorological data available for Tangla observatory, which may be taken as representative for the climatic conditions of the district as a whole. The winter season sets in the district from the beginning of December when both day and night temperatures begin to decrease. January is the coldest month with the mean maximum temperature at 24.7°C and the mean minimum temperature at 10.3°C. In winter months the district experiences few cold spells when the minimum temperature may go down to 5°C on individual days. Temperatures begin to rise from about the beginning of March. The rise in temperature continues till the

southwest monsoon season when temperatures are higher than those of the summer months. The highest mean temperatures are experienced in August when the mean maximum temperature is 32.9°C and mean minimum temperature is 25.4°C. During the monsoon season maximum temperature may reach up to 38°C on individual days. This together with the high humidity makes the weather rather unpleasant particularly when it is not raining. The weather becomes gradually cool and pleasant after withdrawal of the southwest monsoon season.

The highest maximum temperature ever recorded at Tangla observatory was 39.5°C on 05 June 1984 and the lowest minimum temperature ever recorded was 3.6°C on 31 January 1970.

HUMIDITY

The air is much humid throughout the year and high particularly in the monsoon season when the relative humidity is about 85%. The period from February to April is comparatively less humid particularly in the afternoon when relative humidity is about 67%.

CLOUDINESS

The skies are heavily clouded to overcast during the southwest monsoon season. There is a decrease in the cloudiness after the withdrawal of the monsoon. In the period of November to March skies are usually clear or lightly clouded. On some days particularly in the winter season cloudiness sets in association with passing western disturbances. Cloudiness generally increases after March.

WINDS

Winds are light throughout the year except for short spells of moderate or strong winds during thunderstorms in the pre-monsoon season. Easterly or calm winds are most common throughout the year. Westerly winds sometimes appear during the monsoon and pre-monsoon seasons.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move towards Assam do not reach the district. Thunderstorms occur in the period March to September. Thunderstorms in the period March to May are sometimes accompanied by strong winds. Fog occasionally occurs on some days during the post monsoon and winter seasons.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind direction, special weather phenomena respectively for Tangla observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
DARRANG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Bhoota Chang Te	10	a	9.9	19.4	71.6	124.0	276.1	432.1	333.2	209.5	200.2	95.6	17.5	3.6	1792.7	142	62	235.6	14 Jun 1995
		b	0.6	2.1	3.0	8.0	12.8	16.1	14.6	9.9	10.1	4.8	0.9	0.6	83.5	(1995)	(1997)		
Kopati/Kaupati	12	a	17.7	13.3	68.6	132.7	286.3	291.5	262.1	223.3	146.8	99.9	25.2	4.8	1572.2	125	87	167.9	15 May 1910
		b	1.9	1.9	6.0	10.3	15.0	14.9	15.1	1.7	8.9	6.6	2.1	0.5	94.9	(1952)	(1957)		
Orangajuli	19	a	24.1	63.0	84.7	166.8	349.0	456.2	378.9	270.7	218.6	117.2	21.9	10.5	2170.6	245	17	283.2	09 Jul 1915
		b	2.1	2.1	4.7	8.9	13.9	15.4	12.6	2.5	9.6	6.4	1.9	0.6	90.7	(1973)	(1995)		
Tangla (Obsy)	41	a	11.6	19.4	46.6	179.8	314.3	412.4	325.9	247.0	212.3	84.1	18.0	10.8	1882.2	146	42	224.4	16 Jun 1973
		b	1.1	1.6	3.5	9.5	13.6	13.8	13.7	1.1	8.8	4.4	1.1	0.8	83.0	(1974)	(1961)		
Tongani	30	a	9.8	8.3	52.0	141.9	224.2	312.9	262.1	183.0	152.2	61.8	14.3	7.5	1430.0	192	38	127.0	19 Sep 2001
		b	1.2	1.2	4.5	9.4	11.6	12.6	1.5	9.4	8.9	4.5	1.1	0.9	6.8	(1967)	(1994)		
Darrang (District)		a	14.9	25.5	65.7	151.3	294.6	388.1	316.9	226.5	188.6	93.2	19.6	7.6	1792.5	154	31		
		b	1.4	1.8	4.4	9.3	13.6	14.7	13.7	10.9	9.3	5.4	1.4	0.7	86.6	(1974)	(1994)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more).
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
DARRANG
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
501 – 600	1	1701 – 1800	6
601 – 700	0	1801 – 1900	1
701 – 800	1	1901 – 2000	2
801 – 900	0	2001 – 2100	2
901 – 1000	0	2101 – 2200	4
1001 – 1100	1	2201 – 2300	1
1101 – 1200	3	2301 – 2400	3
1201 – 1300	4	2401 – 2500	1
1301 – 1400	4	2501 – 2600	1
1401 – 1500	1	2601 – 2700	1
1501 – 1600	1	2701 – 2800	1
1601 – 1700	0		

(Data available for 39 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(TANGLA)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	24.7	10.3	31.7	12-01-1963	3.6	31-01-1970	84	75
February	26.1	12.3	32.5	28-02-1967	5.3	07-02-1964	76	70
March	29.9	15.9	38.0	05-03-1971	8.4	11-03-1979	69	61
April	30.5	19.9	37.9	30-04-1960	10.8	01-04-1968	75	70
May	30.8	22.4	38.9	01-05-1960	10.1	09-05-1967	81	76
June	32.0	24.6	39.5	05-06-1984	17.4	20-06-1985	85	79
July	32.5	25.4	38.7	19-07-1976	20.1	16-07-1974	86	80
August	32.9	25.4	39.0	14-08-1984	20.3	30-08-1974	85	80
September	32.1	24.6	38.8	06-09-1965	19.0	01-09-1974	85	82
October	31.2	21.1	37.0	05-10-1983	11.3	21-10-1968	80	81
November	28.8	15.6	33.4	03-11-1983	9.2	25-11-1961	76	77
December	25.7	11.6	31.1	01-12-1981	5.2	28-12-1961	82	76
Annual	29.8	19.1	39.5	05-06-1984	3.6	31-01-1970	80	76

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(TANGLA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	22	19	18	13	7	4	4	4	6	15	18	21	151
b	2	2	2	4	9	12	11	7	6	3	2	1	61
c	1.2	1.7	1.6	3.1	4.3	4.9	5.2	5.0	4.3	2.4	1.4	1.2	3.0
1730 HOURS IST													
a	24	20	18	12	8	5	4	3	4	13	19	19	149
b	1	1	2	2	4	4	4	3	3	3	1	1	29
c	1.2	1.3	1.7	2.9	3.3	3.8	3.9	4.1	3.9	2.0	1.2	1.1	2.5

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(TANGLA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	1.7	2.5	3.4	4.2	4.1	3.6	3.2	3.4	3.2	2.4	1.9	1.6	2.9
Direction in morning	C	C/E	C/E	C/E/ SE/SW	C/W/E	C/E	C/W/E	C/E	C/E	C/E	C/E	C/SE/E	
Direction in evening	C	C	C	C/W	C/E	C	C/E	C	C/W	C	C	C	

TABLE - 6
Special Weather Phenomena
(TANGLA)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.0	0.0	0.2	0.2	0.2	0.0	0.5	0.1	0.2	0.0	0.0	0.0	1.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4

DHEMAJI DISTRICT

The climate of this district is characterized by cold in winter, mild hot in summer and is mostly humid throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer (pre-monsoon) season associated with thunderstorms from March to May. Southwest monsoon season is from June to the first week of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station for a period of 17 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 2625.7 mm. During the monsoon season (June to September), the district receives rainfall about 70% of the annual rainfall. July is the rainiest month with an average rainfall of 507.8 mm. In pre-monsoon months (March to May) the district receives rainfall about 20% of the annual rainfall. The variation in annual rainfall from year to year is large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 144% of the normal occurred in year 1987, while the lowest annual rainfall was 52% of the normal occurred in 1998. In this fifty year period, there were 3 years in which annual rainfall in the district was less than 80% of the normal and on one occasion it was consecutive for two years. It is seen from Table 2 that the annual rainfall was between 2101 mm and 3200 mm in 6 years out of 13.

On an average there are 106 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at this station - S.D.A.O. Dhemaji, in the district was 383.6 mm on 12 September 1987.

TEMPERATURE

There is no meteorological observatory in the district at Dhemaji. The description of the climate of this district is based on the records of neigbhouring meteorological observatories at Dibrugarh and North Lakhimpur. Both the day and night temperature begin to decrease rapidly by about the end of November. January is the coldest month with mean minimum temperature about 9°C and mean maximum temperature about 23°C. In winter season cold waves affect the district in the wake of passing western disturbances and minimum temperature may go down to 3°C

or less on individual days. The temperatures begin to rise from the middle of March. In April and May weather becomes pleasant with the occurrence of thundershowers, day temperature seldom becomes high while nights are cool. August is the hottest month of the year with mean maximum temperature about 32°C and mean minimum temperature about 25°C. During the monsoon season maximum temperature may reach up to 36°C on individual days and sometimes weather becomes oppressive due to damp heat in between two spells of rain. The weather becomes gradually cool after withdrawal of the southwest monsoon and pleasant during post monsoon season.

HUMIDITY

The air is mostly humid throughout the year, the relative humidity being usually over 75 to 80%. The relative humidity is high about 85% in the monsoon season, while it is less about 70% in February and March months.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon. In the post monsoon and winter season skies are lightly or moderately clouded. Moderately or heavily clouded skies are common particularly during afternoons and evenings in the summer season.

WINDS

Winds are generally light to moderate throughout the year except in occurrence of thunderstorms in the summer season when the winds are strong for short spells. Generally northeasterly, northerly or northwesterly winds blow in the district. Winds are calm during post monsoon and winter seasons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year and are more frequent in the period from March to September. Their frequency is the highest in April. Thunderstorms during the period from March to May are similar to Norwesters (Kalbaisakhi) of Bengal and are sometimes violent. Thunderstorms during this period are sometimes accompanied with hail. Dust storms and squall are sometimes observed during February to May. Sometimes fog is observed after the southwest monsoon season and in the winter season. Fog is common in the morning hours during December and January.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
DHEMAJI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
S.D.A.O. Dhemaji	17	a	26.1	60.8	69.6	137.1	327.2	481.8	507.8	471.2	381.4	130.2	12.5	20.0	2625.7	144	52	383.6	12 Sep 1987
		b	2.7	5.2	7.1	9.4	13.7	14.9	16.3	15.3	12.8	5.9	0.9	1.7	105.9	(1987)	(1998)		
Dhemaji (District)		a	26.1	60.8	69.6	137.1	327.2	481.8	507.8	471.2	381.4	130.2	12.5	20.0	2625.7	144	52		
		b	2.7	5.2	7.1	9.4	13.7	14.9	16.3	15.3	12.8	5.9	0.9	1.7	105.9	(1987)	(1998)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. ** Years of occurrence given in brackets

TABLE - 2
Frequency of Annual Rainfall in the District
DHEMAJI
(Data 1979-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1301 - 1400	1	2201 – 2300	1	3101 - 3200	0
1401 - 1500	0	2301 – 2400	0	3201 - 3300	0
1501 - 1600	1	2401 – 2500	3	3301 - 3400	1
1601 - 1700	1	2501 – 2600	0	3401 – 3500	1
1701 - 1800	0	2601 - 2700	0	3501 – 3600	1
1801 - 1900	0	2701 - 2800	0	3601 – 3700	0
1901 - 2000	0	2801 - 2900	0	3701 – 3800	1
2001 - 2100	0	2901 - 3000	1		
2101 – 2200	1	3001 - 3100	0		

(Data available for 13 years)

DHUBRI DISTRICT

The climate of this district is characterized by abundant rains in monsoon period, mild cold in winter, mild hot in summer and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. The next three months March to May are considered as summer (pre-monsoon) season associated with thunderstorm activities. Southwest monsoon season is from June to the first week of October. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 7 raingauge stations for the period ranging from 10 to 37 years. The details of 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 3166.6 mm. During the monsoon season (June to September), the district receives rainfall about 71% of the annual rainfall. July is the rainiest month with an average rainfall of 702.7 mm. The pre-monsoon months (March to May) contribute rainfall about 21% of the annual rainfall. Rainfall mostly occurs as thundershowers during this period. The annual rainfall pattern from year to year in the district shows some variation. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 152% of the normal occurred in year 1995, while the lowest annual rainfall was 50% of the normal occurred in 1961. In this fifty year period, there were 11 years in which the annual rainfall in the district was less than 80% of the normal. There was one occasion each of three and two consecutive years of such a low rainfall respectively during this period. It is seen from Table 2 that the annual rainfall was between 2501 mm and 3800 mm in 31 years out of 44.

On an average there are 92 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 84 at Bilasipura D.B. to 97 at Dhubri/Rupsi (A) observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 479.3 mm at Dhubri/Rupsi(Aero) (Obsy) on 28 May 1989.

TEMPERATURE

There are two meteorological observatories in the district, one at Dhubri and other at Dhubri/Rupsi(A). The data of temperature and other meteorological elements at these stations may be taken as representative of the climatic conditions in the district. The drop in temperature is more rapid from the middle of November till January. January is the coldest month with the mean maximum temperature about 23°C and mean minimum temperature about 10°C. In the wake of western disturbances during winter season, cold weather occurs in the district when the minimum temperature may drop up to 3°C on individual days. From about the end of February the temperatures begin to increase. In April the mean maximum temperature at Dhubri and Dhubri/Rupsi (A) is about

31.5°C and mean minimum temperature is about 20.5°C. Sometimes the temperature during the period March to May is high; weather is rather unpleasant on account of excessive dampness in the air. Even in the southwest monsoon season, the day temperatures continue to be nearly the same as in April or May or sometimes little higher, while the night temperatures are higher than those in April and May. August is the hottest month with mean maximum temperature of 31.8°C and mean minimum temperature of 25°C. Temperatures decrease to become cool after withdrawal of the southwest monsoon season and become pleasant during post monsoon season.

The highest maximum temperature ever recorded at Dhubri was 41.4°C on 02 May 1960 while the lowest minimum temperature ever recorded was 2.4°C on 28 January 1964 and 2.4°C on 30 January 1964 at Dhubri and Dhubri/Rupsi observatories respectively.

HUMIDITY

The air is much humid throughout the year. In the monsoon season relative humidity is about 85%. During the months; February to April, the relative humidity is comparatively less especially in the afternoon when it is between 45% and 70%. In the rest of the year it is about 80% or more.

CLOUDINESS

Skies are heavily clouded to overcast in the monsoon season and latter part of pre-monsoon season. During the rest of the year light to moderate clouded skies are common. In winter season skies are sometimes obscured in the morning due to lifted fog which dissipates with the advance of the day.

WINDS

Winds are generally light to moderate in the district but winds are strong for short spells in occurrence of thunderstorms during the period March to June. Northeasterly or easterly winds are the most common all the year round. But in the afternoons during the monsoon season southerly and southwesterly winds also blow on some days. Southwesterly winds in the afternoons are also common in the period February and March.

SPECIAL WEATHER PHENOMENA

Some of the cyclonic storms and depressions from the Bay of Bengal in the monsoon and post monsoon seasons which move towards north Bengal or Bangladesh affect the district and its neighbourhood causing heavy rains and high winds. Thunderstorms sometimes violent and similar to the Norwesters of Bengal

occur in the period March to May. Thunderstorms generally occur throughout the year, but they are frequent in the period April to September. Fog occurs on a few days in the post monsoon and winter seasons.

Table 3, 4, 5 and 6 and 3(a), 4(a), 5(a) and 6(a) give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Dhubri and Dhubri Rupsi (A) observatories.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
DHUBRI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Agomoni D.B.	10	a	22.6	30.8	61.6	160.4	510.8	694.7	995.9	546.6	445.3	168.1	15.5	9.6	3661.9	159	73	440.0	15 Jun 1991
		b	1.3	1.8	2.6	6.8	15.4	16.4	17.9	15.1	10.9	4.8	0.8	0.5	94.3	(1995)	(1994)		
Bilasipura D.B.	11	a	14.7	100.1	46.1	183.1	508.0	671.9	530.3	393.7	292.4	156.8	9.9	0.0	2907.0	141	82	271.6	12 Jul 1996
		b	1.4	2.0	2.9	8.8	13.8	14.6	12.3	11.7	10.6	5.2	1.0	0.0	84.3	(1995)	(1992)		
Dhubri (Obsy)	35	a	9.6	7.8	52.9	125.7	389.7	571.2	505.8	355.8	265.3	139.4	19.1	0.7	2443.0	157	64	368.3	11 Jun 1909
		b	0.8	0.7	3.1	6.9	15.1	17.9	17.3	13.8	9.9	5.3	1.0	0.1	91.9	(1974)	(1961)		
Dhubri/Rupsi (A) Obsy	37	a	8.9	14.8	40.6	154.8	395.5	629.4	611.5	484.2	413.1	153.5	19.1	5.4	2930.8	164	74	479.3	28 May 1989
		b	0.7	1.2	2.8	8.2	15.1	17.0	18.3	14.3	12.8	5.3	1.1	0.4	97.2	(1974)	(1962)		
Golokganj D.B.	11	a	17.4	16.4	58.0	219.5	438.9	920.2	888.6	621.1	422.8	217.7	13.4	11.7	3845.7	164	63	460.6	16 Jun 1995
		b	0.8	1.3	2.3	8.7	13.8	16.4	18.6	14.9	10.7	5.3	0.7	0.4	93.9	(1998)	(1992)		
Gouripur D.B.	10	a	23.3	8.5	57.7	260.3	488.2	705.7	908.3	719.4	317.7	208.1	4.5	6.0	3707.7	163	38	360.0	30 Oct 1998
		b	0.9	1.0	2.2	8.2	14.4	17.2	17.6	15.2	10.4	4.9	0.4	0.4	92.8	(1998)	(1999)		
S.D.A.O. Dhubri	11	a	12.4	6.3	32.8	167.4	373.8	571.7	478.5	430.2	342.7	228.4	20.2	5.2	2669.6	140	75	270.8	19 Jul 1993
		b	0.6	0.9	2.6	8.8	13.5	16.5	16.7	13.5	9.7	5.3	0.9	0.3	89.3	(1987)	(1992)		
Dhubri (District)		a	15.6	26.4	50.0	181.6	443.6	680.7	702.7	507.3	357.0	181.7	14.5	5.5	3166.6	152	50		
		b	0.9	1.3	2.6	8.1	14.4	16.6	17.0	14.1	10.7	5.2	0.8	0.3	92.0	(1995)	(1961)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
DHUBRI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1501 – 1600	1	3201 – 3300	1
1601 – 1700	0	3301 – 3400	1
1701 – 1800	0	3401 – 3500	3
1801 – 1900	0	3501 – 3600	0
1901 – 2000	2	3601 – 3700	1
2001 – 2100	1	3701 – 3800	1
2101 – 2200	0	3801 – 3900	0
2201 – 2300	1	3901 – 4000	0
2301 – 2400	3	4001 – 4100	0
2401 – 2500	2	4101 – 4200	0
2501- 2600	6	4201 – 4300	0
2601 – 2700	2	4301 – 4400	1
2701 – 2800	3	4401 - 4500	1
2801 – 2900	4	4501 – 4600	0
2901 – 3000	2	4601 – 4700	0
3001 – 3100	3	4701 – 4800	0
3101 – 3200	4	4801 – 4900	1

(Data available for 44 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(DHUBRI)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	22.8	11.8	29.9	22-01-1976	2.4	28-01-1964	87	63
February	26.2	13.7	33.2	28-02-1966	2.8	09-02-1905	76	54
March	31.2	17.5	38.3	27-03-1909	7.4	20-03-1961	68	46
April	31.3	20.9	41.1	21-04-1939	6.4	19-04-1973	78	64
May	30.5	22.6	41.4	02-05-1960	15.9	18-05-1957	85	77
June	31.1	24.5	39.1	01-06-1966	13.9	08-06-1953	88	83
July	31.0	25.1	37.8	03-07-1930	20.8	19-07-1977	89	85
August	31.6	25.2	37.0	18-08-1973	21.7	28-08-1957	87	84
September	31.2	24.5	38.8	03-09-1973	19.4	08-09-1981	88	85
October	30.1	22.3	34.3	01-10-1982	17.2	29-10-1902	86	79
November	26.7	17.7	32.1	23-11-1971	9.4	26-11-1962	83	73
December	23.3	12.9	27.8	Dec 1944	7.8	27-12-1922	88	66
Annual	28.9	20.0	41.4	02-05-1960	2.4	28-01-1964	84	72

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (DHUBRI)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	25	22	21	13	7	2	1	1	4	14	22	27	159
b	2	2	3	6	10	14	14	12	10	5	2	1	81
c	1.0	1.1	1.6	3.4	4.9	6.2	6.4	6.0	5.2	3.0	1.3	0.9	3.4
1730 HOURS IST													
a	27	24	25	19	12	3	1	1	5	18	24	27	186
b	0	1	1	2	3	6	6	6	5	2	1	0	33
c	0.7	0.8	1.0	2.2	3.4	5.3	5.7	5.8	4.7	2.2	1.1	1.0	2.8

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (DHUBRI)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	4.8	5.6	7.7	11.0	10.1	8.6	6.9	6.6	6.4	6.9	7.4	5.7	7.3
Direction in morning	NE	NE/C	NE	NE	NE	NE/E/C	E/NE/C	NE/E/C	NE/E	NE	NE	NE	
Direction in evening	C/NE	C/E	C/NE/E	C/NE	C/NE	C/E/NE	C/NE/E	C/NE/E/SE	C/E/NE	C/NE/E	C/NE	C/NE	

TABLE - 6
Special Weather Phenomena (DHUBRI)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.4	1.3	4.1	7.9	4.0	1.9	2.0	2.3	0.7	0.1	0.0	24.8
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	1.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.5	2.0

TABLE – 3(a)
Normals of Temperature and Relative Humidity
(DHUBRI (RUPSI) (A)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	23.7	8.6	29.0	28-01-1982	2.4	30-01-1964	85	75
February	26.2	10.5	34.0	21-02-1976	3.2	04-02-1983	76	61
March	31.1	15.2	39.1	23-03-1972	7.3	11-03-1979	62	45
April	31.6	20.2	41.0	21-04-1960	10.9	01-04-1993	70	58
May	30.7	22.2	41.3	03-05-1966	15.5	12-05-1993	81	73
June	31.5	24.4	39.4	18-06-1979	17.6	03-06-1993	85	78
July	31.2	25.1	37.9	12-07-1959	18.5	12-07-1974	87	82
August	32.0	25.2	36.4	07-08-1979	15.1	12-08-1957	85	82
September	30.9	24.2	35.9	09-09-1982	19.7	28-09-1986	86	84
October	30.1	21.1	35.2	05-10-1983	14.5	24-10-1992	83	82
November	27.7	15.5	32.5	22-11-1976	8.2	29-11-1978	78	80
December	24.5	10.6	29.4	26-12-1979	3.3	15-12-1964	83	80
Annual	29.3	18.5	41.3	03-05-1966	2.4	30-01-1964	80	74

TABLE – 4(a)
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(DHUBRI (RUPSI) (A)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	20	15	17	7	2	1	0	0	0	6	16	21	107
b	1	2	2	4	8	12	15	10	9	4	1	1	65
c	1.5	1.7	1.9	4	5.3	6.3	6.7	6.2	6	3.6	1.6	1.1	3.8
1730 HOURS IST													
a	18	14	18	7	2	1	0	0	0	5	15	19	101
b	1	1	1	2	4	5	6	4	3	2	1	1	30
c	1.2	1.5	1.5	3.2	4.2	5.4	6	5.8	5.2	2.9	1.4	1	3.3

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE – 5(a)
Mean Wind Speed and Predominant Wind Direction
(DHUBRI (RUPSI) (A)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	3.7	4.9	6.6	8.4	6.7	5.5	4.7	4.1	3.9	4.3	4.9	3.9	5.1
Direction in morning	NE\C	NE/ E/C	NE/E	NE/E	NE/E	NE/ E/C	C/E/ NE/S	C/E /NE	C/NE /E	NE	NE	NE	
Direction in evening	C	C/W/ SW/NE	C/W /SW	C/NE/ /E	C/E/ NE	C/E/ S/NE	C/SW /S/E	C/S/ SW/E	C/E/ NE/S	C/NE/ E	C	C	

TABLE – 6(a)
Special Weather Phenomena
(DHUBRI (RUPSI) (A)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.3	0.9	2.0	8.1	12.3	10.1	7.7	8.7	9.1	2.4	0.2	0.0	61.8
Hail	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.6
Dust storm	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Fog	7.4	1.8	0.5	0.0	0.1	0.0	0.0	0.1	0.4	1.7	1.1	4.0	17.1
Squall	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3

DIBRUGARH DISTRICT

The climate of this district is characterized by mild cold in winter, mild hot in summer and is mostly humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by pre-monsoon season associated with thunderstorms from March to May. Southwest monsoon season is from June to the first week of October followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for 9 raingauge stations for the period ranging from 10 to 48 years. The details of 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 2358.5 mm. During the monsoon season June to September, the district receives rainfall about 62% of the annual rainfall. July is the rainiest month with an average rainfall of 463.7 mm. In pre-monsoon months March to May the district receives rainfall about 27% of the annual rainfall. The variation in annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 132% of the normal occurred in year 1958, while the lowest annual rainfall which was 65% of the normal occurred in 1978. In this fifty year period, there were 5 years in which annual rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 1901 mm and 2900 mm in 35 years out of 45. On an average there are 122 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 79 at Panitola to 142 at Jaipur. The heaviest rainfall recorded in 24 hours at any station in the district was 246.1 mm at Panitola on 02 May 1999.

TEMPERATURE

There is one meteorological observatory in the district at Dibrugarh/Mohanbari(A). The description of the climate of this district is based on the records of meteorological parameters from Dibrugarh observatory which may be taken as a representative of the climatic conditions over the district as a whole. Day and night temperatures begin to fall from the end of November. January is the coldest month with mean minimum temperature at 9.2°C and the mean maximum temperature at 22.8°C. In this season cold waves affect the district in the wake of passing western disturbances and minimum temperature may go down to 4°C or less. The temperatures begin to rise from the middle of March. In March to May weather is experienced sometimes as pleasant with occurrence of thundershowers, day temperature seldom becoming oppressive while nights are cool. August is the hottest month of the year with mean maximum temperature at 31.8°C and mean minimum temperature at 24.9°C. During the monsoon season maximum temperature may reach up to 36°C on individual days and weather particularly in absence of rain is often unpleasant due to the damp heat. The weather starts to

become gradually cool after withdrawal of the southwest monsoon by first week of October and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Dibrugarh observatory was 38.1°C on 21 June 1996 and the lowest minimum temperature ever recorded was 2.7°C on 28 December 1961. .

HUMIDITY

The air is much humid throughout the year, being particularly high during the southwest monsoon season when the relative humidity is above 85% in the morning and about 80% in the evening. The period of February and March is comparatively drier with the relative humidity about 70%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon and pre-monsoon seasons. In the post monsoon and cold seasons skies are lightly to moderately clouded.

WINDS

Winds are generally light to moderate throughout the year except for short spells and blow mostly from northeast. Sometime winds are calm during post monsoon and winter seasons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year and are more frequent in the period from March to September, their frequency being highest in April and August. Thunderstorms during the period from March to May are similar to Norwesters (Kalbaishaki) of Bengal and are sometimes violent. Thunderstorms during this period are sometimes accompanied with hail. Fog occurs after southwest monsoon season and is frequent in December and January and particularly in the vicinity of Brahmaputra Valley. Dust storms and squall are sometimes observed from February to May.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Dibrugarh/Mohanbari(A) observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
DIBRUGARH

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
D/Mohanbari (A) (Obsy)	48	a	32.7	56.5	109.9	213.6	305.4	426.4	522.7	440.3	333.4	147.2	21.7	18.1	2627.9	128	78	210.5	10 May 1996
		b	3.6	5.2	8.8	12.8	14.7	18.1	21.7	17.6	14.8	7.7	2.0	1.9	128.9	(1954)	(1963)		
Dibrugarh (Obsy)	10	a	35.1	49.3	144.8	189.9	301.5	470.1	519.2	387.7	358.0	228.1	47.3	28.2	2759.2	118	99	223.5	30 Aug 1920
		b	3.4	3.8	9.5	12.3	15.0	19.5	21.0	18.0	12.4	10.8	4.0	3.0	132.7	(1954)	(1952)		
Khowang (Hydro)	23	a	21.1	51.9	86.4	190.7	276.6	349.5	453.2	322.4	321.5	102.3	16.1	13.3	2205.0	133	62	217.4	13 Jul 1985
		b	2.1	4.5	6.5	13.0	13.6	16.7	20.3	15.1	14.3	6.0	1.4	1.1	114.6	(1995)	(1987)		
Nahar Katia (Hydro)	24	a	25.4	47.8	128.0	241.4	262.7	373.9	509.1	339.8	312.2	125.7	21.9	18.2	2406.1	122	64	190.2	04 Jul 1994
		b	2.9	5.1	9.6	14.0	14.0	16.7	21.2	16.2	15.3	6.9	2.1	1.8	125.8	(1995)	(1978)		
Panitola	12	a	32.1	73.7	97.7	240.8	217.7	222.1	359.7	248.6	158.2	76.1	13.5	12.4	1752.6	201	23	246.1	02 May 1999
		b	2.1	4.1	6.4	11.5	8.8	9.9	13.3	8.3	8.3	4.2	1.0	1.0	78.9	(1999)	(1983)		
SDAO Dibrugarh	13	a	21.3	41.4	104.0	182.5	302.2	359.2	459.7	338.0	273.3	122.3	16.5	22.8	2243.2	168	22	140.1	24 July 1987
		b	2.1	4.5	8.8	12.4	13.9	17.1	21.3	15.4	14.0	6.1	1.4	2.6	119.6	(1993)	(1997)		
Jaipur	11	a	33.7	54.8	136.4	265.8	353.4	333.2	491.7	351.8	242.5	177.4	28.5	20.2	2489.4	123	85	143.3	23 Jul 1956
		b	4.2	5.6	10.2	14.8	16.8	20.0	21.6	18.0	13.9	11.6	3.1	2.6	142.4	(1954)	(1951)		
Moran	12	a	20.6	35.4	104.2	235.6	412.4	364.6	435.9	323.0	272.0	151.4	25.8	16.9	2397.8	130	87	210.1	02 May 1944
		b	2.8	4.1	7.5	13.1	16.7	18.5	20.4	14.5	11.8	9.6	2.6	1.8	123.4	(1959)	(1951)		
Namrup	10	a	41.2	53.7	132.6	232.9	293.3	340.2	422.2	406.1	223.3	158.3	27.3	14.6	2345.7	122	88	146.1	12 Sep 1954
		b	4.0	5.6	8.9	12.4	14.8	18.4	21.1	17.7	12.0	8.8	2.6	2.2	128.5	(1954)	(1952)		
Dibrugarh (District)		a	29.2	51.6	116.0	221.5	302.8	359.9	463.7	350.9	277.2	143.2	24.3	18.3	2358.5	132	65		
		b	3.0	4.7	8.5	12.9	14.3	17.2	20.2	15.6	13.0	8.0	2.2	2.0	121.6	(1968)	(1978)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
DIBRUGARH
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1501 – 1600	1	2401 – 2500	5
1601 – 1700	1	2501 – 2600	3
1701 – 1800	3	2601 – 2700	5
1801 – 1900	0	2701 – 2800	8
1901 – 2000	0	2801 – 2900	4
2001 – 2100	3	2901 – 3000	1
2101 – 2200	3	3001 – 3100	2
2201 – 2300	3	3101 – 3200	2
2301 – 2400	1		

(Data available for 45 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(DIBRUGARH/MOHANBARI) (A)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	22.8	9.2	28.5	26-01-1990	3.4	06-01-1983	82	75
February	23.9	12.2	31.9	12-02-1999	4.8	02-02-1960	77	69
March	26.4	15.9	34.5	27-03-1973 & 19-03-2010	8.1	01-03-1983	72	65
April	27.6	18.8	36.0	15-04-1999	10.8	05-04-1965	76	71
May	29.7	21.9	37.2	24-05-2009	14.1	09-05-1964	79	74
June	31.1	24.2	38.1	21-06-1996	16.5	20-06-1969	85	78
July	31.0	24.6	37.9	16-07-1994	20.6	05-07-1978	88	79
August	31.8	24.9	37.5	16-08-2006	19.5	23-08-1958	86	78
September	30.6	23.8	37.6	08-09-2009	19.7	18-09-1964	86	83
October	29.8	20.7	36.3	06-10-2007	13.3	27-10-1971	79	84
November	27.4	15.0	33.1	06-11-1995	6.5	30-11-1971	74	84
December	24.2	10.0	30.6	01-12-2002	2.7	28-12-1961	78	81
Annual	28.0	18.4	38.1	21-06.1996	2.7	28-12-1961	80	77

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (DIBRUGARH/MOHANBARI) (A)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	7	4	4	1	0	0	0	0	0	1	3	7	26
b	2	3	4	6	8	11	15	11	9	4	1	1	75
c	3.3	4.4	4.7	5.5	6	6.7	7.1	6.8	6.4	4.7	3.2	2.7	5.1
1730 HOURS IST													
a	2	1	1	0	0	0	0	0	0	0	2	3	8
b	2	2	2	3	3	3	3	2	2	2	1	1	27
c	3.3	4.5	4.9	5.5	5.4	5.6	5.7	5.3	5.1	3.9	2.9	2.6	4.6

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(DIBRUGARH/MOHANBARI) (A)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	2.9	4.9	6.6	7.3	5.7	5.7	5.4	4.4	4.4	3.3	2.8	2.7	4.7
Direction in morning	C/NE	NE	NE	NE	NE	NE	NE/C	C/NE	NE/C	NE	NE	NE	
Direction in evening	C	C/NE	NE/C	NE/C	C/NE	NE/C	NE/C	C/NE	C/NE	C	C	C	

TABLE - 6
Special Weather Phenomena
(DIBRUGARH/MOHANBARI) (A)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.6	4.1	7.4	11.2	8.6	9.2	8.3	11.4	8.4	3.1	0.5	0.5	74.3
Hail	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Dust storm	0.0	0.1	0.3	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.7
Fog	7.6	1.0	0.4	0.4	0.2	0.1	0.0	0.3	0.7	0.8	1.5	6.8	19.8
Squall	0.0	0.1	0.2	0.4	0.2	0.0	0.0	0.1	0.0	0.0	0.0	00	1.0

GOALPARA DISTRICT

The climate of this district is characterized by mild cold in winter, mild hot in summer season, abundant rains, and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. The period from March to May is of summer season. Southwest monsoon season is from June to the first week of October followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for 7 raingauge stations for the period ranging from 10 to 36 years. The details of 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 2650.8 mm. During the monsoon season (June to September), the district receives rainfall about 68% of the annual rainfall. June and July are the rainiest months with an average rainfall of 560.3 mm. During the pre-monsoon season (March to May), the district receives rainfall about 24% of the annual rainfall. There is some rainfall in the district in October also. The variation in annual rainfall from year to year is somewhat large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 136% of the normal occurred in year 1956, while the lowest annual rainfall was 35% of the normal occurred in 1982. In this fifty year period, there were 8 years in which annual rainfall in the district was less than 80% of the normal. In this period there were two occasions of consecutive years of such a low rainfall, one occasion each of two and three consecutive years. It is seen from Table 2 that the annual rainfall was between 2101 mm and 3200 mm in 22 years out of 32. On an average there are 99 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 87 at Lakhipur to 109 at Marnai. The heaviest rainfall recorded in 24 hours at any station in the district was 508.0 mm at Damra on 13 April 1968.

TEMPERATURE

There is one meteorological observatory in the district at Goalpara. The data of temperature and other meteorological elements at Goalpara observatory may be taken as representative of the climatic conditions of the district as a whole. The drop in temperature is more rapid from the middle of November. January is the coldest month with mean maximum temperature at 25.0°C and mean minimum temperature at 9.8°C. In the wake of western disturbances spells of cold weather may occur in the district when minimum temperatures go down to 4°C or less on individual days. Temperatures begin to increase from about the end of February. In April the mean maximum temperature at Goalpara was 32.2°C. Although the temperatures in April and May are seldom excessive, the weather is sometimes rather unpleasant on account of the excessive dampness in the air. In the southwest monsoon season, the day temperatures continue to be nearly as same as that of April or sometimes they are more, while the night temperatures are higher than those in April and May. The highest mean

temperatures are experienced in August when the mean maximum temperature is 32.4°C and mean minimum temperature is 23.9°C. So the weather in the monsoon season is sometimes unpleasant due to damp heat, particularly when it is not raining. Temperatures decrease progressively after withdrawal of the southwest monsoon and weather becomes gradually cool and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Goalpara was 41.4°C on 02 May 1960 while the lowest minimum temperature ever recorded was 3.3°C on 31 January 1964.

HUMIDITY

The air is highly humid throughout the year. During the months January to April, the relative humidity is comparatively less especially in the afternoons, when it is between 50% and 60%. In the rest of the year the relative humidity is high when it is between 70% and 90%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season. During the rest of the year light to moderate clouded skies are common. In the cold season skies are sometimes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year. Northeasterly or southeasterly or calm winds are more common throughout the year. Sometimes southwesterly winds blow in the afternoon during the monsoon season.

SPECIAL WEATHER PHENOMENA

Some of the cyclonic storms and depressions which originate in the Bay of Bengal in the monsoon and post monsoon seasons move towards north Bengal and affect the district and its neigbhourhood causing heavy rains and high winds. Thunderstorms sometimes violent occur in the pre-monsoon, latter part of southwest monsoon and post monsoon period. Fog occurs on a few days in the winter and post monsoon seasons.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Goalpara observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
GOALPARA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Damra	10	a	12.6	5.4	47.8	164.9	358.8	540.2	481.8	376.6	237.8	186.5	9.0	1.9	2423.3	161 (1959)	32 (1967)	508.0	13 Apr 1968
		b	0.9	0.8	3.1	6.8	14.5	21.0	17.2	18.0	11.3	9.1	0.6	0.3	103.6				
Goalpara	11	a	56.7	7.1	70.5	187.3	476.9	606.7	551.7	277.1	513.9	173.7	19.9	8.5	2950.0	156 (1984)	81 (1954)	295.0	08 Oct 1979
		b	1.3	0.9	4.7	8.4	16.2	19.4	19.6	12.7	11.4	7.3	1.1	0.5	103.5				
Goalpara (Obsy)	36	a	13.0	18.0	50.6	194.9	411.6	552.1	460.4	302.6	287.0	121.1	21.5	5.4	2438.2	157 (1974)	70 (1981)	224.1	04 Jun 1968
		b	1.1	1.4	3.9	9.3	16.1	18.2	17.6	13.0	11.0	5.0	1.2	0.4	98.2				
Goalpara/Barpeta (Hydro)	16	a	11.7	24.1	55.0	202.2	390.7	573.9	545.4	365.9	326.7	196.5	21.3	4.8	2718,2	131 (1987)	70 (1992)	420.6	14 Jun 2002
		b	1.2	2.0	3.5	9.7	14.7	16.7	18.2	13.5	13.6	5.7	1.2	0.5	100.5				
Lakhipur	20	a	17.0	4.2	54.3	122.3	449.2	521.0	409.5	326.9	219.3	120.1	16.7	3.4	2263.9	166 (1956)	33 (1999)	490.3	05 May 1959
		b	1.3	0.6	3.7	6.6	14.9	18.1	14.3	13.6	8.6	4.5	0.7	0.2	87.1				
Marnai	14	a	18.7	10.0	46.9	170.0	595.1	842.2	907.5	553.6	424.8	182.8	18.9	2.7	3773.2	116 (1956)	74 (1957)	288.3	27 Jun 1968
		b	1.5	1.0	3.3	8.3	18.7	20.3	20.8	15.3	11.8	6.8	0.9	0.2	108.9				
S.D.A.O. Goalpara	13	a	8.3	9.1	30.3	159.6	293.6	423.2	428.4	279.4	224.2	120.2	8.1	4.0	1988.4	141 (1995)	46 (1982)	175.0	19 Jul 1993
		b	0.8	1.1	1.9	9.5	12.8	16.1	15.1	12.4	12.3	5.5	0.6	0.5	88.6				
Goalpara(District)		a	19.7	11.1	50.8	171.6	425.1	579.9	540.7	354.6	319.1	157.3	16.5	4.4	2650.8	136 (1956)	35 (1982)		
		b	1.2	1.1	3.4	8.4	15.4	18.5	17.5	14.1	11.4	6.3	0.9	0.4	98.6				

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
GOALPARA
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
901 – 1000	1	2301 – 2400	0
1001 – 1100	0	2401 – 2500	3
1101 – 1200	0	2501 – 2600	1
1201 – 1300	0	2601 – 2700	0
1301 – 1400	0	2701 – 2800	4
1401 – 1500	1	2801 – 2900	2
1501 – 1600	0	2901 – 3000	2
1601 – 1700	1	3001 – 3100	1
1701 – 1800	2	3101 – 3200	3
1801 – 1900	0	3201 – 3300	0
1901 – 2000	1	3301 – 3400	1
2001 – 2100	2	3401 – 3500	0
2101 – 2200	6	3501 – 3600	0
2201 – 2300	0	3601 – 3700	1

(Data available for 32 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(GOALPARA)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	25.0	9.8	29.0	27/1/1959	3.3	31/1/1964	81	61
February	27.2	11.4	32.4	13/2/1960	5.2	16/2/1961	78	53
March	31.2	15.4	37.6	29/3/1958	5.8	4/3/1965	72	51
April	32.2	19.1	39.9	26/4/1958	10.4	10/4/1974	77	61
May	31.6	20.9	41.4	2/5/1960	12.6	12/5/1974	84	72
June	31.4	22.8	39.6	13/6/1972	13.4	2/6/1974	88	82
July	32.0	23.6	36.7	15/7/1962	15.4	19/7/1974	88	82
August	32.4	23.9	40.5	20/8/1959	15.4	31/8/1974	88	81
September	32.4	23.3	37.1	22/9/1967	14.4	2/9/1974	87	79
October	31.6	20.4	36.1	2/10/1956	11.4	30/10/1974	83	76
November	28.9	15.2	32.6	6/11/1969	6.4	8/11/1974	80	72
December	26.1	11.6	31.1	6/12/1955	4.4	12/12/1974	85	69
Annual	30.2	18.1	41.4	2/5/1960	3.3	31/1/1964	83	70

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (GOALPARA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	23	22	20	14	7	2	1	2	4	12	20	24	151
b	6	3	6	10	17	22	22	20	16	10	5	4	141
c	2.0	1.4	2.2	3.6	5.4	7.0	6.7	6.6	5.6	3.7	1.9	1.7	4.0
1730 HOURS IST													
a	25	23	21	16	10	2	2	4	6	18	22	28	177
b	2	2	4	7	11	19	19	18	14	5	3	1	105
c	1.1	1.2	1.8	2.9	4.3	6.2	6.5	6.1	5.1	2.5	1.2	0.7	3.3

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (GOALPARA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	2.1	2.3	4.0	5.0	4.3	3.4	3.2	2.9	2.5	2.6	2.1	1.6	3.0
Direction in morning	C/NE	C/NE	NE	NE	NE	NE/SE	NE/SE	C/NE/SE	NE	NE	NE	C/NE	
Direction in evening	C/NE	C/NE/NW/W	C/NE/SW	NE	NE	C/NE/SE	SW/C/SE/NE	C/SW/SE/NE	C/SW/NE	C/NE	C/NE	C	

TABLE - 6
Special Weather Phenomena (GOALPARA)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.0	0.0	0.2	1.5	0.0	0.0	0.1	0.3	0.4	0.1	0.0	0.0	1.3
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	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Fog	3.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.1	0.6	3.6	8.9
Squall	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

GOLAGHAT DISTRICT

The climate of this district is characterized by cold in winter, mild hot in summer season and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer (pre-monsoon) season associated with thunderstorms from March to May. Southwest monsoon season starts from June and lasts till the first week of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 8 raingauge stations for the period ranging from 10 to 34 years. The details of 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 1813.3 mm. During the monsoon season (June to September), the district receives rainfall about 63% of its annual rainfall. July is the rainiest month with an average rainfall of 336.1 mm. In the pre-monsoon months (March to May) the district receives rainfall about 26% of its annual rainfall. The variation in annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 142% of the normal occurred in year 1959, while the lowest annual rainfall was 66% of the normal occurred in 1988. In this fifty year period, there were 3 years in which annual rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 1401 mm and 2400 mm in 30 years out of 34

.

On an average there are 99 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 78 at Barpathar (Hydro) to 108 at Golaghat West.

The heaviest rainfall recorded in 24 hours at any station in the district was 294.2 mm at Barpathar (Hydro) on 17 July 2000.

TEMPERATURE

There is one meteorological observatory in the district at Golaghat, but the data of this observatory for climatic normals is not available. The description of climate of this district is based on the data of neighbouring observatory Gohpur in Sonitpur district. The winter season sets in the end of November when both day and night temperatures begin to decrease. January is the coldest month of the year with the mean maximum temperature about 23°C and the mean minimum temperature about 8°C. On individual days in winter season the minimum temperature may go down to 4°C. Temperatures begin to rise from the beginning of March and continues till August. The highest values of temperatures are generally experienced in the month of August when mean

maximum temperature is about 32°C and minimum temperature is about 24°C. However, temperatures in the monsoon season are even higher than in summer season. During the monsoon season maximum temperature may reach up to 36°C on individual days. The weather becomes gradually cool after withdrawal of the monsoon and pleasant during post monsoon season.

HUMIDITY

The atmosphere is much humid throughout the year, particularly more during the southwest monsoon season when the relative humidity is about 85%. In the winter season also, the air is quite humid with a relative humidity of about 80%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season. The skies are lightly or moderately clouded during the rest of the year. In the winter season sometimes cloudiness sets in association with passing western disturbances.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in summer season when they are moderate or strong. Easterly winds blow in the district throughout the year. In winter and pre-monsoon seasons north-easterlies blow in afternoon on some days in the district.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions from the Bay of Bengal which move into Assam during May and June months seldom reach the district to affect its weather. Thunderstorms occur throughout the year except during winter season. Fog occasionally occurs in post monsoon and winter seasons. Its frequency is more in December month.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
GOLAGHAT

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Barpathar (Hydro)	22	a	21.3	29.1	77.1	106.6	228.5	222.1	283.2	243.5	195.3	117.9	21.5	17.5	1563.6	209	51	294.2	17 Jul 2000
		b	1.9	1.9	5.4	7.2	10.5	10.5	11.5	11.0	8.1	6.1	1.7	1.8	78.3	(1959)	(1996)		
Golagat	21	a	15.9	27.5	80.8	118.4	180.2	261.1	308.6	273.9	220.9	117.8	24.4	25.3	1654.8	134	58	195.0	26 Sep 1987
		b	2.0	3.2	5.7	9.3	10.6	15.1	15.9	13.2	11.4	6.5	1.6	1.8	96.3	(1952)	(1986)		
Golaghat (Hydro)	25	a	12.9	32.4	61.9	152.4	196.6	282.4	360.1	272.1	221.8	109.3	29.7	14.9	1746.5	125	79	266.0	25 Jul 2000
		b	1.6	3.4	5.8	10.5	11.3	15.7	17.8	14.9	12.9	6.4	2.0	1.5	103.8	(1957)	(1979)		
Golaghat (Obsy)	34	a	15.0	25.6	53.3	138.1	271.0	259.1	318.5	294.2	204.1	100.7	19.3	12.5	1711.4	121	85	147.0	30 Aug 1996
		b	1.7	3.0	4.9	10.0	13.3	15.0	16.7	14.6	11.5	6.3	1.4	1.3	99.7	(1957)	(1996)		
Golaghar (North)	10	a	17.6	45.3	58.2	141.1	220.6	341.0	358.8	330.5	241.1	123.0	18.8	14.4	1910.4	112	84	150.6	25 Aug 1999
		b	1.6	4.1	4.9	9.3	1.7	15.8	18.6	13.7	11.6	5.7	1.3	1.0	99.3	(1993)	(2000)		
Golaghat (West)	10	a	22.1	52.0	54.4	159.8	266.5	360.1	333.4	318.4	233.2	133.8	29.1	15.1	1977.9	129	56	163.4	06 Jul 1994
		b	2.3	4.6	4.5	10.3	13.8	18.1	16.8	14.1	13.3	7.0	1.6	1.3	107.7	(1993)	(2000)		
Namaligarh (Hydro)	24	a	15.4	34.7	62.1	167.5	238.9	287.9	341.2	276.5	227.9	89.0	17.0	14.2	1772.3	124	68	133.8	15 Jun 1990
		b	1.4	3.4	5.3	11.0	13.8	16.12	18.0	14.8	13.8	5.3	1.4	1.7	106.0	(1993)	(1988)		
Namarjan	15	a	24.8	21.2	104.6	224.5	393.7	353.5	385.0	284.5	224.0	123.7	20.0	10.8	2170.3	115	80	236.7	22 Apr 1956
		b	2.7	2.1	6.6	10.4	15.5	15.9	15.0	13.1	10.6	5.7	1.5	1.4	100.5	(1959)	(1954)		
Golaghat (Disrict)		a	18.1	33.5	69.0	151.0	249.5	295.9	336.1	286.7	221.0	114.4	22.5	15.6	1813.3	142	68		
		b	1.9	3.2	5.4	9.8	12.7	15.3	16.3	13.7	11.7	6.1	1.6	1.5	99.2	(1959)	(1988)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
GOLAGHAT
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1201 - 1300	1	1901 – 2000	5
1301 - 1400	2	2001 - 2100	5
1401 – 1500	1	2101 – 2200	2
1501 – 1600	3	2201 - 2300	0
1601 – 1700	1	2301 - 2400	0
1701 – 1800	9	2401 - 2500	0
1801 – 1900	4	2501 - 2600	1

(Data available for 34 years)

HAILAKANDI DISTRICT

The climate of this district is characterized by mild cold in winter, mild hot in summer and humid air throughout the year. The year may be divided into four seasons. Winter season starts from December to February, followed by summer season from March to May. Southwest monsoon season is from June to the middle of October. The period of mid-October to November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 3 raingauge stations for the period ranging from 17 to 24 years. The details of 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 2669.6 mm. During the monsoon season (June to September), the district receives rainfall about 60% of the annual rainfall. June is the rainiest month with an average rainfall of 473.6 mm. In the pre-monsoon months; March to May, the district receives rainfall about 31% of the annual rainfall. The variation in annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 161% of the annual normal occurred in year 1959, while the lowest annual rainfall was 77% of the normal occurred in 1984. In this fifty year period, there was only one occasion in which the annual rainfall in the district was less than 80% of the normal. It is seen from Table 2 that the annual rainfall was between 2101 mm and 3200 mm in 18 years out of 22.

On an average there are 116 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 109 at Gharmura to 120 at Hailakandi.

The heaviest rainfall recorded in 24 hours at any station in the district was 338.6 mm at Hailakandi on 08 June 1913.

TEMPERATURE

There is no meteorological observatory in the district. The description of the climate which follows is based on the records of meteorological parameters of neighbouring observatories Silchar and Silchar Kumbhigram (A) in Cachar district. From the end of November, both day and night temperatures begin to decrease, the drop being more rapid in case of night temperatures. January is the coldest month with the mean maximum temperature about 25°C and the mean minimum temperature about 12°C. On individual days in the winter season, the minimum temperature may go down to 6°C. Day and night temperatures begin to rise from the beginning of March. The day temperatures seldom become oppressive while the nights are cool in April and May. The frequent thundershowers during this period reduce the temperatures to some extent. The onset of the southwest monsoon in June does not lower the temperatures as in other parts of India, while the day and night

temperatures are even higher in this season than in the rest of the year. The highest mean values of the temperature are experienced in the month of August when mean maximum temperature is about 32°C and mean minimum temperature is about 25°C. During the monsoon and summer seasons maximum temperature may reach up to 37°C on individual days. Both day and night temperatures begin to decrease after withdrawal of the monsoon by the first week of October and the weather becomes gradually cool and pleasant during post monsoon season.

HUMIDITY

The air is much humid throughout the year, being particularly high during the southwest monsoon season when the relative humidity is above 80%. The air is comparatively less humid during February and March, particularly in the afternoons, when the humidity is less than 60%.

CLOUDINESS

The skies are heavily clouded to overcast during the period May to September. The cloudiness decreases thereafter and in the cold season the skies are lightly to moderately clouded. The cloudiness increases from March.

WINDS

Winds are generally light to moderate throughout the year except for short spells of thunderstorms during summer season when the winds are strong. Winds are generally easterly or northeasterly throughout the year. Southwesterly wind is seen in afternoon during the monsoon season. Sometimes wind is calm.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year but they are frequent in the summer season. Thunderstorms in summer season are sometimes associated with hail and squall. Fog occasionally occurs on a few days during post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
HAILAKANDI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Gharmura	17	a	4.7	34.2	95.9	245.2	403.7	379.4	350.3	410.7	284.5	128.7	36.2	11.0	2384.5	156	65	280.0	03 Apr 1991
		b	0.7	2.8	4.7	10.2	14.5	16.6	18.1	17.5	15.4	6.3	1.6	0.6	109.0	(1993)	(1996)		
Hailakandi	24	a	13.3	42.5	187.4	250.5	480.6	492.4	459.6	358.6	279.3	160.5	34.3	17.1	2776.1	155	76	338.6	08 Jun 1913
		b	1.2	2.4	6.8	10.1	16.0	20.0	21.5	18.0	13.6	8.1	1.9	0.6	120.2	(1959)	(1999)		
Matighura (Hydro)	17	a	8.2	49.7	151.1	223.6	406.7	549.0	502.2	393.0	349.4	172.0	36.5	6.9	2848.3	125	62	293.0	09 Jun 1998
		b	0.9	2.5	5.3	8.7	14.8	20.3	21.7	19.1	16.3	7.2	1.8	0.4	119.0	(1990)	(1984)		
Hailakandi (District)		a	8.7	42.1	144.8	239.8	430.3	473.6	437.4	387.4	304.4	153.7	35.7	11.7	2669.6	161	77		
		b	0.9	2.6	5.6	9.7	15.1	19.0	20.4	18.2	15.1	7.2	1.8	0.5	116.1	(1959)	(1984)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
HAILAKANDI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
2001 - 2100	1	2801 - 2900	3	3601 - 3700	1
2101 - 2200	0	2901 - 3000	1	3701 - 3800	1
2201 - 2300	3	3001 - 3100	1	3801 - 3900	0
2301 - 2400	2	3101 - 3200	1	3901 - 4000	0
2401 - 2500	2	3201 - 3300	0	4001 - 4100	0
2501 - 2600	2	3301 - 3400	0	4101 - 4200	0
2601 - 2700	1	3401 - 3500	0	4201 - 4300	1
2701 – 2800	2	3501 - 3600	0		

(Data available for 22 years)

JORHAT DISTRICT

The climate of this district is characterized by mild hot in summer, cold in winter and humid air throughout the year. The year may be divided into four seasons. The period of June to the first week of October is of southwest monsoon season followed by post monsoon season comprising the months of October and November. Winter season is from December and continues till the beginning of March and is followed by summer (pre-monsoon) season of thunderstorms till May.

RAINFALL

Records of rainfall in the district are available for 7 raingauge stations for the period ranging from 10 to 25 years. The details of 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 2073.9 mm. During the monsoon season (June to September), the district receives rainfall about 65% of the annual rainfall. July is the rainiest month with an average rainfall of about 413.4 mm. In the pre-monsoon season the district receives rainfall about 25% of the annual rainfall. The variation in annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 128% of the normal occurred in year 1977, while the lowest annual rainfall which was 84% of the normal occurred in 1951. It is seen from Table 2 that the annual rainfall was between 1701 mm and 2500 mm in 27 years out of 30.

On an average there are 107 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 80 at Jorhat D.B. to 118 at Seleng T.E. The heaviest rainfall recorded in 24 hours at any station in the district was 254.8 mm at Jorhat Central on 18 Jul 1900.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district is based on meteorological data of the neighbouring observatory at Sibsagar. The winter season sets in towards the end of November when both day and night temperatures begin to drop rapidly. January is the coldest month with mean maximum temperature about 23°C and mean minimum temperature about 10°C. During winter season minimum temperature may go down to 4°C on individual days. Temperatures begin to rise steadily from March and reach its maximum in July and August. The mean maximum temperature in these months is about 32°C and mean minimum temperature is about 25°C. During summer and monsoon seasons maximum temperature may reach up to 37°C on individual days. The summer season is not very hot and is associated with thunderstorms. The highest temperatures occur during the monsoon period. The high moisture content in the air sometimes makes the weather unpleasant due to damp heat especially in between two spells of rain in the monsoon

season. The weather gradually becomes cool after withdrawal of the southwest monsoon and pleasant during post monsoon season.

HUMIDITY

The atmosphere over the district is much humid throughout the year, particularly high in the monsoon season. The average relative humidity in the morning is about 80% and that in the afternoon is about 75%.

CLOUDINESS

The skies are generally heavily clouded to overcast during southwest monsoon and pre-monsoon seasons. Skies are lightly clouded in the post monsoon and winter seasons. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in the period of March to August when they are a little stronger. Winds are generally northerly or northeasterly or calm throughout the year.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are common throughout the year but they are more frequent during March to September. Thunderstorms are sometimes accompanied with hail in pre-monsoon season. Dust-storms are also sometimes observed in the pre-monsoon season. Fog is very frequent in post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
JORHAT

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Jorhat	23	b	22.2	34.7	85.1	186.8	266.3	275.1	380.0	327.2	273.2	117.8	21.8	17.7	2007.9	139	76	163.8	28 Jul 1952
		b	2.1	3.8	6.9	11.4	12.9	14.6	18.7	15.3	13.7	6.6	1.7	1.5	109.2	(1955)	(1997)		
Jorhat Central	10	a	33.2	72.0	102.3	186.4	288.5	415.4	610.2	505.7	390.4	131.3	32.5	14.4	2782.3	125	76	254.8	18 Jul 1900
		b	3.2	4.8	7.3	11.8	13.4	15.5	19.9	17.2	14.2	5.7	2.1	1.2	116.3	(1993)	(1997)		
Jorhat D.B.	10	a	19.5	45.1	59.2	104.9	171.6	231.5	383.4	311.2	281.8	99.2	24.3	24.1	1755.8	134	58	168.2	23 Jun 1993
		b	1.8	4.1	4.8	6.4	8.3	9.1	16.3	11.8	11.1	4.3	0.7	1.2	79.9	(1996)	(2000)		
Jorhat East	10	a	18.9	48.9	78.0	149.6	252.6	288.6	378.5	313.2	261.1	84.8	28.6	11.6	1914.4	119	71	189.2	30 Aug 1966
		b	1.6	5.2	6.2	11.2	14.5	15.4	19.9	16.1	16.2	5.7	1.6	1.3	114.9	(1998)	(1997)		
Neamatighat (Hydro)	25	a	22.0	32.7	63.9	176.4	244.1	285.5	389.1	304.4	253.5	117.7	26.0	14.4	1929.7	138	67	185.0	29 May 1977
		b	1.9	3.5	6.0	11.6	13.6	15.3	18.5	14.7	12.5	6.1	1.8	1.5	107.0	(1977)	(2000)		
S.D.A.O. Majuli	10	a	34.0	44.0	72.6	168.0	255.0	297.8	345.3	239.6	255.5	107.7	15.0	6.5	1841.0	117	89	166.9	04 Sep 1991
		b	1.7	3.4	5.9	11.7	13.3	16.9	18.6	13.1	11.9	6.2	1.4	0.6	104.7	(1994)	(2000)		
Seleng T.E.	21	a	22.6	38.5	94.3	254.8	311.6	308.7	407.4	406.3	272.8	127.0	29.1	14.4	2287.5	114	77	248.1	29 Apr 1974
		b	2.6	3.9	7.4	12.4	14.8	16.2	18.8	17.4	12.4	7.7	2.5	1.9	118.0	(1976)	(1951)		
Jorhat (District)		a	24.6	45.1	79.3	175.3	255.7	300.4	413.4	343.9	284.0	112.2	25.3	14.7	2073.9	128	84		
		b	2.1	4.1	6.4	10.9	13.0	14.7	18.7	15.1	13.1	6.0	1.7	1.3	107.1	(1977)	(1951)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
JORHAT
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1701 - 1800	3	2201 - 2300	3
1801 - 1900	2	2301 - 2400	1
1901 - 2000	7	2401 - 2500	2
2001 - 2100	3	2501 - 2600	2
2101 – 2200	6	2601 - 2700	1

(Data available for 30 years)

KAMRUP METRO DISTRICT

The climate of this district is characterized by mild cold in winter, hot in summer and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February and this is followed by summer (pre-monsoon) season associated with thunderstorms activities from March to May. The period of June to the first week of October is of southwest monsoon season. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 3 raingauge stations for the period ranging from 12 to 48 years. The details of 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 1592.1 mm. The variation in annual rainfall from year to year is not large. During the monsoon season (June to September), the district receives about 66% of the annual rainfall. July is the rainiest month with an average rainfall of 313.0 mm. In pre-monsoon months (March to May), the district receives rainfall about 26% of the annual rainfall. In the fifty year period 1951 to 2000, the highest annual rainfall of 141% of the normal occurred in year 1988, while the lowest annual rainfall is 69% of the normal occurred in 1962. In this period there were 4 years in which the annual rainfall in the district was less than 80% of the normal and there is one occasion when such a low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall was between 1201 mm and 2000 mm in 37 years out of 42. On an average there are 85 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 74 at SDAO Guwahati to 93 at Guwahati AP Observatory. The heaviest rainfall recorded in 24 hours at any station in the district was 306.0 mm at SDAO Guwahati on 07 August 1982.

TEMPERATURE

There are two meteorological observatories in the district, one at Guwahati and other at Guwahati A.P. (Bhorjar). The description of climate is based on meteorological data of Guwahati (Bhorjar) observatory which may be taken as a representative of climatic conditions over the district as a whole. The winter season sets in the district towards the end of November when both day and night temperatures begin to drop. January is the coldest month with mean maximum temperature at 23.6°C and mean minimum temperature at 10.6°C. On individual days during winter season minimum temperature may go down to 5°C. Temperatures begin to rise steadily by the beginning of March and reach the maximum in the monsoon season. August is the hottest month with mean maximum temperature at 32.2°C and mean minimum temperature at 25.5°C. However, on individual days maximum temperature may reach up to 38°C in summer season. The monsoon season is the period with the highest temperatures. The weather is often unpleasant due to damp heat especially in between two spells of rain.

The weather becomes gradually cool after withdrawal of the southwest monsoon by the first week of October and pleasant during post monsoon season. The highest maximum temperature ever recorded at Guwahati observatory was 40.3°C on 01 May 1960 and the lowest minimum temperature ever recorded was 3.0°C on 30 January 1964.

HUMIDITY

The atmosphere is much humid throughout the year except in the period of February to April, with relative humidity about 80%. During this period February to April the relative humidity drops especially in the afternoon when it is between 45% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and in the latter part of summer season. Skies are generally lightly or moderately clouded during the rest of the year. In the cold months skies become obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in the period March to May when they are little stronger. Winds are generally northeasterly or easterly or calm in the mornings throughout the year. Southwesterly or westerly winds blow in the afternoons in the southwest monsoon season. In the rest of the year winds are calm and northeasterly or westerly in the afternoon.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are common throughout the year but they are more frequent during the period March to October. Thunderstorms in the period March to May are very severe and similar to the Norwesters of Bengal and they are sometimes violent. Some of the thunderstorms are accompanied with hail or squall in pre-monsoon season. Fog occasionally occurs in the post monsoon and winter seasons.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Guwahati (A) (Bhorjar) observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KAMRUP METRO

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Guwahati (Obsy)	12	a	17.4	9.3	62.2	110.2	249.1	292.8	327.5	294.8	162.7	84.6	8.8	7.3	1626.7	124 (1956)	68 (1962)	194.3	05 Jun 1956
		b	1.6	1.0	4.6	7.9	16.0	14.3	13.7	12.4	9.4	4.8	1.1	0.6	87.4				
Guwahati AP (Obsy)	48	a	12.2	17.7	57.3	152.6	255.2	325.2	351.4	271.3	189.5	90.9	17.0	6.3	1746.6	154 (1977)	78 (1997)	259.6	29 Apr 1977
		b	1.2	1.8	4.7	9.0	14.0	15.4	16.6	13.5	10.4	5.1	1.2	0.6	93.5				
S.D.A.O. Guwahati	15	a	5.8	16.9	32.0	122.6	209.6	278.7	260.1	223.8	194.2	52.4	4.6	2.2	1402.9	142 (1987)	45 (1999)	306.0	07 Aug 1982
		b	0.6	1.8	2.7	7.5	11.8	14.0	13.6	10.1	8.1	2.6	0.6	0.2	73.6				
Kamrup Metro (District)		a	11.8	14.6	50.5	128.5	238.0	298.9	313.0	263.3	182.1	76.0	10.1	5.3	1592.1	141 (1988)	69 (1962)		
		b	1.1	1.5	4.0	8.1	13.9	14.6	14.6	12.0	9.3	4.2	1.0	0.5	84.8				

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
KAMRUP METRO
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1001 - 1100	2	1701 – 1800	6
1101 - 1200	1	1801 – 1900	6
1201 - 1300	1	1901 – 2000	3
1301 - 1400	2	2001 – 2100	1
1401 – 1500	3	2101 – 2200	0
1501 – 1600	6	2201 – 2300	1
1601 – 1700	10		

(Data available for 42 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(GUWAHATI (A) BHORJAR)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	23.6	10.6	29.6	29-01-2010	3.0	30-01-1964	87	70
February	26.0	12.2	35.7	28-02-2006	5.3	04-02-1983	76	55
March	29.8	15.9	38.6	27-03-1979	8.5	11-03-1979	66	48
April	31.0	20.0	40.1	17-04-1999	10.3	01-04-1968	73	60
May	31.0	22.5	40.3	01-05-1960	16.4	03-05-1975	79	70
June	31.9	24.9	38.5	06-06-1979	20.6	01-06-1979	83	77
July	31.8	25.5	37.5	13-07-2009	21.6	08-07-1978	85	80
August	32.2	25.5	38.0	11-08-2006	22.3	21-08-1978	83	80
September	31.5	24.5	37.8	28-09-2009	19.9	28-09-1986	84	81
October	30.3	22.0	37.0	01-10-2009	13.8	31-10-1979	83	79
November	27.7	17.0	33.0	03-11-2009	10.0	22-11-1965	84	78
December	24.6	11.9	30.9	18-12-1957	4.9	28-12-1961	87	77
Annual	29.3	19.4	40.3	01-05-1960	3.0	30-01-1964	81	71

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(GUWAHATI (A) BHORJAR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	12	13	14	6	1	0	0	0	0	1	4	9	57
b	1	1	2	4	7	9	9	7	6	3	2	1	52
c	2.3	2.3	2.6	4.1	5.4	6.4	6.7	6.4	5.9	4.4	3.2	2.2	4.3
1730 HOURS IST													
a	4	4	6	2	0	0	0	0	0	0	1	4	22
b	1	1	1	1	2	4	3	3	3	2	1	1	23
c	3.2	3.1	3.3	4.1	4.8	6	6.2	6.1	5.8	4.1	3.1	2.7	4.4

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(GUWAHATI (A) BHORJAR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	2.0	2.7	4.0	4.9	4.1	3.4	3.1	3.1	2.7	2.6	2.3	1.8	3.1
Direction in morning	C	C/NE/E	C/NE/E	NE/C/E	NE/C	C/NE	C/NE	C/NE/E	C/NE/E	C/NE/E	C/NE/E	C	
Direction in evening	C	C/NE/W	C/NE/W	NE	C/NE	C/NE	C/W/S/SW	C/S	C/W/S	C/NE	C	C	

TABLE - 6
Special Weather Phenomena
(GUWAHATI (A) BHORJAR)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.6	2.0	5.2	12.5	14.3	11.9	10.9	12.5	9.1	3.2	0.9	0.2	83.3
Hail	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Dust storm	0.0	0.1	1.0	0.5	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	1.8
Fog	8.5	1.0	0.4	0.0	0.1	0.0	0.0	0.0	0.0	2.1	5.7	10.9	28.7
Squall	0.0	0.1	0.5	2.0	1.7	0.3	0.0	0.1	0.2	0.0	0.0	0.0	4.9

KAMRUP RURAL DISTRICT

The climate of this district is characterized by mild cold in winter, mild hot in summer and humid in monsoon season. The year may be divided into four seasons. Winter season is from December to February and is followed by pre-monsoon season associated with thunderstorms from March to May. June to the first week of October is of southwest monsoon season and is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for 11 raingauge stations for the period ranging from 10 to 38 years. The details of 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 2181.2 mm. During the monsoon season (June to September), the district receives about 64% of the annual rainfall. June is the rainiest month with an average rainfall of 450.5 mm. In pre-monsoon months (March to May), district receives rainfall about 26% of the annual rainfall. The variation in annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 132% of the annual normal occurred in year 1992, while the lowest annual rainfall which was 54% of the normal occurred in 1988. In the fifty year period 1951-2000, the rainfall was less than 80% of the normal in 6 years. During this period there was one occasion when such a low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall was between 1701 mm and 2700 mm in 24 years out of 33.

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On an average there are 93 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 73 at Kamalpur to 120 at Ukium (Hydro).

The heaviest rainfall recorded in 24 hours at any station in the district was 530.0 mm at Kamalpur on 21 August 1992.

TEMPERATURE

There is one meteorological observatory in the district, at Rangia. The description of climate which follows is based on meteorological data available for Rangia observatory which may be taken as a representative of climatic conditions over the district as a whole. The winter season sets in the district towards the end of November when both day and night temperatures begin to drop. January is the coldest month with mean maximum temperature at 23.6°C and mean minimum temperature at 10.2°C. On individual days during winter months minimum temperature may go down to 7°C. Temperatures begin to rise steadily by about the beginning of March and reach the maximum in July and August. In August mean maximum temperature is 32.5°C and mean minimum temperature is 24.8°C. The monsoon season is the period with the highest temperatures when maximum temperature may reach up to 37°C on individual days. The weather is often unpleasant due to the

damp heat especially in between two spells of rain. The weather becomes gradually cool after withdrawal of the southwest monsoon by first week of October and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Rangia observatory was 39.5°C on 01 May 1960 and the lowest minimum temperature ever recorded was 5.3°C on 30 January 1964.

HUMIDITY

The atmosphere is humid throughout the year with average relative humidity being about 75%. In southwest monsoon season relative humidty is about 80%. The relative humidity is less about 60% to 70% during the period February to April.

CLOUDINESS

The skies are heavily clouded or overcast during southwest monsoon months June to September and latter part of pre-monsoon season (April-May). The skies are light to moderate clouded during the rest of the year. In the cold season skies may become obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in the period March to May when they are strong. Easterly winds blow in the district throughout the year. In the southwest monsoon season sometimes westerly winds are also observed in the afternoon.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are frequent during the period March to September. Fog is sometimes observed on a few days in the post monsoon and winter seasons.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Rangia observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KAMRUP RURAL

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Chhaygaon	11	A	29.6	18.6	78.7	169.7	335.2	380.5	307.9	249.4	167.8	154.8	15.2	26.2	1933.6	152	67	198.1	11 Jun 1911
		b	2.2	1.5	5.1	8.5	13.9	16.7	14.4	14.3	9.2	6.3	1.3	1.5	94.9	(1952)	(1994)		
Digaru (Hydro)	11	A	6.8	14.3	39.3	153.2	189.3	324.4	334.3	315.9	172.2	88.8	16.8	17.1	1672.4	136	85	324.0	06 Oct 1979
		b	1.1	1.6	3.6	10.6	12.5	15.6	16.7	14.1	10.3	4.6	1.1	1.2	93.0	(1977)	(1978)		
Hajo	11	A	25.0	15.6	81.1	151.2	348.2	394.4	311.9	262.1	216.3	139.9	8.4	13.3	1967.4	124	71	218.4	07 May 1941
		b	2.4	1.5	5.2	9.2	18.2	15.2	12.9	13.2	9.4	6.0	0.8	1.0	95.0	(1953)	(1954)		
Kamalpur	13	A	11.7	17.6	76.9	238.9	485.6	602.4	532.0	546.2	297.6	358.5	8.7	4.0	3180.1	167	46	530.0	21 Aug 1992
		b	0.7	1.2	3.7	9.3	12.8	12.5	9.8	11.7	6.8	3.9	0.2	0.3	72.9	(1992)	(1954)		
Khanapara Campus	10	A	21.5	40.2	66.6	156.6	278.5	450.1	438.6	332.9	249.9	134.7	9.7	6.5	2185.8	144	76	195.6	15 Oct 1991
		b	1.2	2.4	4.6	7.9	13.2	18.6	19.2	18.4	12.7	4.7	1.0	1.1	105.0	(1993)	(1987)		
Menoka	10	A	25.6	16.9	94.0	200.7	582.0	808.5	624.1	275.2	295.6	164.1	11.9	24.7	3123.3	132	83	380.5	08 Jul 1967
		b	1.8	1.2	5.0	9.8	18.2	16.9	16.6	12.0	10.6	6.4	1.1	1.2	100.8	(1954)	(1953)		

TABLE – 1 (contd…)
NORMALS AND EXTREMES OF RAINFALL
KAMRUP RURAL

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Puthimari (Hydro)	16	a	9.0	22.0	57.4	132.7	295.6	354.0	338.7	237.1	198.3	120.3	14.3	5.5	1784.9	149	64	185.8	08 Jul 1990
		b	0.8	2.0	4.4	9.1	13.7	13.8	13.1	10.9	10.9	4.5	1.2	0.8	85.2	(1993)	(1996)		
Rangia	27	a	11.0	15.7	67.8	160.1	305.8	357.1	400.9	214.4	181.3	128.6	34.7	4.0	1881.4	138	70	430.0	19 Jul 1982
		b	1.0	1.3	4.0	7.9	12.7	13.8	12.8	10.4	8.3	5.2	0.8	0.2	78.4	(1995)	(1996)		
Rangia (Obsy)	38	a	12.8	23.5	50.1	131.3	342.3	457.0	318.2	253.4	192.9	97.0	12.0	10.5	1901.0	155	85	217.0	29 May 1977
		b	1.1	1.8	3.7	7.4	14.9	14.4	12.5	11.3	9.2	4.5	0.8	0.6	82.2	(1981)	(1976)		
Rani/Ranigoda	16	a	16.6	15.5	50.8	121.0	310.9	364.7	371.3	410.1	289.1	111.9	13.1	9.5	2084.5	196	64	239.5	07 May 1911
		b	1.1	1.5	4.0	7.7	14.6	16.6	15.2	14.6	10.4	5.2	1.1	0.8	92.8	(1993)	(2000)		
Ukium (Hydro)	12	a	12.4	15.0	40.0	169.9	255.0	462.7	493.1	347.8	275.6	146.1	37.4	24.7	2297.7	126	82	195.0	02 Jul 1979
		b	0.7	1.1	4.4	10.4	16.4	18.8	22.4	18.8	14.1	7.8	3.2	1.5	119.6	(1986)	(1978)		
Kamrup Rural (District)		a	16.5	19.5	63.9	162.3	338.9	450.5	406.5	313.1	230.6	149.5	16.6	13.3	2181.2	132	54		
		b	1.3	1.6	4.3	8.9	14.6	15.1	15.1	13.6	10.2	5.4	1.1	0.9	92.7	(1992)	(1988)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
KAMRUP RURAL
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1101 - 1200	1	2001 – 2100	5
1201 - 1300	0	2101 – 2200	0
1301 - 1400	0	2201 – 2300	2
1401 – 1500	1	2301 – 2400	2
1501 – 1600	1	2401 – 2500	2
1601 – 1700	3	2501 – 2600	1
1701 – 1800	4	2601 – 2700	1
1801 – 1900	3	2701 – 2800	0
1901 - 2000	4	2801 – 2900	3

(Data available for 33 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(RANGIA)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	23.6	10.2	28.4	26-01-1966	5.3	30-01-1964	78	69
February	26.1	12.4	32.3	28-02/-1963	6.2	03-02-1983	69	60
March	29.3	15.7	36.5	27-03-1979	7.5	31-03-1980	65	59
April	30.4	19.4	38.4	30-04-1960	12.1	01-04-1968	73	65
May	31.0	22.0	39.5	01-05-1960	16.0	03-05-1977	79	72
June	31.6	24.1	39.0	20-06-1977	20.0	06-07-1981	83	78
July	32.3	24.8	39.4	27-07-1973	20.6	07-06-1978	83	79
August	32.5	24.8	38.6	05-08-1977	20.0	14-08-1978	83	78
September	32.1	24.2	39.0	01-09-1977	19.9	16-09-1960	81	79
October	30.5	20.9	36.5	10-10-1978	13.2	15-10-1982	78	77
November	27.8	16.1	34.5	01-11-1959	10.1	22-11-1965	75	75
December	24.8	11.8	33.6	02-12-1977	7.3	28-12-1982	79	74
Annual	29.3	18.9	39.5	01-05-1960	5.3	30-01-1964	77	72

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(RANGIA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	25	21	19	11	4	1	0	0	1	12	19	22	135
b	0	1	2	5	6	9	9	6	6	4	2	1	51
c	1	1.2	1.9	3.6	4.8	5.9	6.1	5.8	5.2	3.2	1.6	1.4	3.5
1730 HOURS IST													
a	26	22	20	6	4	1	0	0	2	18	21	26	146
b	0	0	1	2	2	4	4	3	3	2	1	0	22
c	1	1.3	1.8	2.9	3.4	4.8	5	4.6	4.3	2.3	1.5	0.8	2.8

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(RANGIA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	3.1	4.4	5.7	6.4	5.7	5.7	4.1	4.6	4.5	4.2	3.6	3.0	4.6
Direction in morning	E	E	E	E	E	E	E/W	E	E	E	E	E	
Direction in evening	C	C/E	C/E	E/C	E	E/C	W/C/E	W/E/C	C/E/W	C/E	C	C	

TABLE - 6
Special Weather Phenomena
(RANGIA)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.2	0.9	1.0	1.4	0.9	0.3	0.3	0.3	0.2	0.1	0.1	5.8
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	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Fog	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.4
Squall	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

KARBI ANGLONG DISTRICT

The climate of this district varies from place to place as per topographic features. The district is divided into two parts, i.e. eastern and western parts by Nagaon district. Western part of the district is mostly hilly with altitude ranging from 150 metres to 1600 metres above mean sea level and is bounded with Jaintia hills in southwest and Ri-Bhoi in west. Eastern part of the district is mostly plain and has some hilly areas. The climate of this district is mostly characterized by cold in winter, mild hot in summer and a humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for 7 raingauge stations for the period ranging from 11 to 25 years. The details of 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 1371.2 mm. During the monsoon season (June to September), the district receives rainfall about 66% of the annual rainfall. July is the rainiest month with an average rainfall of 258.9 mm. The pre-monsoon months (March to May) contribute rainfall of about 22% of the annual rainfall. The variation in annual rainfall from year to year is not large. There is also no much spatial rainfall variation in both the parts of the district. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 161% of the normal occurred in year 1959, while the lowest annual rainfall which was 57% of the normal occurred in 1976. In his fifty year period, there were 4 years in which the annual rainfall in the district was less than 80% of the normal however, none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 1001 mm and 1700 mm in 23 years out of 28. On an average there are 80 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 73 at Diphu Hydro to 91 at Dhansiri Hydro. The heaviest rainfall recorded in 24 hours at any station in the district was 350.1 mm at Baithaalangso Hydro on 11 June 1978.

TEMPERATURE

There is no meteorological observatory in the district. So the description which follows is based on the meteorological data of neighbouring observatories Lumding and Chaparmukh of the Nagaon district. The winter season commences in the district from the end of November, when both day and night temperatures begin to decrease rapidly. January is the coldest month with mean maximum temperature about 23°C and mean minimum

temperature about 9°C in the plain areas of the district and the temperatures may be about 16°C and 5°C respectively in the hilly areas of the district. In winter, the district experiences some spells of cold weather in association with the passage of western disturbances and minimum temperature on individual days may go down to 0°C or less at hilly terrain. Day and night temperatures increase from the beginning of March to August. August is the warmest month with mean maximum temperature about 33°C and mean minimum temperature about 24°C in the plain areas. However, these temperatures may go down by 5° to 8°C in the hilly terrain of the district. On individual days during summer and monsoon seasons maximum temperature may reach up to 40°C in plain areas. The weather becomes gradually cool after withdrawal of the southwest monsoon by the first week of October and pleasant during post monsoon season.

HUMIDITY

The atmosphere over the district is humid throughout the year. The relative humidity is comparatively low during the period from February to April, especially in the afternoon when it is about 70%. In the rest of the year, relative humidity remains above 80%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and the latter part of summer. Sometimes the hill-tops are enveloped with clouds. Cloudiness decreases in the post monsoon season after the withdrawal of the monsoon. The skies are generally clear or lightly clouded during the period of December to March. However, in the winter season skies become cloudy on some days when the district is affected by western disturbances. The cloudiness again increases after March.

WINDS

Winds are generally light or moderate throughout the year except for short spells during thunderstorms in the period of March to August when winds are strong. As anabatic and katabatic winds blow over hilly areas and play a dominant role in air motion. During the post monsoon and winter seasons, winds are generally calm or not regular in any direction in some part of the district, but in other part easterly or southeasterly winds also blow on some days. In the period March to September southerly or easterly winds are common.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam during May and June seldom reach the district to affect its weather. Thunderstorms occur throughout the year. Its frequency is more in the latter part of summer and southwest monsoon season. Thunderstorms during March to May are occasionally accompanied by dust storms. Fog occurs on a few days during the period from October to February, while it occasionally occurs over hilly areas in the monsoon months.

TABLE - I
NORMALS AND EXTREMES OF RAINFALL
KARBI ANGLONG

																ANNUAL R/F AS OF NORMAL & YEARS**		HEAVIEST R/F IN 24 HOURS*	
STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST	LOWEST	AMOUNT (mm)	DATE
Baithaalangso	11	a	7.2	8.8	33.8	83.3	117.3	308.3	293.6	259.1	205.3	85.6	10.8	9.1	1422.2	127	77	350.1	11 Jun 1978
(Hydri)		b	0.8	1.0	3.3	7.3	8.3	12.8	16.4	13.1	10.4	5.7	1.1	0.8	81.0	(1993)	(1998)		
Bakulia	24	a	9.3	17.8	53.2	107.5	158.8	241.7	312.5	261.1	211.9	78.0	26.1	14.1	1492.0	203	56	133.9	10 Aug 1983
(Hydro)		b	0.8	1.5	4.5	8.0	9.0	11.8	14.7	13.1	10.8	4.4	1.6	1.1	81.3	(1999)	(1978)		
Bokajan	21	a	13.5	28.4	73.1	120.1	144.1	231.8	264.6	237.8	203.6	81.9	28.6	10.7	1438.2	137	86	279.6	18 Jun 1985
(Hydro)		b	1.4	2.7	5.8	8.1	9.9	12.1	13.1	12.5	11.1	4.7	2.0	0.9	84.3	(1989)	(1988)		
Dhansiri	14	a	20.5	32.5	68.8	115.5	192.1	196.2	309.0	238.7	248.4	115.6	33.9	6.8	1578.0	161	70	153.3	12 Sep 1990
(Hydro)		b	1.6	2.7	5.2	8.3	11.6	11.9	13.8	13.3	11.3	7.7	2.3	0.8	90.5	(1990)	(1996)		
Diphu	23	a	13.6	24.2	55.7	88.3	112.7	208.5	187.7	214.9	181.9	115.3	21.0	15.6	1239.4	179	63	165.1	05 Oct 1959
		b	1.3	2.4	4.5	6.6	7.7	10.8	10.8	11.5	9.7	5.2	2.0	1.5	74.0	(1959)	(1976)		
Diphu	12	a	8.8	20.9	51.5	83.2	148.8	155.8	232.4	205.7	183.9	84.0	20.8	5.1	1200.9	147	77	128.7	14 Jun 1996
(Hydro)		b	1.1	1.8	4.6	6.5	9.2	9.3	11.2	11.8	10.3	5.5	1.5	0.5	73.3	(1999)	(1989)		
Kheronighat	25	a	10.7	20.0	36.0	92.2	136.0	202.8	212.2	202.7	161.9	119.2	23.2	9.7	1226.6	148	64	180.4	09 Sep 1986
(Hydro)		b	0.9	1.8	3.9	8.0	8.9	12.3	13.0	11.6	9.2	5.8	1.7	0.8	77.9	(1989)	(1976)		
Karbi Anglong		a	11.9	21.8	53.2	98.6	144.3	220.7	258.9	231.4	199.6	97.1	23.5	10.2	1371.2	161	57		
(District)		b	1.1	2.0	4.5	7.5	9.2	11.6	13.3	12.4	10.4	5.6	1.7	0.9	80.2	(1959)	(1976)		

a : Normal rainfall in mm
b : Average number of rainy days (days with rain of 2.5 mm or more)
* : Based on all available data upto 2010.
** : Years of occurrence given in brackets

TABLE - II
Frequency of Annual Rainfall in the District
KARBI ANGLONG
(Data 1952 - 2000)

Range in mm	No. of years	Range in mm	No. of years
701 - 800	1	1501 - 1600	2
801 - 900	0	1601 - 1700	1
901 - 1000	0	1701 - 1800	2
1001 - 1100	3	1801 - 1900	1
1101 - 1200	5	1901 - 2000	0
1201 - 1300	5	2001 - 2100	0
1301 - 1400	5	2101 - 2200	0
1401 - 1500	2	2201 - 2300	1

(Data available for 28 years)

KARIMGANJ DISTRICT

The climate of this district is characterized by abundant rains in monsoon period, mild hot in summer, mild cold in winter and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February, followed by summer season from March to May. Southwest monsoon season is from June to the second week of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 4 raingauge stations for the period ranging from 10 to 24 years. The details of 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 3149.6 mm. the district receives rainfall about 62% of the annual rainfall during the monsoon season (June to September). June is the rainiest month with an average rainfall of 597.0 mm. The summer rains during the period of March to May mostly as thundershowers, constitute rainfall about 30% of the annual rainfall. The annual rainfall from year to year has some variation. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 178% of the normal occurred in year 1987, while the lowest annual rainfall which was 47% of the normal occurred in 1992. In this fifty year period, there were two years in which the annual rainfall in the district was less than 80% of the normal, and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 2501 mm and 3800 mm in 15 years out of 23 years for which whole data is available.

On an average there are 117 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 93 at Patharkandi to 135 at Karimganj.

The heaviest rainfall recorded in 24 hours in the district was 624.2 mm at Karimganj on 25 June 1978.

TEMPERATURE

There is no meteorological observatory in the district of Karimganj. The description that follows is based on the meteorological records of Silchar and Silchar (Kumbhigarm (A)) observatories in the neighbouring Cachar district. From about the middle of November, both day and night temperatures begin to decrease, the drop being more pronounced in case of night temperatures. January is the coldest month with mean maximum temperature about 25°C and mean minimum temperature about 12°C. On individual days in the winter season, the minimum temperature may go down to 6°C. The temperatures begin to rise from the beginning of March. The day temperatures seldom become oppressive and sometimes weather becomes discomfortable due to damp heat in the

latter part of summer season, while the nights are cool during the period March to May. The frequent thundershowers during this period reduce the temperatures to some extent. The onset of the southwest monsoon in June does not lower the day temperatures as in other parts of India, while the day and night temperatures are even higher during the monsoon season than during the rest of the year. August is the warmest month with an average of maximum temperature about 32°C and minimum temperature 25°C. During summer and monsoon season maximum temperature may reach up to 37°C on individual days. The day and night temperatures begin to decrease after withdrawal of the monsoon by the first week of October and the weather becomes gradually cool and pleasant during post monsoon season.

HUMIDITY

The air is much humid throughout the year, being particularly high during the southwest monsoon season when the relative humidity is above 80%. The air is comparatively less humid during February and March, particularly in the afternoon, when the humidity is less than 60%.

CLOUDINESS

The skies are heavily clouded to overcast during the period May to September. The cloudiness decreases thereafter and in the cold season the skies are lightly to moderately clouded. The cloudiness increases from March.

WINDS

Winds are generally light to moderate throughout the year except short spells of thunderstorms during summer season when the winds are strong. Winds are generally easterly or northeasterly throughout the year. Southwesterly winds are seen in afternoon during the monsoon season. Sometimes wind is calm throughout the year, particularly in the afternoon.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year but they are frequent in the summer season. Thunderstorms during the summer season are sometimes associated with hail and squall. Fog occasionally occurs on a few days in the morning throughout the year except in the summer season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KARIMGANJ

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Karimganj	24	a	13.2	35.5	169.7	340.2	603.9	647.0	646.0	429.8	423.9	240.5	38.6	14.0	3602.3	139	75	624.2	25 Jun 1978
		b	1.3	2.2	6.7	13.1	19.5	21.3	24.3	19.1	16.5	8.5	1.6	0.8	134.9	(1994)	(1981)		
Karimganj Rars	10	a	13.0	55.5	155.2	280.8	538.9	690.1	600.1	660.5	402.0	189.6	18.6	18.1	3622.4	131	55	255.0	09 Jun 1991
		b	1.0	2.6	5.8	11.3	13.4	18.7	21.6	22.6	15.2	6.3	1.0	0.9	120.4	(1998)	(1999)		
Ramkrishnan.D.B.	11	a	11.4	81.9	211.9	284.9	383.5	733.7	511.7	491.7	340.5	177.1	16.7	15.4	3260.4	172	63	225.0	05 Aug 1992
		b	0.9	3.1	7.5	10.8	13.5	19.5	21.3	20.4	13.1	7.0	1.1	0.6	118.8	(1987)	(1999)		
Patharkandi	13	a	10.6	20.7	73.6	171.3	503.0	317.1	395.2	302.8	166.0	112.2	33.2	7.6	2113.3	148	44	275.4	08 May 1991
		b	1.0	1.5	3.3	6.5	13.4	14.3	18.0	15.0	11.0	6.3	1.6	0.6	92.5	(1991)	(1994)		
Karimganj (District)		a	12.0	48.4	152.6	269.3	507.3	597.0	538.2	471.2	333.1	179.9	26.8	13.8	3149.6	178	47		
		b	1.0	2.3	5.8	10.4	15.0	18.5	21.3	19.3	14.0	7.0	1.3	0.7	116.6	(1987)	(1992)		

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010.

** Years of occurrence given in brackets.

TABLE - 2

Frequency of Annual Rainfall in the District

KARIMGANJ

(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1401 – 1500	1	3601 - 3700	2
1501 – 1600	0	3701 - 3800	1
1601 – 1700	0	3801 - 3900	1
1701 – 1800	0	3901 - 4000	2
1801 – 1900	0	4001 - 4100	0
1901 – 2000	0	4101 - 4200	1
2001 - 2100	0	4201 - 4300	0
2101 - 2200	1	4301 - 4400	0
2201 – 2300	0	4401 - 4500	0
2301 – 2400	0	4501 - 4600	0
2401 – 2500	0	4601 - 4700	1
2501 - 2600	1	4701 - 4800	0
2601 - 2700	3	4801 - 4900	0
2701 - 2800	1	4901 - 5000	0
2801 - 2900	2	5001 - 5100	0
2901 - 3000	0	5101 - 5200	0
3001 - 3100	2	5201 - 5300	0
3101 - 3200	1	5301 - 5400	0
3201 - 3300	0	5401 - 5500	0
3301 - 3400	2	5501 - 5600	0
3401 - 3500	0	5601 – 5700	1
3501 - 3600	0		

(Data available for 23 years)

KOKRAJHAR DISTRICT

The climate of this district has features that are intermediate between those of the north Bengal plains and the Assam valley. The climate of the district is characterized by abundant rains, cold in winter, mild hot in summer and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season which is associated with thunderstorm activities. Southwest monsoon season is from June to the first week of October. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 9 raingauge stations for the period ranging from 10 to 16 years. The details of 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 4013.8 mm. The annual rainfall varies from place to place. During the monsoon season (June to September), the district receives rainfall about 75% of the annual rainfall. July is the rainiest month with an average rainfall of 1026.3 mm. The pre-monsoon months (March to May) contribute rainfall about 19% of the annual rainfall mostly in the form of thundershowers. The annual rainfall from year to year has some variation. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 136% of the normal occurred in year 1977, while the lowest annual rainfall which was 64% of the normal occurred in 1992. In this fifty year period, there were 4 years in which the annual rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 3201 mm and 4800 mm in 15 years out of 23.

On an average there are 107 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 92 at SDAO Gossaigaon to 123 at Jamduar (Hydro). The heaviest rainfall recorded in 24 hours at any station in the district was 632.6 mm at Jamduar (Hydro) on 12 July 1984.

TEMPERATURE

There is no meteorological observatory in the district. The description of the climate which follows is based on the records of neighbouring meteorological observatories at Dhubri and Dhubri (Rupsi). The winter season commences from the end of November when both day and night temperatures drop rapidly. January is the coldest month with mean maximum temperature about 23°C and mean minimum temperature about 10°C. In the wake of western disturbances during winter season, cold weather occurs in the district when minimum temperature may drop to 3°C on individual days. From about the end of February the temperatures begin to rise till August. August is the hottest month with mean maximum temperature about 32°C and mean minimum temperature about 25°C. With the

onset of the southwest monsoon season, the day and night temperatures remain high or even little higher than in the summer season. The weather in the monsoon season is sometimes oppressive due to damp heat in between two spells of rain and maximum temperature may reach up to 38°C on individual days. Temperatures decrease progressively after withdrawal of the southwest monsoon and weather becomes gradually cool and pleasant during post monsoon season.

HUMIDITY

The air is humid throughout the year. During the months February to April, the relative humidity is comparatively less especially in the afternoons when it is between 45% and 60%. In the rest of the year it is about 80% or more.

CLOUDINESS

Skies are heavily clouded to overcast in the monsoon season and the latter part of the pre-monsoon season. During the rest of the year light to moderate clouded skies are common. In winter season skies are sometimes obscured in the morning due to lifted fog which dissipates with the advance of the day.

WINDS

Winds are generally light to moderate in the district, however winds are strong for short spells of thunderstorms during the period March to June. Northeasterly or easterly winds are the most common throughout the year. During the monsoon season southerly winds also blow on some days. Southwesterly or westerly winds in the afternoons are also common in the period of February and March.

SPECIAL WEATHER PHENOMENA

Some of the cyclonic storms and depressions from the Bay of Bengal in the monsoon and post monsoon seasons which move towards north Bengal or Bangladesh affect the district and its neighbourhood causing heavy rains and high winds. Thunderstorms generally occur throughout the year, but they are frequent in the period April to September. Fog occurs on a few days in the post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KOKRAJHAR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Deosiri (Hydro)	11	a	16.4	56.0	51.1	192.7	407.8	790.3	1174.0	660.8	693.4	106.6	26.3	26.0	4201.4	123	90	435.3	13 Sep 1983
		b	1.2	2.4	3.2	10.0	14.9	18.7	22.1	14.7	13.3	4.3	1.7	1.7	108.2	(1977)	(1978)		
Gosaigaon (Hydro)	15	a	9.5	24.4	42.7	234.5	467.6	825.3	904.5	708.5	476.0	157.8	19.3	6.0	3876.1	136	69	421.0	13 Apr 1988
		b	1.0	1.8	3.4	9.9	15.3	17.9	19.5	16.1	14.7	6.3	1.4	0.5	107.8	(1988)	(1994)		
Jamduar (Hydro)	11	a	19.2	25.9	68.2	323.8	631.0	979.0	1220.7	851.9	867.6	342.4	36.8	8.1	5374.6	152	62	632.6	12 Jul 1984
		b	1.3	2.3	3.1	10.4	15.4	20.7	24.0	18.6	17.1	7.6	2.0	1.0	123.5	(1977)	(1981)		
Kachugaon (Hydro)	11	a	6.8	18.6	45.4	275.7	422.4	767.5	1131.0	579.3	605.4	149.0	35.7	11.4	4048.2	143	82	375.1	15 Jul 1983
		b	0.7	1.7	2.8	10.7	14.8	18.4	22.4	14.6	14.3	6.1	1.9	0.7	109.1	(1984)	(1976)		
Kokrajhar (Hydro)	16	a	11.7	31.1	48.6	207.7	453.8	818.1	824.2	635.9	448.9	160.6	15.8	6.1	3662.5	134	70	530.2	15 Jun 1995
		b	1.1	1.9	3.3	10.4	15.5	18.9	19.6	17.1	15.3	6.1	1.1	0.5	110.8	(1995)	(1992)		
SDAO Gossaigaon	10	a	13.0	21.2	23.9	160.7	411.1	839.3	836.8	659.4	368.9	125.5	10.8	1.5	3472.1	135	73	406.9	27 Jun 1996
		b	0.8	1.6	1.5	8.0	14.7	18.1	16.4	15.0	10.8	4.5	0.7	0.1	92.2	(1995)	(1994)		
Raimona (Hydro)	12	a	7.0	13.8	64.9	282.0	537.6	783.8	1060.2	589.5	565.5	190.3	25.8	7.6	4128.0	152	81	445.8	14 Sep 1984
		b	0.7	1.1	2.7	10.3	14.3	15.3	17.5	12.9	12.2	6.9	1.7	0.7	96.3	(1984)	(1976)		
Saralpara (Hydro)	10	a	10.1	37.6	68.9	128.6	446.3	592.0	1247.5	477.4	612.5	164.4	32.1	3.7	3821.1	128	72	386.1	28 Sep 1978
		b	0.7	2.0	2.7	6.1	14.3	18.0	23.5	15.2	14.9	5.6	2.1	0.3	105.4	(1983)	(1982)		
SDAO Kokrajhar	10	a	11.9	11.5	39.2	190.3	498.2	779.0	837.4	617.8	405.3	124.5	21.0	3.9	3540.0	136	84	305.6	15 Jul 1996
		b	0.8	1.2	2.9	9.4	15.6	19.5	19.4	17.5	14.2	5.1	1.4	0.3	107.3	(1995)	(1986)		
Kokrajhar (District)		a	11.7	26.7	50.3	221.8	475.1	797.1	1026.3	642.3	560.4	169.0	24.8	8.3	4013.8	136	64		
		b	0.9	1.8	2.8	9.5	15.0	18.4	20.5	15.7	14.1	5.8	1.6	0.6	106.7	(1977)	(1992)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
KOKRAJHAR
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
2501 - 2600	1	4001 - 4100	1
2601 - 2700	1	4101 - 4200	1
2701 - 2800	0	4201 - 4300	0
2801 - 2900	0	4301 - 4400	1
2901 - 3000	0	4401 - 4500	3
3001 - 3100	0	4501 - 4600	0
3101 - 3200	2	4601 - 4700	0
3201 - 3300	1	4701 - 4800	0
3301 - 3400	0	4801 - 4900	0
3401 - 3500	0	4901 - 5000	1
3501 - 3600	1	5001 - 5100	1
3601 - 3700	1	5101 – 5200	1
3701 - 3800	1	5201 – 5300	0
3801 - 3900	4	5301 – 5400	0
3901 - 4000	1	5401 – 5500	1

(Data available for 23 years)

LAKHIMPUR DISTRICT

The climate of this district is characterized by mild hot in summer, cold in winter, abundant rains in monsoon and humid atmosphere throughout the year. The year may be divided into four seasons. Winter season is from December to February and is followed by summer season from March to May. Southwest monsoon season is from June to the first week of October. October and November constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 7 raingauge stations for the period ranging from 11 to 47 years. The details of 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 3227.2 mm. During the monsoon season (June to September), the district receives rainfall about 70% of the annual rainfall. July is the rainiest month with an average rainfall of 713.1 mm. In pre-monsoon months (March to May), the district receives rainfall about 20% of the annual rainfall. The variation in annual rainfall from year to year is not large but it varies from place to place. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 142% of the annual normal occurred in year 1985, while the lowest annual rainfall was 66% of the normal occurred in 1997. There were four years when the rainfall was less than 80% of the normal and one occasion when such a low rainfall occurred in three consecutive years during the same period. It is seen from Table 2 that the annual rainfall was between 2601 mm and 3900 mm in 39 years out of 47. On an average there are 122 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 102 at Badatighat to 138 at Gerukhamukha (Hydro). The heaviest rainfall recorded in 24 hours at any station in the district was 262.4 mm at Harmati on 13 September 1934.

TEMPERATURE

There is one meteorological observatory in the district at North Lakhimpur. So, the description of climate which follows is based on meteorological data available for North Lakhimpur observatory. The winter season sets in the district towards the end of November when both day and night temperatures begin to decrease rapidly. January is the coldest month with mean maximum temperature at 23°C and mean minimum temperature at 9.1°C. In winter season the cold waves affect the district in the wake of passing western disturbances and minimum temperature may go down to 4°C or less on individual days. Temperatures begin to rise gradually by about the beginning of March and continue till August. The period from March to May continues to be pleasant with thundershowers, day temperature seldom becoming oppressive while nights are cool. August is the hottest month of the year with mean maximum temperature at 31.8°C and mean minimum at 24.7°C. During the monsoon season maximum temperature may reach up to 37°C on individual days. In the monsoon season which is also the period with the highest moisture content in the air, the weather, particularly when not raining, is often

unpleasant with damp heat. The weather starts to become gradually cool after the withdrawal of the southwest monsoon by first week of October and pleasant during post monsoon season.

The highest maximum temperature ever recorded at North Lakhimpur observatory was 39.0°C on 16 August 2006 and the lowest minimum temperature ever recorded was 2.7°C on 04 January 1956.

HUMIDITY

The atmosphere is highly humid throughout the year with the relative humidity being about 80%. In February and March relative humidity is less when it is 70% to 75%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon and pre-monsoon seasons. In the post monsoon season and cold season skies are lightly to moderately clouded.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in summer season when winds are moderate and strong. Winds are generally northeasterly or calm in the year. Winds sometimes appear northerly or northwesterly in the afternoon during November to January months.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur almost throughout the year but they are frequent during the period April to September. During the period March to May these are similar to Norwesters (Kalbaisakhi) of Bengal and sometimes they become violent. Fog occasionally occurs on a few days in latter part of post monsoon and winter seasons, particularly in the vicinity of Brahmaputra Valley.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for North Lakhimpur observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
LAKHIMPUR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Badatighat (Hydro)	24	a	17.2	28.0	51.5	135.2	251.5	350.6	433.3	289.2	286.8	127.5	18.9	20.3	2010.0	115	86	173.8	11 Oct 1994
		b	1.4	3.2	4.5	10.2	13.1	15.7	18.7	13.6	12.9	5.7	1.3	1.5	101.8	(1991)	(1999)		
Chauldaught (Hydro)	23	a	35.9	59.6	79.8	142.3	385.5	787.5	883.8	703.4	666.9	159.7	25.6	20.5	3950.5	114	78	212.8	14 Sep 1984
		b	3.3	4.9	7.0	10.4	14.9	20.5	24.7	19.3	17.0	6.5	1.8	1.7	132.0	(1998)	(1992)		
Dhakuakhana	18	a	26.1	56.8	103.8	173.5	401.9	336.4	403.8	266.0	249.2	135.1	21.1	11.7	2185.4	146	27	240.0	04 Jun 1993
		b	2.7	5.2	7.3	11.2	14.9	14.8	17.2	13.1	10.4	6.5	1.4	1.2	105.9	(1991)	(1999)		
Gerukhamukha (Hydro)	11	a	32.7	60.4	79.1	192.6	335.8	921.2	1544.5	984.2	778.9	157.8	43.0	34.7	5164.9	134	77	235.4	17 Jul 1981
		b	3.5	5.4	7.1	11.7	12.8	21.1	25.6	20.4	17.7	6.6	3.1	2.6	137.6	(1980)	(1986)		
Harmati	18	a	30.0	55.1	85.0	239.2	527.4	574.1	553.5	435.3	363.4	247.3	28.7	25.7	3164.7	123	86	262.4	13 Sep 1934
		b	3.5	4.3	6.4	12.3	17.5	20.4	21.3	17.1	14.5	9.1	2.4	2.1	130.9	(1957)	(1972)		
N.Lak/Lilabari (Obsy)	47	a	36.8	55.7	88.4	189.5	410.0	629.8	677.1	532.3	444.6	172.7	30.8	26.0	3293.7	121	79	261.6	12 Jul 1971
		b	3.4	5.2	6.9	12.2	15.7	20.0	22.0	18.2	15.7	8.2	2.3	2.2	132.0	(1984)	(1967)		
North Lakhimpur	16	a	27.8	43.5	85.1	167.1	459.0	529.6	495.8	395.5	372.2	181.9	32.2	31.0	2820.7	119	81	224.8	04 Jun 1936
		b	2.6	3.7	6.1	9.9	15.5	17.6	17.6	14.1	12.1	7.9	2.2	2.6	111.9	(1954)	(1976)		
Lakhimpur (District)		a	29.5	51.3	81.8	177.1	395.9	589.9	713.1	515.1	451.7	168.9	28.6	24.3	3227.2	142	66		
		b	2.9	4.6	6.5	11.1	14.9	18.6	21.0	16.5	14.3	7.2	2.1	2.0	121.7	(1985)	(1997)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
LAKHIMPUR
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
2101 – 2200	1	3401 – 3500	6
2201 – 2300	1	3501 – 3600	0
2301 – 2400	0	3601 – 3700	2
2401 – 2500	2	3701 – 3800	1
2501 – 2600	0	3801 – 3900	1
2601 – 2700	2	3901 – 4000	1
2701 – 2800	5	4001 – 4100	0
2801 – 2900	2	4101 – 4200	0
2901 – 3000	2	4201 – 4300	0
3001 – 3100	4	4301 – 4400	2
3101 – 3200	7	4401 - 4500	0
3201 – 3300	4	4501 - 4600	1
3301 – 3400	3		

(Data available for 47 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(NORTH LAKHIMPUR)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	23.0	9.1	29.8	22-01-1986	2.7	04-01-1956	80	75
February	23.8	12.1	31.8	13-02-1999	4.3	11-02-1961	77	72
March	26.7	15.7	35.4	20-03-2010	8.1	02-03-1957	72	69
April	27.8	18.9	36.2	22-04-1991	11.1	01-04-1968	77	75
May	29.8	21.7	37.8	25-05-2006	15.1	01-05-1989	79	76
June	31.2	24.1	37.6	28-06-1980	19.5	07-06-2010	85	79
July	31.0	24.5	38.5	07-07-2001	19.5	12-07-2006	89	81
August	31.8	24.7	39.0	16-08-2006	20.8	14-08-1969	87	80
September	30.6	23.6	38.0	15-09-1994	19.3	29-09-1966	87	85
October	29.9	20.7	37.7	06-10-2007	10.6	31-10-1955	79	83
November	27.7	14.5	33.8	02-11-2009	6.3	30-11-1971	73	80
December	24.4	9.8	30.8	01-12-2002	3.1	29-12-1961	77	78
Annual	28.2	18.4	39.0	16-08-2006	2.7	04-01-1956	80	78

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (NORTH LAKHIMPUR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	6	2	2	0	0	0	0	0	0	1	5	8	24
b	2	3	3	7	8	13	17	12	11	5	1	2	83
c	3.1	4.3	4.6	5.8	6	6.6	7.1	6.7	6.6	4.7	2.9	2.7	5.1
1730 HOURS IST													
a	3	1	1	0	0	0	0	0	0	0	4	6	15
b	2	2	2	3	4	4	5	3	4	3	1	1	34
c	3.5	4.5	4.6	5.5	5.3	5.7	5.9	5.3	5.5	4.1	2.9	2.8	4.7

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (NORTH LAKHIMPUR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	3.0	4.2	5.4	6.5	5.6	6.1	6.3	5.1	4.7	3.4	2.5	2.5	4.6
Direction in morning	NE/C	NE/C	NE	NE	NE	NE	NE	NE/C	NE/C	NE	NE/C	NE	
Direction in evening	C/NW/ NE/N	C/NE	NE	NE	NE/C	NE/C	NE/C	C/NE	C/NE	C/NE	C/NW/ N	C/NW /N	

TABLE - 6
Special Weather Phenomena (NORTH LAKHIMPUR)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.7	1.2	2.7	5.1	6.0	6.1	5.6	7.3	5.7	1.7	0.3	0.4	42.8
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	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Fog	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	2.3
Squall	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

MORIGAON DISTRICT

The climate of this district is characterized by humid air, cold in winter and mild hot in summer season. The year may be divided into four seasons. Winter season is from December to February and this is followed by pre-monsoon season associated with thunderstorms activities from March to May. The period from June to the first week of October is of southwest monsoon season which is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for the period of 11 and 25 years. The details of 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 1642.7 mm. During the monsoon season (June to September), the district receives rainfall about 71% of the annual rainfall. July is the rainiest month with an average rainfall of 333.7 mm. In pre-monsoon months (March to May), the district receives rainfall about 19% of the annual rainfall. The variation in annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall of 131% of the normal occurred in year 1993, while the lowest annual rainfall is 71% of the normal occurred in 1996. In this period there was only one year in which annual rainfall in the district was less than 80% of the normal. It is seen from Table 2 that the annual rainfall was between 1301 mm and 2000 mm in 15 years out of 20.

On an average there are 93 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 90 at SDAO Morigaon to 96 at Dharmatal Hydro.

The heaviest rainfall recorded in 24 hours at any station in the district was 194.0 mm at Dharmatal Hydro on 31 August 1983.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate is based on meteorological data of neighbouring observatory Guwahati (Bhorjar) in Kamrup Metro district. The winter season starts from the end of November when both day and night temperatures begin to drop. January is the coldest month with mean maximum temperature about 24°C and mean minimum temperature about 11°C. In winter months the district sometimes experiences cold spells of two and three days when the minimum temperature may go down to 4°C on individual days. Temperatures begin to rise steadily by the beginning of March. This rise in temperatures continues well till August. August is the hottest month when mean maximum temperature is about 32°C and mean minimum temperature is about 25°C. Day and night temperatures in the southwest monsoon season are higher than in summer season and maximum temperature may reach up to 38°C on

individual days. In monsoon season the weather becomes oppressive due to damp heat between two spells of rain. The weather becomes gradually cool after withdrawal of the southwest monsoon and pleasant during post monsoon season.

HUMIDITY

The air is humid throughout the year, being particularly high during the southwest monsoon season when relative humidity is above 80%. In February and March months the air is comparatively less humid particularly in the afternoon when the humidity is about 50%.

CLOUDINESS

The skies are generally heavily clouded to overcast during southwest monsoon season and in the latter part of summer. The cloudiness generally decreases after the withdrawal of the monsoon and during the period December to April skies are usually clear or lightly clouded. In winter season skies become sometimes obscured in the morning on some days due to lifted fog which dissipates with the advance of the day.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in the period of March to May when they are strong. Winds are generally northeasterly or easterly or calm throughout the year while southwesterly or westerly in the afternoons especially in the southwest monsoon season.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms occur throughout the year but they are more frequent during the period March to October. Thunderstorms in the period March to May are accompanied with high winds like the Norwesters of Bengal. Some thunderstorms are accompanied with hail or squall in summer season. Fog occasionally occurs on a few days during the post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
MORIGAON

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Dharmatal (Hydro)	25	a	18.8	24.6	51.6	116.5	160.2	305.9	374.7	301.3	216.9	81.4	18.6	8.2	1678.9	150	73	194.0	31 Aug 1983
		b	1.0	2.1	4.2	9.0	11.3	15.5	18.5	15.7	11.6	4.7	1.1	0.9	95.6	(1991)	(1996)		
S.D.A.O. Morigaon	11	a	13.6	29.0	49.6	99.0	159.4	277.8	292.6	335.1	223.8	112.3	9.7	4.4	1606.3	128	81	180.0	15 Aug 1991
		b	1.2	2.3	4.5	7.8	11.5	14.1	15.9	14.5	12.3	4.8	0.9	0.5	90.3	(1993)	(1996)		
Morigaon (District)		a	16.2	26.8	50.6	107.8	159.8	291.8	333.7	318.2	220.4	97.0	14.1	6.3	1642.7	131	71		
		b	1.1	2.2	4.4	8.4	11.4	14.8	17.2	15.1	12.0	4.8	1.0	0.7	93.1	(1993)	(1996)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
MORIGAON
(Data 1976-2000)

Range in mm	No. of years	Range in mm	No. of years
1201 - 1300	1	1701 – 1800	3
1301 - 1400	2	1801 – 1900	0
1401 – 1500	3	1901 – 2000	2
1501 – 1600	4	2001 – 2100	3
1601 – 1700	1	2101 - 2200	1

(Data available for 20 years)

NAGAON DISTRICT

The climate of this district is characterized by hot in summer, cold in winter and humid atmosphere throughout the year. The year may be divided into four seasons. Winter season is from December to February which is followed by summer season associated with thunderstorm activities from March to May. The period of June to September is of southwest monsoon season. October and November constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 12 raingauge stations for the period ranging from 10 to 49 years. The details of 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 1603.7 mm. The variation in annual rainfall from year to year in the district is large. The variation in rainfall from place to place is also significant. During the monsoon season (June to September), the district receives rainfall about 68% of the annual rainfall. July and August are the rainiest months with an average rainfall of 305.5 mm. The pre-monsoon months (March to May) contribute rainfall about 22% of the annual rainfall. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 223% of the normal occurred in year 1966, while the lowest annual rainfall which was 61% of the normal occurred in 1963. In his fifty year period, there were 12 years in which annual rainfall in the district was less than 80% of the normal. During this period there was one occasion of each two and three consecutive years of such a low rainfall. It is seen from Table 2 that the annual rainfall was between 1301 mm and 2000 mm in 26 years out of 44. On an average there are 89 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 73 at Batadrava D.B. to 112 at Selonah. The heaviest rainfall recorded in 24 hours at any station in the district was 410.0 mm at Lumding (Obsy) on 03 August 1981.

TEMPERATURE

There are two meteorological observatories in the district, one at Lumding and other at Chaparmukh. The description of climate of the district is based on meteorological data of these observatories which may be taken as representative of the climatic conditions of the district as a whole. The cold season sets in the district from the end of November when both day and night temperatures begin to decrease rapidly. January is the coldest month with mean maximum temperature at 23.6°C and mean minimum temperature at 9.3°C. In winter, the district experiences some spells of cold weather in association with western disturbances and minimum temperature may go down to 4°C on individual days. Temperatures begin to rise from the beginning of March. The mean maximum temperature remains at about 32°C to 34°C from April to September. During this period the weather is often oppressive due to dampness in between two spells of rain. August is the warmest month with mean maximum temperature at 33.5°C and mean minimum temperature at 25°C. The weather becomes

gradually cool after withdrawal of the southwest monsoon by the first week of October and pleasant during post monsoon season. The highest maximum temperature ever recorded at Chaparmukh was 43.9°C on 06 July 1961 while the lowest minimum temperature ever recorded at Lumding was 2.1°C on 28 Jan 1964.

HUMIDITY

The atmosphere over the district is much humid throughout the year, particularly high humid in the monsoon season. The relative humidity is comparatively low in February and March months, especially in the afternoon when it is less than 70%. In the rest of the year, relative humidity remains above 80%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and latter part of summer. Cloudiness decreases in the post monsoon season with the withdrawal of southwest monsoon. The skies are generally clear or lightly clouded during the period from December to March. However, in the cold season on some days, skies become cloudy when the district is affected by western disturbances. The cloudiness again increases after March.

WINDS

Winds are generally light throughout the year. During the post monsoon and winter seasons, winds are generally calm or not regular in any direction. In the period March to September, southerly or easterly or calm winds are common.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam during May and June seldom reach the district to affect its weather. Thunderstorms occur throughout the year at some places. Its frequency is more in the latter part of summer and southwest monsoon season. Thunderstorms during March to May are occasionally accompanied by dust storms. Fog occasionally occurs on a few days during the period from October to February.

Table 3, 4, 5 and 6 and 3(a), 4(a), 5(a) and 6(a) give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Lumding and Chaparmukh observatories.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
NAGAON

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Batadrava D.B	10	a	12.3	14.2	37.7	82.5	144.0	143.6	173.2	229.9	143.7	69.4	19.3	2.2	1072.0	303	24	150.0	15 Aug 1991
		b	1.0	1.4	4.6	7.0	11.0	9.9	11.0	13.3	9.0	3.8	0.7	0.2	72.9	(2000)	(1996)		
Chaparmukh (Obsy)	42	a	14.0	28.8	49.5	190.3	233.9	392.1	502.3	419.8	259.2	116.4	21.0	15.3	2242.6	170	80	295.5	17 Jul 1980
		b	1.0	1.3	3.4	7.6	11.1	13.6	15.9	13.3	9.2	4.7	1.2	1.0	83.3	(1977)	(1955)		
Juria D.B.	10	a	10.7	30.3	52.1	107.3	254.3	348.1	256.0	302.6	229.6	78.4	11.1	0.9	1681.4	166	20	130.0	22 Jun 2000
		b	1.6	2.4	4.9	8.8	13.5	16.5	17.4	16.0	11.4	5.0	1.0	0.1	98.6	(1993)	(1991)		
Kaliabar SDAO	10	a	21.4	28.7	61.1	159.9	286.9	335.4	349.7	402.2	215.9	126.3	26.2	8.7	2022.4	121	79	150.0	01 May 2000
		b	1.5	2.8	4.2	9.7	15.0	16.8	17.7	16.3	12.4	6.1	1.5	1.1	105.1	(1991)	(1992)		
Kampur	11	a	3.8	4.5	24.6	57.9	144.7	366.6	430.3	449.1	254.9	111.6	16.4	7.5	1871.9	309	70	385.0	05 Aug 1966
		b	0.7	0.4	2.5	4.6	10.3	15.0	16.4	12.7	9.8	6.6	1.1	0.5	80.6	(1966)	(1959)		
Kampur (Hydro)	25	a	9.2	23.6	42.7	109.0	153.7	236.8	276.9	244.6	210.5	108.7	19.0	9.1	1443.8	139	70	135.2	02 Aug 1990
		b	1.0	2.2	4.1	8.5	10.3	13.1	16.1	13.2	11.4	5.4	1.5	1.0	87.8	(1991)	(1997)		
Kulikuchi	12	a	10.4	4.8	38.5	63.2	143.6	281.2	287.7	274.3	155.3	91.4	17.9	1.3	1369.6	125	59	227.6	27 Jul 1930
		b	1.2	0.8	4.4	6.6	11.8	17.5	15.7	13.2	10.4	5.4	1.4	1.2	88.6	(1966)	(1957)		
Lawkhowa D.B.	10	a	6.3	22.3	34.6	61.2	209.9	189.2	174.3	223.5	127.5	77.5	11.5	6.8	1144.6	158	17	160.0	23 May 2000
		b	0.8	2.5	3.2	6.9	13.8	14.8	14.4	12.6	14.1	7.7	1.8	1.0	93.6	(2000)	(1994)		
Lumding (Obsy)	49	a	9.9	17.8	51.0	80.4	132.1	223.8	199.5	185.7	174.3	110.4	27.4	8.5	1220.8	141	76	410.0	03 Aug 1981
		b	0.8	1.6	4.3	6.9	9.1	12.2	10.7	10.6	9.2	6.0	1.7	0.8	73.9	(1973)	(1998)		

TABLE – 1 (contd…)
NORMALS AND EXTREMES OF RAINFALL
NAGAON

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
S.D.A.O. Hojai	14	a	10.1	15.0	44.3	75.7	112.0	196.1	229.2	246.2	176.1	106.1	14.3	4.6	1229.7	149	72	187.0	25 Aug 1987
		b	0.9	1.7	4.3	5.5	8.5	12.1	12.7	11.9	10.7	5.2	1.8	0.6	75.9	(1987)	(1996)		
S.D.A.O. Nagaon	15	a	17.7	34.9	84.2	145.3	282.5	293.1	360.9	255.7	222.0	114.2	21.2	7.8	1839.5	158	70	152.4	15 Jul 1981
		b	1.5	2.2	5.0	9.2	11.3	15.4	16.1	13.3	10.8	5.4	1.9	0.7	92.8	(1991)	(2000)		
Selonah	11	a	16.8	17.1	75.2	121.0	292.3	360.1	447.3	409.4	201.7	132.9	22.1	7.4	2103.3	122	95	182.6	13 Jun 1911
		b	1.8	1.7	4.7	10.3	14.7	18.6	19.4	17.4	12.0	8.4	2.1	1.1	112.2	(1952)	(1951)		
Nagaon (District)		a	11.9	20.2	49.6	104.5	199.2	280.5	307.3	303.6	197.6	103.6	19.0	6.7	1603.7	223	61		
		b	1.2	1.8	4.1	7.6	11.7	14.6	15.3	13.6	10.9	13.6	1.5	0.7	88.8	(1966)	(1963)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
NAGAON
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
901 - 1000	2	2301 – 2400	0
1001 - 1100	3	2401 – 2500	0
1101 - 1200	3	2501 – 2600	0
1201 - 1300	5	2601 – 2700	1
1301 - 1400	5	2701 – 2800	1
1401 – 1500	7	2801 – 2900	1
1501 – 1600	4	2901 – 3000	0
1601 – 1700	3	3001 – 3100	0
1701 – 1800	3	3101 – 3200	0
1801 – 1900	2	3201 – 3300	0
1901 – 2000	2	3301 – 3400	0
2001 – 2100	0	3401 – 3500	0
2101 – 2200	0	3501 – 3600	1
2201 – 2300	1		

(Data available for 44 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(LUMDING)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	24.6	8.2	33.3	23-01-1922	2.1	28-01-1964	87	76
February	27.1	10.5	33.9	24-02-1952	2.8	13-02-1950	80	69
March	31.6	14.6	38.5	29-03-1973	7.2	09-03-1921	77	67
April	32.8	19.0	41.9	30-04-1960	5.0	17-04-1920	79	73
May	33.1	21.5	41.9	01-05-1960	10.0	01-05-1919	83	77
June	33.2	23.8	42.0	06-06-1979	16.5	15-06-1979	87	82
July	33.7	24.3	38.5	10-07-1973	16.1	08-07-1920	86	81
August	33.7	24.4	39.0	08-08-1979	15.0	04-08-1979	87	82
September	33.0	23.5	37.2	10-09-1951	-	-	88	84
October	31.3	20.9	36.2	04-10-1971	13.0	31-10-1983	89	85
November	28.3	15.4	33.0	04-11-1983	8.3	29-11-1937	90	84
December	25.6	10.4	31.0	05-12-1972	4.4	31-12-1969	90	81
Annual	30.7	18.0	42.0	06-06-1979	2.1	28-01-1964	85	78

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (LUMDING)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	24	19	22	15	12	6	4	6	6	12	18	24	168
b	2	2	2	3	5	9	5	7	4	5	3	1	48
c	1.1	1.3	1.6	2.6	3.5	4.5	4.7	4.7	4.1	3.2	1.7	1.1	2.8
1730 HOURS IST													
a	20	13	14	8	7	6	4	6	5	12	18	22	135
b	2	2	3	4	4	6	5	5	5	3	2	1	42
c	1.5	2.3	2.8	3.5	3.7	4.4	4.5	4.0	4.3	2.8	1.6	1.2	3.1

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (LUMDING)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	1.8	2.9	4.3	4.7	4.4	3.3	3.1	3.0	2.3	1.8	1.5	1.4	2.9
Direction in morning	C	C	C/E	C/E	C/E	C/E	C/E/S	C	C	C	C	C	
Direction in evening	C	C/S/W	C/S	C/S/E	C/E/S	C/E/S	C/E/S	C/S	C	C	C	C	

TABLE - 6
Special Weather Phenomena (LUMDING)

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	0.2	0.4	0.3	0.4	0.1	0.3	0.0	0.1	0.0	1.8
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	1.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.1	6.2	11.0

TABLE – 3(a)
Normals of Temperature and Relative Humidity
(CHAPARMUKH)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	22.6	10.3	29.5	11-01-1976	5.3	30-01-1967	81	73
February	25.4	12.3	33.3	FEB-1960	6.5	02-02-1967	75	67
March	28.9	15.6	37.2	27-03-1958	9.4	01-03-1967	71	65
April	31.1	20.3	41.1	21-04-1960	11.1	10-04-1981	76	71
May	31.9	22.8	41.2	01-05-1960	13.4	27-05-1966	81	77
June	32.6	24.6	39.1	24-06-1979	16.6	11-06-1966	84	80
July	32.5	24.8	43.9	06-07-1961	17.0	31-07-1974	83	80
August	33.2	25.3	39.5	13-08-1978	19.8	10-08-1966	83	80
September	32.6	24.6	37.3	11-09-1958	19.1	12-09-1981	82	79
October	30.9	22.5	36.1	02-10-1956	17.3	02-10-1976	84	79
November	28.1	17.3	33.3	03-11-1958	9.5	27-11-1967	83	78
December	24.3	12	30.0	09-12-1962	4.3	13-12-1976	80	75
Annual	29.5	19.4	43.9	06-07-1961	4.3	13-12-1976	80	75

TABLE – 4(a)
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(CHAPARMUKH)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	18	15	14	8	1	0	0	0	0	1	8	17	82
b	2	2	3	6	11	14	13	12	7	5	2	1	78
c	1.6	1.8	2.1	3.6	5.0	6.2	6.3	5.9	5.2	3.9	2.4	1.5	3.8
1730 HOURS IST													
a	18	12	7	2	1	0	0	0	1	2	8	18	69
b	1	1	2	3	4	6	7	5	5	3	1	0	38
c	1.5	2.3	2.9	3.8	4.2	5.5	5.8	5.3	5.0	3.4	2.0	1.4	3.6

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE – 5(a)
Mean Wind Speed and Predominant Wind Direction
(CHAPARMUKH)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	3.2	3.7	4.4	4.6	4.3	4.7	4.4	3.8	3.9	3.2	2.9	2.8	3.8
Direction in morning	SE/E	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE/E	SE/E	
Direction in evening	NE/SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	C/SE/NE	SE	

TABLE – 6(a)
Special Weather Phenomena
(CHAPRMUKH)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.6	1.6	4.7	3.5	4.7	5.2	4.5	3.2	0.6	0.2	0.1	29.0
Hail	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Dust storm	0.0	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Fog	4.3	1.8	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	2.1	4.6	13.2

NALBARI DISTRICT

The climate of this district is characterized by cold in winter, mild hot in summer and most humid in monsoon season. The year may be divided into four seasons. Winter season is from December to February and is followed by summer (pre-monsoon) season associated with thunderstorms from March to May. The period of June to the first week of October is of southwest monsoon season. October and November constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for 11 and 20 years. The details of 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 2227.4 mm. During the monsoon season (June to September), the district receives rainfall about 65% of the annual rainfall. June is the rainiest month with an average rainfall of 489.4 mm. In pre-monsoon months (March to May), the district receives rainfall about 27% of the annual rainfall. The variation in annual rainfall from year to year is large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 180% of the annual normal occurred in year 1954, while the lowest annual rainfall is 80% of the normal occurred in 1973. In this fifty year period there was no a single year in which annual rainfall in the district was less than 80% of the normal. It is seen from Table 2 that the annual rainfall was between 1701 mm and 2700 mm in 8 years out of 11.

On an average there are 93 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

The heaviest rainfall recorded in 24 hours at any station in the district was 193.3 mm at Nalbari (Hydro) on 20 June 1972.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate which follows is based on records of neighbouring meteorological observatory at Rangia in Kamrup Rural district. The winter season sets in the district towards the end of November when both day and night temperatures begin to decrease. January is the coldest month with the mean minimum temperature about 10°C and mean maximum temperature about 24°C. On individual days during winter season minimum temperature may go down to 7°C. Day and night temperatures begin to rise steadily from the beginning of March and reach the maximum in July and August. The mean maximum temperature in these two months is about 32°C and the mean minimum temperature is about 25°C. The monsoon season is the period of high temperatures when maximum temperature may reach up to 37°C on individual days.

Sometimes the weather is often unpleasant due to the damp heat especially in between two spells of rain. The weather becomes gradually cool after withdrawal of the southwest monsoon and pleasant during post monsoon season.

HUMIDITY

The atmosphere is humid throughout the year with relative humidity being generally about 75%. In southwest monsoon season relative humidity is about 80%. During the period February to April the relative humidity drops especially in the afternoons when it is generally between 60% and 70%.

CLOUDINESS

The skies are heavily clouded or overcast during southwest monsoon months and latter part of pre-monsoon season. The skies are light to moderately clouded during the rest of the year. In winter season skies become obscured in the mornings on some days due to lifted fog which dissipates with the advance of the day.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms during the period March to May when they are a little stronger. Easterly winds are predominant in the district throughout the year. Westerly winds blow in the southwest monsoon season particularly in the afternoon.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are frequent during the period March to September. Fog is sometimes observed in the post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
NALBARI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Nalbari	20	a	11.0	18.1	86.3	190.6	355.3	410.3	409.1	307.9	289.0	157.0	17.6	10.9	2263.1	177	79	186.7	14 Sep 1955
		b	0.7	1.2	5.2	11.6	14.5	13.9	14.4	11.8	10.6	6.2	1.3	0.9	92.3	(1954)	(1991)		
Nalbari (Hydro)	11	a	8.7	12.4	47.1	230.5	296.9	568.5	449.1	289.8	156.5	103.8	20.8	7.3	2191.4	126	81	193.3	20 Jun 1972
		b	0.7	1.6	3.4	10.1	12.7	17.4	16.0	12.3	9.3	6.3	1.7	0.9	92.4	(1977)	(1973)		
Nalbari (District)		a	9.9	15.3	66.7	210.6	326.1	489.4	429.1	298.8	222.8	130.4	19.2	9.1	2227.4	180	80		
		b	0.7	1.4	4.3	10.9	13.6	15.6	15.2	12.1	10.0	6.3	1.5	0.9	92.5	(1954)	(1973)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
NALBARI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1701 - 1800	2	2501 - 2600	1	3301 - 3400	0
1801 - 1900	0	2601 - 2700	0	3401 - 3500	0
1901 - 2000	1	2701 - 2800	1	3501 - 3600	0
2001 - 2100	1	2801 - 2900	0	3601 - 3700	0
2101 - 2200	1	2901 - 3000	0	3701 - 3800	0
2201 - 2300	0	3001 - 3100	0	3801 - 3900	0
2301 - 2400	0	3101 - 3200	0	3901 - 4000	1
2401 - 2500	2	3201 - 3300	0		

(Data available for 11 years)

NORTH CACHAR HILLS DISTRICT

North Cachar Hills district is covered with hills of elevation up to 1850 metres above mean sea level in the eastern, southern and western parts of the district, and has plain areas in the remaining parts. The climate of this district varies from place to place due to topographic features. The climate of the district is generally characterized by mild hot, abundant rain and highly humid air in summer and monsoon period, and cold in winter. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The monsoon season is followed by post monsoon season.

RAINFALL

Records of rainfall in the district are available for 4 raingauge stations for the period ranging from 11 to 33 years. The details of 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 2693.3 mm. The variation in annual rainfall from year to year is much large. The variation in rainfall from place to place is also large which is associated with orographic features. During the monsoon season (June to September), the district receives rainfall about 57% of the annual rainfall. June is the rainiest month with an average rainfall of 451.4 mm. About 29% rainfall of the annual rainfall is received during the summer season (March to May) due to occurrence of thunderstorms. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 222% of the annual normal occurred in year 1999, while the lowest annual rainfall was 35% of the normal occurred in 1995. In this fifty year period, there were 9 years in which annual rainfall in the district was less than 80% of the normal and on two occasions when they were consecutive for two years and three years. It is seen from Table 2 that the annual rainfall was between 2101 mm and 3300 mm in 15 years out of 30.

On an average there are 87 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 54 at Jatinga Valley to 108 at Halflong observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 838.0 mm at Maibong on 10 June 1998.

TEMPERATURE

There is one meteorological observatory in the district at Halflong (Alt 525 metres). The records of temperature, wind, relative humidity, cloud, etc. which are available for Halflong observatory may be considered as representative of climatic conditions over the district as a whole. From about the middle of November, both day and night temperatures begin to decrease, the drop being more rapid in case of night temperatures. January is the coldest month with mean minimum temperature at 10.4°C and mean maximum temperature at 19.7°C.

However, these temperatures at high altitudinal areas in the district are likely 6°C and 14°C respectively. On individual days in the cold season, the minimum temperature may go down to 6°C or less. Temperatures begin to slight rise from about the beginning of March. The weather is pleasant in the period March to May due to occurrence of significant rainfall associated with thunderstorms, so temperature becomes moderate during the summer season. After onset of the southwest monsoon in the beginning of June, the temperature does not lower as day temperatures in other parts of India, while the night temperatures in the monsoon season are even higher than in the rest of the year. July and August are the warmest months with mean maximum temperature 27.3°C and mean minimum temperature 20.9°C; however, these temperatures at high altitudinal areas are likely 22°C and 17°C respectively. On individual days during summer and monsoon season maximum temperature may reach up to 35°C. Both day and night temperatures on individual days may be 4 to 6°C lower in the hilly terrain from the plain areas of the district. The day and night temperatures begin to decrease after withdrawal of the monsoon by about the first week of October and the weather becomes gradually cool and pleasant during post monsoon season. The highest maximum temperature ever recorded at Halflong was 35.6°C on 13 May 1956 and the lowest minimum temperature ever recorded was 5.0°C on 07 February 1968.

HUMIDITY

The air is much humid throughout the year, being particularly high during the southwest monsoon and post monsoon seasons when the relative humidity is above 85% in the morning and about 80% in the evening. The period of February and March is comparatively drier with the relative humidity between 50% and 60% in the afternoons.

CLOUDINESS

The skies are heavily clouded to overcast from May to October. Sometimes the hill-tops are enveloped with clouds during this period. Moderate to heavily clouded skies are common in the pre-monsoon season. and winter season the skies are lightly or moderately clouded during November to February months.

WINDS

Winds generally blow from southwesterly direction throughout the year. However, in winter season sometimes northwesterly/northeasterly winds are also observed. Sometimes winds become strong as anabatic and katabatic winds blow over hilly terrains and play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions originated from the Bay of Bengal rarely reach in the district. Thunderstorms are frequent during the period from March to September. During the winter season, western disturbances which pass eastwards across Upper Assam or further north cause cloudy weather. Fog occasionally occurs on a few days in the post monsoon and winter seasons, while it occurs over hilly terrains in the monsoon months.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, predominant wind directions, special weather phenomena respectively for Halflong observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
NORTH CACHAR HILLS

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Halflong(Obsy)	33	a	17.4	39.9	131.6	246.0	379.3	478.0	320.7	252.5	203.2	191.9	52.4	6.2	2319.1	178 (1985)	52 (1978)	256.8	07 Jun 1915
		b	1.3	2.4	6.7	11.4	14.5	17.1	17.1	15.8	11.1	7.8	2.1	0.5	107.8				
Harangajao	12	a	4.9	51.7	109.7	225.9	409.6	340.1	326.4	277.2	221.5	140.2	16.0	6.6	2129.8	204 (1953)	36 (1997)	279.4	06 May 1934
		b	0.6	2.9	6.5	9.7	15.6	16.5	15.2	12.6	9.1	6.4	1.4	0.8	97.3				
Jatinga Valley	11	a	19.7	70.7	222.8	198.7	286.5	220.8	264.9	175.0	222.2	241.1	31.2	20.0	1973.6	207 (1954)	36 (1997)	650.0	28 Oct 1996
		b	0.6	2.4	5.4	6.2	8.4	6.4	9.0	6.6	4.5	2.2	1.7	0.7	54.1				
Maibong	16	a	49.5	64.9	148.4	194.5	572.6	766.8	688.9	853.0	542.1	382.5	42.1	46.0	4351.3	316 (1997)	22 (1957)	838.0	10 Jun 1998
		b	1.9	2.8	4.1	6.3	11.9	15.2	12.9	13.3	10.1	6.0	1.4	1.3	87.2				
North Cachar Hills (District)		a	22.9	56.8	153.1	216.3	412.0	451.4	400.2	389.4	297.2	238.9	35.4	19.7	2693.3	222 (1999)	35 (1995)		
		b	1.1	2.6	5.7	8.4	12.6	13.8	13.5	12.1	8.7	5.6	1.6	0.8	86.5				

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
NORTH CACHAR HILLS
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
901 - 1000	1	3501 – 3600	0
1001 - 1100	0	3601 – 3700	0
1101 - 1200	0	3701 – 3800	0
1201 - 1300	1	3801 – 3900	0
1301 - 1400	1	3901 – 4000	0
1401 – 1500	0	4001 – 4100	0
1501 – 1600	1	4101 – 4200	2
1601 – 1700	1	4201 – 4300	0
1701 – 1800	0	4301 – 4400	0
1801 – 1900	1	4401 – 4500	0
1901 – 2000	2	4501 – 4600	0
2001 – 2100	1	4601 – 4700	0
2101 – 2200	2	4701 – 4800	0
2201 – 2300	0	4801 – 4900	0
2301 – 2400	3	4901 – 5000	0
2401 – 2500	2	5001 – 5100	1
2501 – 2600	1	5101 – 5200	0
2601 – 2700	1	5201 – 5300	0
2701 – 2800	4	5301 – 5400	1
2801 – 2900	0	5401 – 5500	0
2901 – 3000	1	5501 – 5600	0
3001 – 3100	0	5601 – 5700	0
3101 – 3200	1	5701 – 5800	0
3201 – 3300	0	5801 – 5900	0
3301 – 3400	1	5901 – 6000	1
3401 – 3500	0		

(Data available for 30 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(HALFLONG)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	19.7	10.4	32.2	27-01-1967	5.1	31-01-1977	75	67
February	22.2	12.3	31.2	15-02-1967	5.0	07-02-1968	66	57
March	25.4	15.8	34.0	27-03-1973	8.4	15-03/-979	63	56
April	26.5	17.7	32.8	09-04-1963	9.7	06-04-1968	74	68
May	26.7	19.2	35.6	13-05-1956	13.0	20-05-1979	81	75
June	26.8	20.5	35.0	25-06-1979	10.0	13-06-1979	88	83
July	27.2	20.9	34.6	02-07-1967	16.0	01-07-1977	89	82
August	27.3	20.9	34.1	02-08-1967	14.2	26-08-1977	89	83
September	27.5	20.6	32.8	02-09-1967	17.2	13-09-1979	88	82
October	25.7	19.0	32.7	09-10-1960	10.0	24-10-1974	85	82
November	22.8	15.2	29.2	05-11-1971	9.0	20-11-1978	82	79
December	20.1	11.6	25.7	04-12-1972	7.0	15-12-1961	79	75
Annual	24.8	17.0	35.6	13-05-1956	5.0	07-02-1968	80	74

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(HALFLONG)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	18	18	16	7	3	1	1	1	2	2	5	15	89
b	2	1	3	7	12	17	18	16	10	10	8	2	106
c	1.8	1.7	2.2	3.8	5.3	6.4	6.6	6.2	5.4	4.9	3.7	1.9	4.2
1730 HOURS IST													
a	15	16	14	7	4	2	1	2	3	3	7	17	91
b	1	1	3	5	7	12	13	9	6	5	4	0	66
c	1.9	1.9	2.4	3.7	4.3	5.7	5.7	5.6	4.9	3.8	2.8	1.5	3.7

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Predominant Wind Direction
(HALFLONG)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Direction in morning	SW/NE	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW/NW	
Direction in evening	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	

TABLE - 6
Special Weather Phenomena
(HALFLONG)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.4	0.7	3.0	6.0	4.2	4.6	1.4	1.6	2.1	0.8	0.2	0.1	25.1
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	0.2	0.2	0.1	0.0	0.1	0.1	0.0	0.1	0.2	0.3	0.5	0.2	2.0

SIBSAGAR DISTRICT

The climate of this district is characterized by mild hot in summer, cold in winter and humid throughout the year. The year may be divided into four seasons. The period of June to the first week of October is of southwest monsoon season followed by post monsoon till November. Winter season is from December to February followed by pre-monsoon season till May.

RAINFALL

Records of rainfall in the district are available for 8 raingauge stations for the period ranging from 10 to 30 years. The details of 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 1997.5 mm. The annual rainfall from year to year in the district has some variation. During the monsoon season (June to September), the district receives rainfall about 63% of the annual rainfall. July is the rainiest month with an average rainfall of 400.7 mm. In the summer months (March to May), the district receives rainfall about 26% of the annual rainfall. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 154% of the normal occurred in year 1986, while the lowest annual rainfall was 38% of the normal occurred in 1979. In this fifty year period, there were 2 years in which the annual rainfall in the district was less than 80% of the normal but they were not consecutive. It is seen from Table 2 that the annual rainfall was between 1601 mm and 2400 mm in 19 years out of 34 for which whole year data is available.

On an average there are 105 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 77 at Bihubar Hydro to 122 at Sibsagar Hydro. The heaviest rainfall recorded in 24 hours at any station in the district was 305.0 mm at Sibsagar Hydro on 08 July 1968.

TEMPERATURE

There is one meteorological observatory in the district at Sibsagar. The description of climate of the district is based on meteorological data of this observatory. The winter season commences in the district from the beginning of December when both day and night temperatures begin to rapidly decrease. January is the coldest month with the mean maximum temperature about 23°C and the mean minimum temperature about 10.2°C. On individual days during winter season minimum temperature may go down to 4°C. Temperatures begin to rise steadily from March and reach their maximum in July and August. The mean maximum temperature in these months, are about 32.1°C and mean minimum temperature is about 25.3°C. There is mild hot in summer season associated with thunderstorms in the district. The monsoon season is a period of the higher temperatures when maximum temperature may reach up to 37°C on individual days. The high moisture content in the air makes the unpleasant weather often due to damp heat especially in between two spells of rain in the monsoon season. The

weather becomes gradually cool after withdrawal of southwest monsoon by first week of October and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Sibsagar was 42.8°C on 23 May 1945 while the lowest minimum temperature ever recorded was 2.8°C on 13 February 1905.

HUMIDITY

The atmosphere over the district is highly humid throughout the year. The average relative humidity in the morning is about 85% and that in the afternoon is about 75%. The relative humidity is less in early part of summer season.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon and pre-monsoon seasons. Skies are lightly or moderately clouded in post monsoon and winter seasons. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in the period March to August when they are strong. Winds are generally northerly to northeasterly or calm throughout the year.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are common throughout the year but they are more frequent during March to September. Thunderstorms are sometimes accompanied with hail in the early part of pre-monsoon season. Dust-storms are sometimes observed in the early part of pre-monsoon season. Fog is very frequent in post monsoon, winter and early part of pre-monsoon season.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Sibsagar observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
SIBSAGAR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Amguri	30	a	21.1	44.1	84.0	217.3	309.9	329.5	382.3	380.8	265.6	141.4	35.9	13.9	2225.8	135	61	242.1	07 Mar 1911
		b	2.2	4.4	6.8	11.8	14.6	17.1	18.6	16.0	12.6	7.3	2.6	1.4	115.4	(1971)	(2000)		
Amguri Tea Estate	15	a	33.9	68.2	101.5	201.0	286.5	318.2	400.5	348.1	292.2	110.2	29.8	10.8	2200.9	139	66	218.0	21 Jun 1985
		b	2.8	4.9	8.0	10.0	14.1	15.3	17.4	14.2	12.9	5.6	2.0	1.2	108.4	(1981)	(1998)		
Bihubar (Hydro)	10	a	9.6	29.6	64.3	81.8	179.0	198.7	320.2	309.3	170.0	68.1	16.7	2.8	1450.1	170	53	144.0	02 Jul 1979
		b	0.9	2.4	4.8	5.2	9.4	10.3	16.1	12.8	9.9	3.8	1.2	0.3	77.1	(1956)	(1979)		
Nazira	17	a	30.2	60.4	125.8	196.6	375.0	330.9	467.8	317.8	163.9	108.5	29.4	14.4	2220.7	133	60	231.4	12 Apr 1911
		b	3.2	4.9	9.0	12.3	14.8	16.2	20.2	14.7	10.1	7.6	2.2	1.8	117.0	(1957)	(1995)		
S.D.A.O. Sibsagar	13	a	21.6	42.3	61.0	153.4	182.9	255.4	330.5	257.1	222.6	107.9	22.9	7.0	1664.6	185	69	254.0	15 Jun 1986
		b	2.1	5.0	6.4	10.5	12.9	14.4	17.2	14.1	12.4	5.8	2.2	0.8	103.8	(1986)	(1996)		
Sibsagar (Hydro)	25	a	25.1	42.8	97.5	178.3	346.1	310.1	454.8	404.9	238.9	130.7	24.9	15.7	2269.6	126	73	305.0	08 Jul 1968
		b	2.6	4.3	7.9	11.2	16.7	17.1	20.1	17.7	12.6	8.1	2.0	1.7	122.0	(1953)	(2000)		
Sibsagar SDAO	10	a	24.5	51.9	99.1	152.5	209.5	348.5	485.6	260.6	220.2	124.5	11.7	15.2	2003.8	135	77	167.2	14 Jul 1999
		b	2.1	5.0	5.6	8.9	11.9	13.4	16/0	12.1	11.7	4.2	1.3	0.8	93.0	(1999)	(1997)		
Sonari	18	a	18.9	42.8	118.2	154.7	230.9	295.6	363.5	360.5	187.1	123.4	33.2	13.6	1942.4	161	45	182.9	19 Jun 1951
		b	2.2	4.1	7.6	9.5	11.7	15.7	18.2	16.6	10.8	6.2	2.9	1/3	106.8	(1954)	(1994)		
Sibsagar (District)		a	23.1	47.8	93.9	167.0	265.0	298.4	400.7	329.9	220.1	114.3	25.6	11.7	1997.5	154	38		
		b	2.3	4.4	7.0	9.9	13.3	14.9	18.0	14.8	11.6	6.1	2.0	1.2	105.5	(1986)	(1979)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
SIBSAGAR
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
701 - 800	1	1901 – 2000	5
801 - 900	0	2001 – 2100	1
901 - 1000	0	2101 – 2200	4
1001 - 1100	0	2201 – 2300	2
1101 - 1200	0	2301 - 2400	1
1201 - 1300	0	2401 – 2500	4
1301 - 1400	0	2501 – 2600	0
1401 –1500	0	2601 – 2700	0
1501 –1600	1	2701 - 2800	4
1601 –1700	2	2801 - 2900	4
1701 –1800	4	2901 - 3000	0
1801 – 1900	0	3001 - 3100	1

(Data available for 34 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(SIBSAGAR)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	23.0	10.2	28.9	17-01-1942	3.3	01-09-1917	87	73
February	24.3	13.2	30.6	28-02-1942	2.8	13-02-1905	81	71
March	27.3	16.2	35.6	25-03-1945	7.2	02-03-1917	74	67
April	29.3	19.7	37.2	30-04-1960	11.0	18-04-1970	76	70
May	29.9	22.5	42.8	23-05-1945	16.7	04-05-1893	83	77
June	31.5	24.8	37.8	06-06-1881	19.4	07-06-1907	84	79
July	32.1	25.3	38.9	12-07-1883	20.0	27-07-1969	86	78
August	32.0	25.4	37.8	21-08-1931	17.8	25-08-1966	87	79
September	31.7	24.2	36.9	11-09-1963	19.4	23-09-1890	85	81
October	29.8	21.4	35.6	31-10-1969	15.0	31-10-1938	85	83
November	27.3	16.2	32.2	02-11-1964	9.4	29-11-1928	84	80
December	24.7	12.3	28.9	06-12-1958	4.4	26-12-1916	87	77
Annual	28.6	19.3	42.8	23-05-1945	2.8	13-02-1905	83	76

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (SIBSAGAR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	10	7	9	4	2	0	0	0	0	1	5	7	45
b	12	11	10	12	19	20	21	21	16	12	8	12	174
c	4.8	4.5	4.4	5.3	6.5	7.2	7.4	7.3	6.7	5.6	4.5	4.8	5.8
1730 HOURS IST													
a	9	5	5	3	1	0	1	0	0	1	5	5	35
b	6	7	7	9	10	12	10	8	7	7	4	5	92
c	3.1	4.1	4.7	5.4	5.7	6.4	6.2	6	5.2	4.3	3.2	3	4.8

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (SIBSAGAR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in km/hr	2.1	3.3	4.6	5.4	5.1	5.0	5.4	4.5	4.0	2.8	1.9	1.7	3.8
Direction in morning	C/N/NE	C/NE/N	NE/N/C	NE/N	NE/N	NE/N/C	NE/C/N	C/NE/N	C/NE/N	C/NE	C/NE	C/NE/N	
Direction in evening	C/N	C/N/NE	C/NE/N	N/NE/C	NE/N/C	C/NE/N	C/NE/N	C/NE/W	C/NE/N	C/NE	C	C	

TABLE - 6
Special Weather Phenomena (SIBSAGAR)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.8	2.6	5.4	8.1	8.9	9.3	11.2	10.0	12.1	3.3	0.4	0.8	72.9
Hail	0.1	0.1	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Dust storm	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Fog	21.2	10.1	5.1	0.4	0.0	0.0	0.0	0.0	0.0	0.1	8.8	21.6	67.3
Squall	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

SONITPUR DISTRICT

The climate of this district is characterized by cold in winter, mild hot in summer season and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer season associated with thunderstorms from March to May. Southwest monsoon season is from June to the first week of October. October and November constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 12 raingauge stations for the period ranging from 10 to 50 years. The details of 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 1910.8 mm. During the monsoon season (June to September), the district receives rainfall about 65% of the annual rainfall. July is the rainiest month with an average rainfall of 379.2 mm. In pre-monsoon months (March to May) average rainfall is a significant about 25% of the annual rainfall. The annual rainfall from year to year has some variation. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 144% of the normal occurred in year 1988, while the lowest annual rainfall which was 56% of the normal occurred in 1981. In this fifty year period, there were three years in which the annual rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 1501 mm and 2300 mm in 27 years out of 41. On an average there are 89 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 49 at Balipara to 122 at Badetti/Behali. The heaviest rainfall recorded in 24 hours at any station in the district was 345.2 mm at Dhakiajuli (Hydro) on 14 August 1996.

TEMPERATURE

There are two meteorological observatories in the district at Gohpur and Tezpur. The description of climate of this district is based on records of meteorological parameters of these observatories. The winter season commences in the district by about end of November when both day and night temperatures begin to decrease. January is the coldest month of the year with mean maximum temperature about 23.3°C and mean minimum temperature about 9.8°C. In the winter season, the district experiences spells of cold and dry weather with scanty rainfall. On individual days in this season minimum temperature may go down to 4°C. The temperatures begin to rise from the beginning of March and continue till August. The temperatures during the monsoon season are higher than that in the period of March to May. The highest mean values of temperature are experienced in August when mean maximum temperature is about 32°C and mean minimum is about 24.5°C. On individual days during the monsoon season maximum temperature may reach up to 37°C. Sometimes

weather becomes oppressive due to damp heat in between two spells of rain. The heavy rains and high temperatures make the weather quite humid. The weather becomes gradually cool after withdrawal of the monsoon and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Tezpur was 39.5°C on 17 July and 02 August 1975 while the lowest minimum temperature ever recorded at Gohpur was 2.0°C on 17 December 1975.

HUMIDITY

The atmosphere is highly humid throughout the year, particularly more during the southwest monsoon season when the relative humidity is around 90%. In the winter season also, the air is much humid with relative humidity around 80%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season. The skies are generally lightly or moderately clouded during the rest of the year. In the cold season sometimes cloudiness sets in association with passing western disturbances.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in the period March to May when they are stronger. Easterly and northeasterly are predominant throughout the year. Sometimes wind is also calm.

SPECIAL WEATHER PHENOMENA

Cyclonic storm and depressions from the Bay of Bengal which move in the state rarely reach the district to affect its weather. Thunderstorms occur throughout the year, but its frequency is more during the monsoon and pre-monsoon seasons. Thunderstorms which occur during the period March to May are accompanied with strong winds. Dust-storm occasionally occurs in the areas surrounded with Tezpur during the summer season. Fog occurs on some days during the post monsoon and winter seasons.

Table 3, 4, 5 and 6 and 3(a), 4(a), 5(a) and 6(a) give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Gohpur and Tezpur observatories.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
SONITPUR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Balipara (Hydro)	11	a	1.2	3.0	25.6	47.1	143.7	279.2	504.5	33.0	126.5	95.0	20.4	3.4	1282.6	135	-	180.0	19 Jul 1979
		b	0.2	0.2	1.7	2.9	5.3	9.6	11.5	5.0	7.5	2.5	1.6	0.6	48.6	(1979)			
Baliapara Addibar	17	a	31.5	39.1	105.1	214.6	433.5	627.5	399.4	397.4	272.1	217.6	16.4	7.9	2762.1	154	28	294.1	22 Jun 1955
		b	1.6	2.7	5.5	9.8	16.0	17.6	14.3	13.3	11.1	7.4	1.2	0.8	101.3	(1995)	(1999)		
Bedatti/Behali	11	a	23.7	27.6	104.2	159.8	451.5	457.2	502.3	399.0	308.8	158.8	26.2	10.1	2629.2	108	92	189.2	12 Jul 1908
		b	2.3	2.6	7.2	10.5	18.5	18.5	20.1	16.4	13.4	9.0	2.4	1.1	122.0	(1956)	(1951)		
Bishwanath D.B.	10	a	11.1	25.3	37.9	129.6	253.1	302.4	267.7	333.1	169.4	115.4	10.8	4.5	1660.3	133	71	160.0	23 Aug 1994
		b	1.0	2.0	2.5	8.2	13.1	15.0	12.8	12.0	8.1	5.2	1.1	0.5	81.5	(1991)	(1999)		
Bishwanath SDAO	10	a	9.3	39.6	31.4	117.7	234.9	287.0	672.1	269.0	271.2	67.2	11.4	2.1	2012.9	281	39	305.6	15 Jul 1996
		b	1.1	3.6	2.6	8.6	14.9	17.2	14.6	11.7	11.9	3.9	1.2	0.4	91.7	(1998	(2000)		
Dhakiajuli	15	a	12.1	24.4	34.3	106.1	275.8	421.0	286.3	273.8	192.0	104.0	20.7	2.4	1752.9	139	65	200.0	27 May 1995
		b	1.1	1.9	2.9	6.9	12.4	13.6	11.3	12.2	8.1	5.3	1.2	0.4	77.3	(1993)	(1996)		
Dhakiajuli (Hydro)	20	a	11.4	19.4	49.1	133.4	264.0	355.4	374.8	339.8	234.4	101.3	11.6	8.5	1903.1	177	56	345.2	14 Aug 1996
		b	1.1	1.7	4.2	8.9	12.3	13.6	14.9	12.1	11.2	5.3	0.8	0.6	86.7	(1988)	(1981)		
Gohpur	11	a	23.1	6.6	74.9	126.4	292.1	290.5	330.6	240.1	174.7	172.7	10.1	13.2	1755.0	139	65	289.6	25 Aug 1923
		b	1.6	0.6	5.1	8.6	13.3	14.9	14.7	11.4	9.9	8.0	1.2	1.0	90.3	(1956)	(1991)		
Gohpur (Obsy)	26	a	32.9	32.1	51.8	147.9	314.7	404.2	423.7	373.5	231.6	124.2	30.2	20.3	2187.1	136	101	216.8	28 May 1989
		b	1.7	3.1	3.9	9.4	14.2	16.7	18.8	15.6	11.2	7.2	2.0	1.9	105.7	(1964)	(1966)		
Na-Duar D.B.	10	a	27.2	35.6	46.8	183.8	371.5	379.9	246.0	322.2	235.6	88.5	9.5	3.3	1949.9	170	42	208.9	11 Sep 1997
		b	1.7	2.7	3.7	10.7	15.5	16.0	10.1	10.3	10.0	4.8	0.9	0.4	86.8	(1995)	(1996)		
S.D.A.O. Tezpur	11	a	10.8	12.0	19.1	89.2	185.5	185.9	194.2	217.3	158.6	74.4	52.5	2.7	1202.2	133	87	183.6	31 Jul 1993
		b	1.4	1.3	1.6	6.5	11.7	12.0	10.6	10.6	10.7	4.7	0.8	0.3	72.2	(1993)	(1994)		
Tezpur (Obsy)	50	a	12.9	18.0	49.5	149.1	271.8	315.0	348.9	304.0	216.0	114.8	21.1	10.8	1831.9	128	77	184.9	30 Jun 1986
		b	1.3	1.8	4.4	10.7	14.2	15.6	16.6	14.1	11.8	6.0	1.7	1.1	99.3	(1985)	(1996)		
Sonitpur (District)		a	17.3	23.6	52.5	133.7	291.0	358.8	379.2	291.8	215.9	119.5	20.1	7.4	1910.8	144	56		
		b	1.3	2.0	3.8	8.5	13.4	15.0	14.2	12.1	10.4	5.8	1.3	0.8	88.6	(1988)	(1981)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
SONITPUR
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1001 – 1100	1	1901 – 2000	2
1101 - 1200	0	2001 – 2100	5
1201 - 1300	0	2101 - 2200	1
1301 – 1400	0	2201 - 2300	3
1401 – 1500	1	2301 - 2400	6
1501 – 1600	4	2401 - 2500	4
1601 – 1700	6	2501 - 2600	1
1701 – 1800	4	2601 - 2700	0
1801 – 1900	2	2701 - 2800	1

(Data available for 41 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(GOHPUR)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	23.1	8.2	28.0	29-01-1982	3.0	11-01-1978	88	81
February	24.6	10.9	31.0	28-02-1975	3.7	08-02-1977	83	73
March	27.8	14.4	34.0	27-03-1971	7.7	01-03-1962	79	73
April	29.0	17.7	36.6	26-04-1962	10.8	05-04-1968	81	76
May	30.2	20.5	37.0	26-05-1982	12.5	03-05-1983	84	79
June	31.3	22.9	38.8	17-06-1974	14.5	06-06-1983	89	84
July	31.9	23.5	36.6	05-07-1964	14.7	02-07-1979	90	82
August	32.0	23.7	39.0	28-08-1979	18.0	10-08-1983	90	84
September	31.5	22.7	36.5	11-09-1977	11.0	18-09-1981	89	85
October	29.9	19.8	36.0	20-10-1980	13.3	06-10-1962	88	84
November	27.4	13.9	31.6	03-11-1958	7.9	30-11-1975	85	80
December	24.1	9.1	29.2	01-12-1968	2.0	17-12-1975	89	83
Annual	28.6	17.3	39.0	28-08-1979	2.0	17-12-1975	86	80

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (GOHPUR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	5	3	5	1	0	0	0	0	0	1	2	6	23
b	4	4	6	11	11	15	14	15	11	6	3	3	103
c	3.1	3.7	3.9	5.3	5.4	6.1	6.4	6.5	5.9	4.3	3.3	3	4.7
1730 HOURS IST													
a	3	2	2	0	0	0	0	0	0	1	2	6	16
b	3	3	4	7	5	8	5	6	5	4	2	2	54
c	2.8	3.6	4.1	5.1	4.7	5.4	5.5	5.4	5.3	3.6	2.8	2.6	4.2

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (GOHPUR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	2.5	3.7	4.4	5.0	4.8	4.4	3.6	3.4	3.2	2.7	2.3	2.0	3.5
Direction in morning	E	E	E	E	E	E/NE	E	E	E	E	E	E	
Direction in evening	C/E	C/E/NE	E/NE	E	E	E	E	E/C	C/E	C/E	C/E	C/E	

TABLE - 6
Special Weather Phenomena (GOHPUR)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.0	0.3	0.3	0.3	0.7	0.3	1.4	0.8	0.7	0.2	0.0	0.0	5.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	3.3	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.7	3.0	3.8	11.9
Squall	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2

TABLE – 3(a)
Normals of Temperature and Relative Humidity
(TEZPUR)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	23.6	11.4	28.8	29-01-1982	5.6	08-01-1945	83	70
February	25.8	13.7	33.2	28-02-1999	6.1	13-02-1905	76	60
March	29.6	17.0	38.2	05-03-1977	10.0	01-03-1927	70	56
April	30.2	19.9	38.7	14-04-1972	12.2	08-04-1990	77	68
May	30.9	22.1	39.1	02-05-1972	14.4	10-05-1975	82	76
June	32.0	24.6	39.4	20-06-1975	17.6	06-06-1972	86	79
July	31.9	25.1	39.5	17-07-1975	21.2	03-07-1962	89	82
August	32.3	25.3	39.5	02-08-1975	20.3	01-08-1962	88	80
September	31.4	24.5	38.9	11-09-1975	20.6	08-09-1959	88	82
October	30.7	21.7	37.9	16-10-1975	14.5	31-10-1962	84	82
November	28.3	16.8	34.3	04-11-1974	10.6	23-11-1953	79	78
December	24.6	12.5	33.9	01-12-1974	6.1	31-12-1913	83	75
Annual	29.4	19.7	39.5	17-07-1975 02-08-2975	5.6	08-01-1945	82	74

TABLE – 4(a)
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(TEZPUR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	16	11	12	6	3	2	1	2	2	6	14	17	88
b	1	2	2	5	7	9	10	8	8	4	2	1	60
c	2	2.7	3.1	4.5	5.3	5.8	6.6	5.8	5.7	3.7	2.2	1.8	4.1
1730 HOURS IST													
a	13	9	8	4	4	2	2	3	3	6	10	15	77
b	1	1	1	2	2	3	3	2	3	1	1	1	20
c	1.8	2.6	3.3	4.2	4.4	5	5.2	4.8	4.8	3	1.9	1.6	3.6

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE – 5(a)
Mean Wind Speed and Predominant Wind Direction
(TEZPUR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	2.8	3.7	5.5	5.7	3.6	2.5	1.8	1.4	1.5	2.0	3.1	3.0	3.1
Direction in morning	C/NE	NE/C	NE	NE	NE/C	C/NE	C/NE	C/NE	C/NE	C/NE	NE	NE/C	
Direction in evening	C/NE	C/NE	C/NE	NE/C	C/NE	C/NE	C/NE	C/NE	C/NE	C/NE	C/NE	C/NE	

TABLE – 6(a)
Special Weather Phenomena
(TEZPUR)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.6	2.1	4.0	10.5	9.9	11.7	10.1	11.4	10.7	3.1	0.6	0.5	75.2
Hail	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Dust storm	1.1	2.7	4.0	1.3	0.6	0.0	0.0	0.0	0.2	0.2	1.7	1.8	13.6
Fog	3.9	0.8	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.8	0.8	3.8	10.7
Squall	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3

TINSUKIA DISTRICT

The climate of this district is characterized by mild hot in summer season, cold in winter and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February, followed by pre-monsoon season associated with thunderstorm activities from March to May. Southwest monsoon season is from June to about the beginning of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 8 raingauge stations for the period ranging from 10 to 27 years. The details of 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 2471.4 mm. During the monsoon season (June to September), the district receives rainfall about 62% of the annual rainfall. July is the rainiest month with an average rainfall of 502.3 mm. In pre-monsoon season (March to May), the district receives rainfall about 28% of the annual rainfall. The variation in annual rainfall from year to year is not large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 124% of the normal occurred in year 1987, while the lowest annual rainfall which was 73% of the normal occurred in 1986. In this fifty year period, there were 3 years in which the annual rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall was between 2001 mm and 3000 mm in 29 years out of 34. On an average there are 124 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 108 at Sadiya to 133 at Doom Dooma. The heaviest rainfall recorded in 24 hours at any station in the district was 339.9 mm at Sadiya on 04 July 1908.

TEMPERATURE

There is one meteorological observatory in the district at Digboi. The records of temperature and other meteorological elements which are available for Digboi may be considered as a representative of the climatic conditions over the district as a whole. The drop in temperature is more rapid from about the latter part of November. January is the coldest month of the year, when the mean maximum temperature is 22.5°C and the mean minimum temperature is 10.5°C. In winter season, cold weather occurs in the district when minimum temperature may go down to 7°C on individual days. The temperatures begin to rise steadily from about end of February till August. In May the mean maximum temperature is 29.8°C and the mean minimum temperature is 20.7°C. In summer season both maximum and minimum temperatures are not much high and sometimes weather becomes pleasant with thundershowers. The onset of southwest monsoon in the first week of June

witnesses a little rise in day and night temperatures which continue till August. August is the hottest month of the year with a mean maximum temperature at 32.2°C and mean minimum temperature at 23.9°C. On individual days during the monsoon season maximum temperature may reach up to 37°C. The weather in the monsoon season is sometimes hot particularly when it is not raining. The temperatures decrease progressively after withdrawal of southwest monsoon in first week of October and weather becomes gradually cool and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Digboi was 39.0°C on 02 August 1971 and the lowest minimum temperature ever recorded was 5.0°C on 11 December 1970. .

HUMIDITY

The air is highly humid throughout the year; the average value of relative humidity is usually above 80%. The relative humidity is less in February to April when it is about 70% in the afternoon.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and latter part of summer season. During the period November to March the skies are moderately clouded and overcast on some days when western disturbances affect the weather of the district.

WINDS

Northeasterly or easterly winds are the most common throughout the year. However, northerly wind is seen during the monsoon season.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions from the Bay of Bengal do not move into Upper Assam. Thunderstorms are frequent in the period from March to September. However, thunderstorms are sometimes experienced during the other months also. Fog occasionally occurs on a few days in the post monsoon and winter seasons.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, predominant wind directions and special weather phenomena respectively for Digboi observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
TINSUKIA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Dholla Bazar (Hydro)	19	a	31.8	59.5	131.0	230.3	299.7	387.7	497.7	354.1	295.1	118.1	26.7	22.2	2453.9	133	80	170.9	05 Sep 2000
		b	3.6	6.2	10.1	12.6	13.8	17.5	20.1	15.8	13.2	6.2	2.2	2.5	123.8	(1995)	(1978)		
Digboi (Obsy)	27	a	44.1	53.1	149.7	164.3	277.7	331.9	443.1	401.7	261.0	133.6	16.3	15.6	2292.1	134	98	157.5	04 Oct 1956
		b	4.2	6.4	10.6	11.4	16.6	18.4	20.6	16.6	12.5	8.3	1.8	1.6	129.0	(1995)	(1959)		
Doom Dooma	17	a	39.4	59.4	131.4	209.5	342.0	378.5	495.4	356.0	255.4	142.2	20.2	14.5	2443.9	118	84	222.8	11 Jun 1923
		b	4.9	6.1	9.4	13.5	16.6	18.8	21.7	16.0	14.1	8.2	2.2	1.9	133.4	(1953)	(1976)		
Margherita	12	a	33.3	60.4	173.9	249.3	344.5	374.0	516.2	396.1	253.9	189.4	25.2	22.7	2538.9	129	44	174.8	01 Jul 1955
		b	3.8	5.2	10.9	14.3	15.2	18.3	19.9	15.6	10.6	9.6	2.1	2.6	128.1	(1959)	(1994)		
Margherita (Hydro)	24	a	21.4	57.4	131.5	201.7	252.9	386.1	530.4	405.5	348.4	123.5	22.7	15.2	2496.7	133	73	170.4	27 Jul 1981
		b	2.6	5.8	9.9	13.0	14.0	17.7	21.7	16.5	14.8	7.5	1.9	1.8	127.2	(1995)	(1978)		
Sadiya	10	a	16.7	59.1	115.6	221.4	308.7	478.9	449.2	322.1	197.3	99.0	16.9	8.6	2293.5	141	66	339.9	04Jul 1908
		b	2.7	4.6	9.0	11.1	15.3	18.5	17.9	12.0	8.4	5.1	2.2	1.1	107.9	(1991)	(1951)		
S.D.A.O. Tinsukia	11	a	19.4	66.3	94.0	233.2	270.9	343.1	490.7	304.9	248.8	72.7	14.3	24.3	2182.6	122	73	115.0	01 Jul 1985
		b	1.8	6.5	7.4	11.9	12.9	17.1	18.8	13.1	12.5	5.3	1.2	2.5	111.0	(1984)	(1994)		
Wilton	10	a	53.5	53.4	154.4	279.2	493.5	519.2	595.5	298.8	285.2	167.0	41.3	29.0	2970.0	136	89	298.5	22 Jul 1955
		b	4.9	6.3	9.0	14.7	16.1	18.9	21.1	13.3	11.3	11.5	3.2	2.4	132.7	(1951)	(1956)		
Tinsukia (District)		a	32.5	58.6	135.2	223.6	323.7	399.9	502.3	354.9	268.1	130.7	22.9	19.0	2471.4	124	73		
		b	3.6	5.9	9.5	12.8	15.1	18.2	20.2	14.9	12.2	7.7	2.1	2.0	124.2	(1987)	(1986)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
TINSUKIA
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1801 – 1900	3	2501 – 2600	6
1901 – 2000	0	2601 – 2700	4
2001 – 2100	2	2701 – 2800	1
2101 – 2200	2	2801 – 2900	1
2201 – 2300	1	2901 – 3000	4
2301 – 2400	3	3001 – 3100	2
2401 – 2500	5		

(Data available for 34 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(DIGBOI)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	22.5	10.5	26.6	09-01-1959	5.5	03-01-1956	87	78
February	23.5	12.4	31.1	06-02-1963	5.6	01-02-1960	83	70
March	27.4	15.3	36.0	27-03-1976	10.0	06-03-1971	79	67
April	29.4	18.2	35.6	29-04-1959	12.4	14-04-1976	79	68
May	29.8	20.7	36.1	31-05-1956	14.6	10-05-1971	82	76
June	31.7	23.3	37.5	12-06-1972	17.7	03-06-1955	85	79
July	32.0	23.7	38.3	04-07-1960	16.6	14-07-1961	87	80
August	32.2	23.9	39.0	02-08-1971	18.0	29-08-1971	87	79
September	31.7	23.3	36.7	05-09-1965	19.4	05-09-1971	86	80
October	29.8	20.7	36.7	04-10-1962	15.0	29-10-1957	86	81
November	27.2	16.4	33.2	05-11-1976	8.2	30-11-1971	84	78
December	23.8	11.2	30.6	03-12-1962	5.0	11-12-1970	86	77
Annual	28.4	18.3	39.0	02-08-1971	5.0	11-12-1970	84	76

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (DIGBOI)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	9	7	11	6	9	5	5	5	5	6	14	18	100
b	5	6	5	7	8	10	11	9	7	9	3	4	84
c	3.4	3.9	3.9	4.5	4.9	5.8	5.8	5.8	5.4	4.7	2.9	2.5	4.5
1730 HOURS IST													
a	14	14	10	5	9	9	7	9	7	9	14	14	121
b	5	4	4	5	6	7	6	5	5	6	3	4	60
c	3	3.1	3.8	4.4	4.3	4.9	5	4.9	5.2	4	2.8	2.6	4

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Predominant Wind Direction (DIGBOI)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Direction in morning	E/NE/W	NE/E	NE/E/N	NE/E/N	NE/E	NE/E	NE/E	NE/E	NE/E	NE/E	NE/E/N	NE/E	
Direction in evening	C/NE/N	NE/C/E	NE/E/N	NE	NE/E	NE/E/N	E/NE/N	E/NE/N	E/NE/N	C/N	C/N/NE	C/NE	

TABLE - 6
Special Weather Phenomena (DIGBOI)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.3	0.8	0.3	1.1	1.1	1.5	0.7	0.5	0.2	0.0	0.1	6.7
Hail	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Dust storm	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
Fog	1.5	1.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.6	2.3	4.9	10.6
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1

UDALGUDI DISTRICT

The climate of this district is characterized by mild hot in summer, cold in winter and humid atmosphere throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer season associated with thunderstorms from March to May. Southwest monsoon season is from June to about the beginning of October. The period of October and November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for 4 raingauge stations for the period ranging from 21 to 43 years. The details of 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 2049.9 mm. During the monsoon season (June to September), the district receives rainfall about 66% of the annual rainfall. June is the rainiest month with an average rainfall of 483.9 mm. The annual rainfall from year to year in the district has large variation. In the pre-monsoon months (March to May) the district receives rainfall about 26% of the annual rainfall. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 173% of the normal occurred in year 1995, while the lowest annual rainfall which was 40% of the normal occurred in 2000. In this fifty year period, there were 10 years in which annual rainfall in the district was less than 80% of the normal and one occasion each when it was consecutive for three years and two years. It is seen from Table 2 that the annual rainfall was between 1601 mm and 2500 mm in 20 years out of 35. On an average there are 89 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 78 at Mangaldai to 98 at Attarikhat. The heaviest rainfall recorded in 24 hours at any station in the district was 500.2 mm at Majbat on 04 June 1976.

TEMPERATURE

There is one meteorological observatory in the district at Majbat. The description of climatic conditions for this district is based on the records of meteorological parameters of Majbat observatory. The cold season starts from the beginning of December when both day and night temperatures begin to decrease. January is the coldest month of the year with the mean maximum temperature of 24.2°C and mean minimum temperature at 9.5°C. In this season the district experiences very cold spells of weather and the minimum temperature on individual days may go down to freezing point of water. The day and night temperatures begin to rise from March and this rise continues till the end of August. The temperature during the southwest monsoon season is sometimes higher than even in the summer season. The highest values of mean temperatures are experienced in the month of August when mean maximum temperature is 32.7°C and mean minimum temperature is 24.7°C. During summer and monsoon seasons maximum temperature may reach up to 37°C on individual days. Since the humidity is quite high during the monsoon season, the weather becomes oppressive in absence of rain

during this period. The weather becomes gradually cool after withdrawal of monsoon season by first week of October and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Majbat was 39.2°C on 14 August 1984 and the lowest minimum temperature ever recorded was - 3.0°C on 22 January 1982. .

HUMIDITY

The air is much humid throughout the year, particularly during the southwest monsoon season, when the relative humidity is high above 80%. During the winter and summer seasons, the humidity is less than 75%.

CLOUDINESS

Skies are heavily clouded to overcast during the southwest monsoon season. Skies are mostly clear or lightly clouded after the withdrawal of monsoon season. In winter season and latter part of summer seasons, skies are sometimes heavily clouded when the district is affected by western disturbances and thunderstorms. Cloudiness generally increases after mid-April.

WINDS

Winds are generally light throughout the year except for short spells of strong winds during thunderstorms in the period of March to May. Winds generally blow from east and northeast direction throughout the year whereas southwesterly or westerly winds blow during southwest monsoon season.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions from the Bay of Bengal which move into Assam do not reach the district to affect its weather. Thunderstorms occur throughout the year. Its frequency is more in latter part of summer and early part of southwest monsoon season. Fog occasionally occurs on a few days during the winter months.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Majbat observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
UDALGUDI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Majbat	24	a	17.4	24.8	48.0	128.3	310.9	573.9	405.5	300.4	256.5	122.3	21.5	4.0	2213.5	186	70	500.2	04 Jun 1976
		b	1.4	2.2	3.6	8.3	12.4	16.0	15.3	11.0	12.3	6.6	1.4	0.5	91.0	(1991)	(1998)		
Majbat (Obsy)	43	a	14.3	18.9	53.8	147.4	330.6	452.6	367.4	289.7	231.1	110.3	13.6	5.9	2037.8	137	47	235.0	09 Jun 1962
		b	1.2	2.2	3.8	8.9	14.3	14.8	14.6	11.8	10.3	6.0	1.3	0.7	89.9	(1993)	(1973)		
Mangaldai	21	a	18.9	22.9	54.5	137.5	213.8	392.3	261.6	199.2	120.5	98.9	9.5	3.4	1533.0	285	53	386.1	17 Jun 1997
		b	1.1	1.7	4.0	8.8	12.2	11.9	13.0	11.3	7.3	5.5	0.8	0.5	78.1	(1997)	(2000)		
Attarikhat	22	a	16.7	21.3	83.7	201.3	393.5	516.8	437.8	282.9	308.3	121.5	16.8	15.3	2415.9	145	90	278.4	06 Jun 1918
		b	1.8	2.2	5.6	10.1	15.1	16.2	15.2	12.2	10.8	6.1	1.4	1.1	97.8	(1959)	(1967)		
UdalguDi (District)		a	16.8	22.0	60.0	153.6	312.2	483.9	368.1	268.0	229.1	113.3	15.8	7.1	2049.9	173	40		
		b	1.4	2.1	4.3	9.0	13.5	14.7	14.5	11.6	10.2	6.1	1.2	0.7	89.3	(1995)	(2000)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
UDALGUDI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
801 – 900	1	2201 – 2300	0
901 – 1000	1	2301 – 2400	3
1101 – 1100	1	2401 – 2500	2
1101 – 1200	1	2501 – 2600	1
1201 – 1300	1	2601 – 2700	1
1301 – 1400	2	2701 – 2800	0
1401 – 1500	2	2801 – 2900	0
1501 – 1600	1	2901 – 3000	0
1601 – 1700	1	3001 – 3100	1
1701 – 1800	1	3101 – 3200	1
1801 – 1900	3	3201 - 3300	0
1901 – 2000	4	3301 - 3400	0
2001 – 2100	5	3401 – 3500	0
2101 – 2200	1	3501 – 3600	1

(Data available for 35 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(MAJBAT)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	24.2	9.5	29.5	28-01-1982	-3.0	22-01-1982	75	73
February	26.3	12.3	34.8	22-02-1977	0.0	27-02-1985	70	64
March	29.7	15.7	38.6	01-03-1965	1.0	21-03-1985	68	61
April	30.4	19.3	38.0	27-04-1979	3.7	10-04-1985	74	69
May	31.1	21.6	37.4	20-05-1985	11.5	03-05-1985	78	73
June	31.7	23.7	37.8	06-06-1979	14.9	21-06-1972	82	72
July	32.2	24.5	38.4	06-07-1984	16.0	13-07-1984	82	77
August	32.7	24.7	39.2	14-08-1984	15.5	08-08-1984	81	76
September	32.1	24.0	37.4	12-09-1985	14.2	30-09-1984	80	78
October	30.6	20.7	37.6	20-10-1979	10.0	24-10-1977	75	77
November	27.9	15.6	33.0	02-11-1990	3.2	30-11-1984	72	74
December	25.1	10.9	31.2	17-12-1985	2.3	01-12-1984	73	74
Annual	29.5	18.5	39.2	14-08-1984	-3.0	22-01-1982	76	72

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(MAJBAT)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	7	4	5	2	1	0	2	1	2	4	10	11	49
b	3	2	2	4	10	10	10	10	9	6	3	2	71
c	2.5	2.8	2.7	4.1	5.2	6.0	6.3	5.8	5.2	3.7	2.3	2.0	4.1
1730 HOURS IST													
a	5	3	3	2	1	0	0	0	2	3	7	8	34
b	1	1	2	3	5	6	5	5	6	4	2	2	42
c	2.3	2.7	3.0	3.7	4.1	5.1	4.9	4.8	4.5	3.2	2.2	2.0	3.5

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(MAJBAT)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	2.4	3.9	5.0	6.5	5.3	4.2	4.3	3.8	3.1	2.7	2.2	2.3	3.8
Direction in morning	C/NE/ E	C/NE/ E	NE/E	NE/E	C/NE/ E	C/NE/ E	C/NE/ E/SW	C/E/NE/ SW/W	C/E/ NE	C/E/ NE	C/E/ NE	C/E/ NE	
Direction in evening	C	C/NE	C/NE/ E	C/NE/ E	C/NE/ E	C/NE/ SW	C/SW/ W/NE/E	C/SW/ W	C/SW/ W	C	C	C	

TABLE - 6
Special Weather Phenomena
(MAJBAT)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.5	1.2	6.8	7.0	5.0	2.0	2.3	1.7	0.6	0.1	0.1	27.4
Hail	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Dust storm	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Fog	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.9

CLIMATE OF MEGHALAYA

General Description

Meghalaya state is situated in the northeastern region of India. The state is bounded on the north and east by Assam and on the south and west by Bangladesh. Meghalaya is spread over an area of 22,429 square kilometers, and lies between 25°01 'N and 26°05' N latitude and 89°50' E and 92°52' E longitude.

The state has mostly hilly terrain with elevations varying from 150 metres to 1965 metres above mean sea level having Khasi hills in central part, Jaintia hills in eastern part and Garo hills in western part and some plain area of low elevation. The state of Meghalaya, literally meaning the abode of clouds, is geographically known as the "Meghalaya Plateau". The boundary of the plateau in the state is not well defined in the north due to the broken hill ranges**.** The state capital is Shillong which is located in Khasi Hills at an altitude of 1496 m. The state has physiographic variation with hills and plants/trees, in the northern and western parts which are highly dissected while in the south the slopes are steep and regular with dense forest.

The Garo hills region is characterized by the presence of the Tura and Arbella ranges running parallel in the east-west direction. The Tura range is about 50 km long, runs from Siju to Tura and it has the highest peak as Nokrek peak with an altitude of 1412 m. The Arbella range up to height 999 m runs parallel to the Tura range towards its north. It gradually increases in height and join Tura towards the South. The remaining parts of the Garo Hills consist of hill ranges running from north to south with elevations varying from 450 to 600 m.

The central and eastern parts of the plateau (Khasi and Jaintia hills regions) have a more even topography. This region of the plateau is characterized by many penne plain surfaces, flat-topped hills and numerous rivers. The highest point of the plateau is Shillong peak with an elevation of about 1965 m and this is the highest in the entire state.

The topography of the Khasi and Jaintia Hills can be characterized into the following three parts based on their physiographic characteristics:

1. The northern undulating hills,
2. The central upland zone and
3. The southern plateau.

The northern hills with an elevation ranging from 170 to 820 m generally slope towards the Brahmaputra river. It is almost flat above an elevation of 490 m. Some central and eastern upland areas with an average elevation of about 1500 m or more which cover more than one-third of the central and eastern region of

Meghalaya and run from west to east and act as a watershed between Surma Valley in Bangladesh and Brahmaputra Valleys in Assam. Steep slopes are seen in the southern parts of the central and eastern Meghalaya plateau which have significant orographic features

The river system is greatly influenced by its orographic features. Tura range in Garo Hills and central uplands in Khasi and Jaintia Hills form watersheds, and from these watersheds the rivers flow down towards the plains of Bangladesh in the south and Brahmaputra river in the north.

In the Garo hills some important rivers flowing in the northern part from west to east are the Kalu, Ringgi, Chagua, Ajagar, Didram, Krishnai and Dudnai. Of these only the Krishnai and Kalu are navigable. The important rivers flowing in the southern part are Daring, Sanda, Bandra, Bhogai, Dareng and Simsang. Simsang is the largest river in the Garo hills but navigable only for about 30 Km, whereas, the other navigable rivers are Nitai and the Bhupai.

In the central and eastern region of the plateau, the important northward flowing rivers are Umkhri, Digaru and Umiam and the south-flowing rivers are Kynchiang (Jadukata), Mawpa, Umiew or Barapani, Myngot and Myntdu.

The state is a part of meteorological sub-division – Assam and Meghalaya. There are following seven districts in the state, viz.

Sr. No.	Name	Sr. No.	Name
1.	East Garo Hills	5.	South Garo Hills
2.	East Khasi Hills	6.	West Garo Hills
3.	Jaintia Hills	7.	West Khasi Hills
4.	Ri-Bhoi		

Climate

The climate in the regions of the state varies with altitude and it is uniquely pleasant in the region of Khasi and Jaintia Hills in the year except winter season, but over the plains of Garo Hills, the climate is warm and humid except in winter. The Shillong area is of the highest elevated part of the state which experiences generally low temperatures. The maximum temperature in this region rarely goes beyond 28 degree celsius whereas in winters the minimum temperatures can be sub-zero at some places. This is the wettest state of India with annual rainfall from 500 cm to 1250 cm in some areas. Mawsynram village near Cherrapunji of East Khasi Hills district and in the south of capital Shillong holds the world record for the highest rainfall (1244 cm) in a year. While Cherrapunji town holds the world record for the heaviest rainfall (1174 cm) with a large number of rainy

days(156) in a year. The western part of the plateau, comprising the Garo Hills region with low elevations, experiences higher temperatures than central and eastern parts of the state.

The year may be divided into four seasons: The period of June to September is of southwest monsoon season although the monsoon sets in the state by the beginning of June and it can extend up to mid-October. This is followed by post monsoon season till November. Winter sets in by early December and lasts up to the first week of March and is followed by pre-monsoon (summer) season of thunderstorms till May.

Areas in the state under each climate pattern based on Koppen's classification are shown in Fig. 2. This broad classification is based on annual and monthly mean values of temperature in degree celsius and rainfall in centimeter. Central and eastern parts of the state i.e. East Khasi Hills, Jaintia Hills, West Khasi Hills (except to some western part) districts and southern part of Ri-Bhoi district come under the climate type: Tropical upland, mild and dry winter, short warm summer (Cwb). Western part of the state i.e. East Garo Hills, West Garo Hills, South Garo Hills districts and northern part of Ri-Bhoi and extreme western part of West Khasi Hills districts come under the climate type: Subtropical monsoon with mild and dry winter, hot summer (Cwa).

Sea Level Pressure and Winds

The seasonal variation in atmospheric pressure over the state occurs in a systematic way with a maximum in the winter and a minimum in the southwest monsoon season. During winter, the pressure is slightly lower over the west and increases towards the east. The pressure decreases with the approach of summer and reaches minimum in July over the state.

Winds are light to moderate throughout the year. Sometimes they become strong over hilly region during the months; April to October as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion. They have an easterly component in winter and are replaced by a southwesterly component in March. The winds turn from south to southwest and strengthen, reaching the maximum value in April. In September, as pressure gradient decreases over the state, the winds become light and again easterly component is seen from October.

Table I gives the monthly mean wind speed in kilometer per hour and predominant wind direction in the morning and evening for observatory stations in the state.

Temperature

Table II gives the mean maximum and minimum temperatures at the observatory stations of the state. Fig. 2(a,b,c,d) and 3(a.b.c.d) show the spatial distribution of mean maximum and mean minimum temperatures for the representative months of each season of a year.

This state being mostly hilly, the temperatures vary sharply according to its topography. It can be seen that there is no distinct summer in the hilly terrain of the state and the temperatures in the monsoon months are equal or slightly more than that of the summer months.

In the plain region i.e. western and extreme northern part of the state, April and May are the hottest part of the year with mean maximum temperature of 30ºC while in the hilly terrains August is the hottest month with mean maximum temperature about 24ºC. The temperature recorded over Shillong plateau region and elevated places are about 6 - 8ºC lower than plain areas. In the month of May mean maximum temperature ranges between 22ºC and 30ºC over the state. The highest values are observed over the western and extreme northern parts of the state as shown in Fig. 2(a). During July, a slight drop in mean maximum temperature is observed, with values ranging between 22ºC and 29ºC (Fig. 2(b)). The temperature pattern of October Fig. 2(c) is quite similar to that of July. The values of mean maximum temperature in October range between 21ºC and 29ºC. From Fig. 2(d), it is observed that mean maximum temperature of January ranges from 14ºC to 23ºC.

January is the coldest month, when the minima of mean minimum temperature are observed over central hilly part of the state. During this month value ranges between 4ºC and 11ºC (Fig. 3(a)). From Fig. 3(b) the temperature ranges between 13ºC and 20ºC. It is higher than 19ºC over extreme western part of the state. From Fig. 3(c), the gradient of mean minimum temperature is observed to decrease during the month of July. The values of mean minimum temperature range between 17ºC and 22ºC. During the month of October, the values of mean minimum temperature range between 13ºC and 20ºC as shown in Fig. 3(d).

The highest maximum temperature and the lowest minimum temperature ever recorded up to year 2010 are depicted in Fig. 4 and Fig. 5 respectively. The highest maximum temperature ever recorded in the state was 39.4ºC on 01 May 1960 at Tura observatory. The highest maximum temperature in the state generally varies from 30 ºC to 40 ºC. This temperature is higher than the respective normal by 10ºC. The lowest minimum temperature ever recorded in the state was -3.3ºC at Shillong on 30 December 1983 which is 10ºC lower than the respective normal. However, the lowest minimum temperature may be -4 ºC to 3 ºC

Both, the maximum and minimum temperatures rise rapidly from the end of February and they reach at peak in June and remain high till August or September. The increase in both temperatures during February to April ranges from 5ºC to 7ºC at individual stations. From the beginning of April to August, the change in mean maximum temperature is only about 1ºC at individual stations, whereas rise in mean minimum temperature is about 2ºC to 4ºC at individual stations. The night temperatures start falling rapidly after September, while the day temperatures follow this trend after October and both attain the lowest values in January.

July and August have the lowest diurnal range of temperature about 4ºC to 7 ºC over the state. The diurnal range increases after withdrawal of monsoon. During the period October to May, the diurnal range is of the order of 8 ºC to 10 ºC, being the highest in January and February.

Humidity

Table III gives the mean relative humidity at 0830 and 1730 HRS IST for observatory stations in the state. The relative humidity is generally high during latter part of summer to the early part of post monsoon season i.e. May to October. It is about 80% in May and October, rising to about 88% in July and August.

In central hilly part of the state, afternoon relative humidity is generally high throughout the year and more than the morning relative humidity. The afternoon relative humidity is 15% to 20% higher than morning relative humidity from October to March. During this period values of relative humidity in the morning are about 60% to 75%. However, relative humidity in western areas of low elevation is generally more in the mornings than in evenings.

Cloudiness

Table IV and IV(a) give the mean monthly and total cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 HRS IST respectively for observatory stations in the state.

The sky is almost cloudy throughout the year. During the period May to September the skies are heavily clouded to overcast. In hilly areas cloudiness is more in the mornings than afternoons throughout the year and in the plains the cloudiness during October to March months is more in the afternoons than mornings. On an average the skies are overcast for 11 to 20 days in a month during the monsoon season. By October the cloudiness begins to decrease. During November to March, the skies are clear with an average of 10 to16 days in the mornings and around 4 to 8 days in the evenings. However, during this period the skies are more clouded in the afternoons than mornings.

Rainfall

Table V gives the districtwise and statewise mean monthly and annual rainfall and number of rainy days (i.e. days with rainfall of 2.5 mm or more). Fig. 6 and Fig. 6 (a to d) depict the spatial distribution of the annual and seasonal rainfall for the winter, pre-monsoon, southwest monsoon and post monsoon season respectively.

The variation in rainfall is large from place to place in the state due to variation in altitudinal and topography of the state. It is observed that there is abundant rainfall in the state especially in the southeastern

sector of the state i.e. East Khasi Hills and Jaintia Hills districts where both districts receive about 600 cm in a year. Jaintia Hills district receives maximum amount of rainfall (as annual normal 637.7 cm) in a year and annual normal rainfall of East Khasi Hills district is 555.5 cm. In general, the rainfall is more in the southern region of the state, compared to the northern region. Ri-Bhoi district in northern part of the state receives minimum amount of rainfall i.e. 213.1 cm in a year. The total annual rainfall for the state as a whole is 390.4 cm and total number of rainy days in a year are 120. During pre-monsoon season this hilly state receives a significant amount of rainfall due to more thunderstorms activity in presence of good amount of moisture. The pattern of rainfall distribution over the state during the pre-monsoon season (March-May) Fig. 6(b) and southwest monsoon season (June-September) Fig.6(c) generally resembles to that of the spatial distribution of the annual rainfall Fig. 6. It is observed that during post monsoon season the rainfall is more in the southeastern region of the state Fig. 6(d).

The southwest monsoon is the principal rainy season of the state. Of the total annual rainfall, 72% is received during the southwest monsoon season (June to September) whereas 19% is received during the pre-monsoon months (March to May), 7% is received during the post monsoon months; October and November, and 2% is received in the winter months (December to February).

The percentage of seasonal number of rainy days with respect to the annual number of rainy days is 64% for the southwest monsoon season, 25% for the pre-monsoon season, 8% for the post monsoon season and 3% for the winter season.

The southwest monsoon sets in by the first week of June over entire state. July is the rainiest month accounting for 24% of the annual rainfalll. The number of rainy days during the southwest monsoon season ranges from 17 to 21 with a maximum of 21 in July.

The withdrawal of the southwest monsoon begins by the beginning of October and completely withdraws from the state by the middle of this month.

The most common rain giving systems over the state are depressions and cyclones originating in the Bay of Bengal and low pressure associated with thunderstorms.

The occasional winter rains accounting for around 2% of the annual rainfall which is very vital for agriculture. The rain occurs in association with the induced lows arising due to the passage of western disturbances moving eastward over the region. The rainfall of about 19% of the annual received in the pre-monsoon months is significant due to thunderstorms.

The features of rainfall described above are also evident from Fig. 7(b), which shows the annual and seasonal rainfall for the individual districts as well as for the state and provides a measure for comparison of seasonal rainfall with the annual for both districtwise and statewise rainfall.

Table VI gives the monthly and annual rainfall for river catchments No. 326 and 504 in the state. The annual rainfall of these river catchments are shown in Fig. 8. Both these catchments are formed by the rivers; Kalu, Ringgi, Chagua, Ajagar, Didram, Krishnai, Dudnai, Daring, Sanda, Bandra, Bhogai, Dareng, Simsang, Umkhri, Digaru, Umiam, Kynchiang (Jadukata), Mawpa, Umiew or Barapani, Myngot and Myntdu. Table VI shows the districts/parts of districts of Meghalaya covered by these catchments. Part of catchment No. 504 formed by Brahmaputra river upto Bangladesh border covers East Garo Hills, Ri-Bhoi and West Garo Hills districts and part of Jaintia Hills, East Khasi Hills and West Khasi Hills, receives an annual rainfall of 2617.0 mm with about 115 rainy days. Part of catchment No.326 formed by the streams flowing through Meghalaya into Bay of Bengal which covers South Garo Hills district and part of the districts of West Khasi Hills, East Khasi Hills and Jaintia Hills receives an annual rainfall of 8530.6 mm with 139 rainy days.

Rainfall Variability

The spatial distribution of variation of annual rainfall over Meghalaya is depicted in Fig. 9. Coefficient of Variation (CV), which is expressed as percentage is defined as:

$$C.V. = \frac{\text{Standard deviation } (\sigma)}{\text{Normal } (N)} \times 100$$

It is observed from Fig. 9 that the values of CV of annual rainfall range between 10.8% and 44.5% over the entire state of Meghalaya.

The spatial distribution of CV of seasonal rainfall over Meghalaya is shown in Fig. 9(a), 9(b), 9(c) and 9(d) for the seasons: pre-monsoon season (March to May), southwest monsoon season (June to September), post monsoon season (October and November) and winter season (December to February) respectively.

It is observed that the values of CV range between 16.8% and 64.4% (Fig. 9(a)) in the pre-monsoon season. The eastern and western regions of Meghalaya exhibit the highest variability with values of CV exceeding 50% while the central region of the state exhibits the least CV of about 30%.

During the southwest monsoon season the rainfall variability is low with CV ranging between 14.7% and 45.7% (Fig. 9(b)). The rainfall variability all over the state during this season is an average of about 45% except for a small portion in the Ri-Bhoi district where the CV is an average below 20%.

During post monsoon season the values of CV range between 41.1% and 121.0% (Fig. 9(c)). The values of CV all over the state during this season is an average of about 75% except for small portions of the Ri-Bhoi, East Khasi Hills and Jaintia Hills districts where they have low CV about 45% and some portion of the East Garo Hills district where it is higher at about 115%.

During the winter season the values of CV show a steep gradient with range between 39.5% and 145.6% (Fig. 9(d)). The western region of the state exhibits higher variability of about 100% or even more especially in the East Garo Hills district where it is about 140%. While the remaining parts of the state exhibit lower variability of about 60 to 90%. Some part of Ri-Bhoi and East Khasi Hills districts exhibit variability of about 110%.

The pattern of variability of annual rainfall over Meghalaya state which ranges between 10.8% and 44.5%, and it is very similar to that of the monsoon season which ranges from 14.7% to 45.7%. It is relatively low and such it is inferred that the bulk of the rainfall in the state is received during the monsoon season. The variability of rainfall is the highest in winter season and it is also much higher during the pre-monsoon and post-monsoon seasons. It is inferred that the contribution to the annual rainfall but the contribution of winter season is comparatively less.

Droughts

Meteorological drought over an area or a place may be defined as a situation when the annual rainfall over the area or place is less than 75% of the normal. It is classified as “Moderate drought” if the rainfall deficit is between 25% and 50% and “Severe drought” when it is more than 50%. Areas where frequency of drought as defined above is more than 20% of the years examined, such areas 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 the period1951 - 2000, which satisfies the criteria for “drought areas”, or “chronically drought affected areas”. Although the East Khasi Hills and Jaintia Hills districts reported less rainfall for about 15 years and 9 years out of the 50 years respectively under consideration of drought condition. The areas can not be considered as “drought area” as data for all 50 years for all stations in the district are not available.

The following districts of the state were affected by drought during some years or other during the period 1951 - 2000. The details of yearwise occurrence of drought over each district during the 50-years period of 1951 - 2000 are given below. The figures within the brackets against each district indicate the number of

occasions during the 50-years period when these districts were affected by drought. Ri-Bhoi district was not affected by drought even on one occasion during this period.

East Khasi Hills(15), Jaintia Hills(9), West Garo Hills(4), East Garo Hills(2), and West Khasi Hills(2)

Occurrence of drought conditions in successive years is not frequent in the state. However, only three individual districts have had successive years of drought. Severity of drought not only depends upon the order of the 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 year may not be as high as in a single year.

The following table (i) depicts districtwise years of successive drought during the 50 year period 1951-2000.

Table (i)

Sr. No.	Name of Affected districts	Years of Successive Drought
1.	East Khasi Hills	1981- 1982- 1983 - 1984- 1985- 1986, 1994- 1995
2.	South Garo Hills	Data not available
3.	West Garo Hills	1980- 1981
4.	East Garo Hills	Nil
5.	Ri-Bhoi	Nil
6.	West Garo Hills	Nil
7.	Jaintia Hills	1952- 1953, 1955 – 1956

Fig. 10 shows the percentage frequency of drought and years of successive drought in the districts during the period 1951 - 2000. Incidence of widespread and fairly widespread drought over the state in any particular year was not seen.

There were no drought conditions in the state in the following years: 1951, 1954, 1957, 1958, 1960, 1962, 1964 to 1969, 1971, 1973 to 1976, 1979, 1987 to 1991, 1993 and 1998 to 2000.

Excessive Rainfall:

Rainfall sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall regions. An annual rainfall of 125% or more of the normal is considered as excessive rainfall.

Fig. 11 shows the percentage frequency of excessive rainfall years and successive years of excessive rainfall during the period 1951 - 2000. It is seen from the figure that the frequency of excessive rainfall is generally higher in the southern western regions of the state.

The following table (iii) gives the districtwise excessive rainfall years and the highest annual rainfall (expressed as percentage of normal) with the years of occurrence.

Table (iii)

S. No.	District	Years of excessive Rainfall	Highest amount of Rainfall in cm	Rainfall in % of normal	Year
1.	East Khasi Hills	1951, 1952, 1953, 1954, 1955, 1956, 1960, 1966, 1971, 1974, 1975, 1979, 1988, 1991, 1998, 1999, 2000.	1288.8	232	1974
2.	West Garo Hills	1952, 1953, 1960, 1964, 1976, 1984, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997.	758.1	260	1995
3.	East Garo Hills	1977, 1980.	484.6	173	1977
4.	Ri-Bhoi	NIL	249.3	117	1991
5.	West Khasi Hills	1983, 1984, 1988, 1991.	619.3	170	1988
6.	Jaintia Hills	1984, 1986.	2149.2	337	1984

From the above table, it is seen that during the 50 year period 1951 - 2000, there were 33 years in which some districts or the other in the state recorded excessive rainfall. In the year 1984, Jaintia Hills district received the highest excessive rainfall (2149.2 cm), at 337% of the annual normal rainfall. There was no year in which all the districts of the state experienced excessive rainfall. East Khasi Hills and West Garo Hills districts experienced maximum number of excessive rainfall years (17 each), however, Ri-Bhoi district did not experience any year with excessive rainfall. The rainfall data for South Garo Hills district is not available. The successive years of excessive rainfall against each district are listed below:

Successive years of Excessive Rainfall (Districtwise)

Sr. No.	Districts	Successive years of Excessive Rainfall
1.	East Khasi Hills	1951-1952-1953-1954- 1955- 1956, 1974- 1975, 1998- 1999- 2000.
2.	West Garo Hills	1952- 1953, 1987- 1988- 1989- 1990- 1991- 1992- 1993- 1994- 1995- 1996- 1997.
3.	East Garo Hills	Nil
4.	Ri-Bhoi	Nil
5.	West Khasi Hills	1983- 1984.
6.	Jaintia Hills	Nil

The heaviest rainfall in 24 hours recorded at any station in the state was 1563.0 mm on 16 June 1995 at Cherrapunji in East Khasi Hills district.

Cyclonic storms and depressions

Table VII depicts the total number of storms/depressions which affected the state during the period 1891-2012 The cyclonic storms and depressions, which affect India, mostly originate and/or intensify over the Bay of Bengal, mainly during the months of May to November. They usually travel northwestwards or westwards and cross the east coast of India. In general, storms and depressions weaken on entering land. Meghalaya though an inland state, the coast is only about 350 km away. The state therefore does not experience the full fury of severe storms/depressions like the coastal regions especially in the pre monsoon months. However, in association with these systems, heavy to very heavy rainfall occurs over the affected districts. During the course of their movement, they sometimes turn or recurve towards north or northeast. This point of turning or recurving progressively shifts westwards till September. In May, these disturbances recurve while still out in the Bay of Bengal. Hence, few of them cross the coast of Bangladesh and travel on inland, affecting the weather of the state.

During January to March and July to August, the state was not affected by Bay storms/depressions even on a single occasion during the period 1891 to 2012, but during the remaining months, it was affected 26 times with a maximum of 10 in May month. The depressions during October and November generally form over the Bay of Bengal and travel towards Meghalaya and other states in the northeast region. Storms/depressions in the Bay of Bengal progressively form in the lower latitudes, with the advance of the year.

Other Weather Phenomena

(a) Thunderstorms and Duststorms

Thunderstorms over North East India, are known as 'Norwesters' (moving from NW direction) or Kalbaishakhi (highly destructive local storms in the month of Baishakh). Convective activity is mostly responsible for the occurrence of thunderstorms and dust storms. With the advance of the summer, thunder activity becomes pronounced due to non-uniform heating of the land in the state as orographic factor plays a dominant role for it. There is a very less possibility of dust storms in the state. In hilly regions maximum thunderstorms occur in the pre-monsoon season while in the plain areas maximum thunderstorms are experienced in the monsoon season. On an average, the frequency of occurrence of thunderstorms is the highest at Cherrapunji i.e. about 30 days and about 20 days at Shillong in a year. Thunderstorms activity attains its maximum in the period April to June and its frequency is the highest in May. During the winter season, the state may experience thunderstorm activity resulting from low pressure areas induced due to eastward moving upper air disturbances known as "Western Disturbances". Thunderstorm activity is the least in December. Hailstorms occur rather rarely in the state, during the months of January to May.

(b) Fog

Fog is generally experienced in evenings and mornings in the hilly areas throughout the year, when the air is still moist and is easily cooled below the dew point while rising over high elevations. Their frequency of occurrence is maximum during the monsoon or winter months in hilly terrain**.**

(c) Earthquakes

Meghalaya state is prone to seismic activity and comes under seismic zone V. Details of earthquakes of intensity 5.0 or more at Richter scale having epicenter in the state are given in Table VIII. The state has experienced 18 earthquakes under moderate and high category during the period of 1862 to 2012. Moderate to heavy damage in property and human life occurred due events of the earthquakes in the state as well as neighborhood regions. It is seen from the Table VIII that the state has experienced maximum number (8) of earthquakes in July. The highest intensity earthquake is experienced of 7.1 at Richter scale in July 1930 and in September 1923 having epicenter at 25º48'N latitude and 90 º 12' E longitude and at 25º 18'N latitude and 91º 00'E longitude respectively.

TABLE – 1
MEGHALAYA
MEAN WIND SPEED (Kmph) AND PREDOMINANT WIND DIRECTION

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Cherrapunji	a	4.0	5.9	7.4	7.5	6.1	6.5	7.4	5.9	4.7	3.9	3.8	3.7	5.6
	m	E/NE	SW/E	SW	SW	SW	SW	SW	SW/E/SE	SW/E/C	E/NE	E	E	
	e	C/SW/W	SW	SW	SW	SW/C	SW/C	SW	SW/C	C/SW	C/NE/SW/W	C/NE/W	C/NE	
Shillong (C.S.O.)	a	4.1	6.2	8.4	9.5	7.2	5.6	4.7	4.3	3.7	3.4	3.8	3.8	5.4
	m	C/E/W	W/SW	W/SW	SW/W	SW/W	C/SW	C/SW/W	C/SW/E	C/SW	C/E	C/E/SE	C/E/SE	
	e	C/NW	C/SW/NW	SW/C	SW/C	C/SW	C/SW	C/SW	C/SW/S	C/SW	C/SW/SE	C/SE	C/E/SE	
Tura	a	5.6	6.3	7.3	8.8	7.7	6.8	6.1	4.7	4.4	4.5	5.2	5.3	6.1
	m	E/C	E/C	E/SE	S/SW	S/C/SW	C/S/SW	S/C/SW	C/S/SW	C/S/SW	C/E	E/C	C/E	
	e	C/SW/S	SW	SW/S	S/SW/SE	S/SW	S/SW	S/SW	SW/S	C/SW/S	C/E/SE/S/SW	C/SE/E	C/SW/E/SE/S	
State Mean	**a**	**4.6**	**6.1**	**7.7**	**8.6**	**7.0**	**6.3**	**6.1**	**5.0**	**4.3**	**3.9**	**4.3**	**4.3**	**5.7**

a Mean Wind Speed in kms per hour
m Predominant wind direction in the morning
e Predominant wind direction in the evening
C Calm

TABLE – II

MEGHALAYA

MEAN DAILY MAXIMUM AND MINIMUM TEMPERATURE (ºC)

STATION	TEMP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Cherrapunji	Max	15.8	17.4	20.5	22.1	22.5	22.7	22.2	23.0	22.9	22.9	20.7	17.4	20.8
	Min	6.7	8.5	12.1	14.4	15.9	17.6	17.9	18.0	17.3	15.4	11.9	8.3	13.7
Shillong (C.S.O.)	Max	14.6	16.8	21.0	23.3	23.3	23.7	23.7	24.0	23.2	21.7	19.1	15.9	20.9
	Min	5.7	7.2	11.0	13.9	15.4	17.4	17.8	17.6	16.6	14.2	10.7	7.1	12.9
Tura	Max	22.7	24.8	29.0	30.4	29.7	29.1	28.6	28.7	29.0	28.8	26.4	23.3	27.5
	Min	11.0	12.7	16.8	19.3	19.4	20.5	21.6	21.5	21.0	19.1	15.6	12.5	17.6
State Mean	**Max**	**17.7**	**19.7**	**23.5**	**25.3**	**25.2**	**25.2**	**24.8**	**25.2**	**25.0**	**24.5**	**22.1**	**18.9**	**23.1**
	Min	**7.8**	**9.5**	**13.3**	**15.9**	**16.9**	**18.5**	**19.1**	**19.0**	**18.3**	**16.2**	**12.7**	**9.3**	**14.7**

TABLE III

MEAN RELATIVE HUMIDITY (%)

MEGHALAYA

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Cherrapunji	M	60	61	64	78	84	93	96	92	89	73	62	61	76
	E	77	73	71	82	87	92	93	91	91	86	80	80	84
Shillong (C.S.O.)	M	61	57	52	63	75	84	87	85	83	71	62	58	70
	E	87	75	66	71	81	86	87	88	90	90	88	88	83
Tura	M	71	67	63	71	76	82	82	83	81	78	72	71	75
	E	65	59	56	67	72	80	82	84	82	78	70	68	72
State mean	**M**	**64**	**62**	**60**	**71**	**78**	**86**	**88**	**87**	**84**	**74**	**65**	**63**	**74**
	E	**76**	**69**	**64**	**73**	**80**	**86**	**87**	**88**	**88**	**85**	**79**	**79**	**80**

M : MORNING E : EVENING

TABLE IV

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

MEGHALAYA

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Cherrapunji	a	14	12	11	3	1	0	0	0	0	4	7	12	64
	b	1	2	3	7	11	20	24	20	15	5	1	1	110
	c	1.9	2.3	2.9	4.9	5.9	7	7.4	6.9	6.3	3.8	2.4	1.8	4.5
Shillong (C.S.O.)	a	17	14	14	6	1	0	0	0	0	4	11	16	83
	b	1	1	1	4	7	13	15	10	8	4	1	1	66
	c	1.5	2	2.2	3.6	5.4	6.5	6.8	6.4	5.9	3.7	2.1	1.5	4.0
Tura	a	16	14	15	6	3	2	1	2	2	6	13	16	96
	b	7	6	7	11	14	19	21	21	17	7	3	5	138
	c	3.1	3.4	3.4	4.7	5.9	6.7	6.8	6.6	6.2	4.3	2.7	2.6	4.7
Mean	**a**	**16**	**13**	**13**	**5**	**2**	**1**	**0**	**1**	**1**	**5**	**10**	**15**	**82**
	b	**3**	**3**	**4**	**7**	**11**	**17**	**20**	**17**	**13**	**5**	**2**	**2**	**104**
	c	**2.2**	**2.6**	**2.8**	**4.4**	**5.7**	**6.7**	**7.0**	**6.6**	**6.1**	**3.9**	**2.4**	**2.0**	**4.4**

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.

TABLE IV A

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

MEGHALAYA

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Cherrapunji	a	7	6	7	2	0	0	0	0	0	2	5	7	36
	b	2	2	3	5	8	14	16	10	7	4	1	1	73
	c	2.9	2.9	3.2	4.7	5.5	6.4	6.7	6.3	5.8	4.1	3.1	2.7	4.5
Shillong (C.S.O.)	a	3	3	5	2	1	0	0	0	0	0	2	3	19
	b	8	5	3	2	5	7	8	8	8	5	4	6	69
	c	5.2	4.4	3.8	4.2	5.2	6.3	6.4	6.5	6.3	5.2	4.6	4.7	5.2
Tura	a	5	7	13	6	3	1	0	0	0	2	4	4	45
	b	13	10	8	10	11	17	21	22	18	15	9	13	167
	c	4.9	4	3.7	4.7	5.3	6.7	7.1	7.2	6.8	5.5	4.8	5	5.5
Mean	**a**	**5**	**5**	**8**	**3**	**1**	**0**	**0**	**0**	**0**	**1**	**4**	**5**	**32**
	b	**8**	**6**	**5**	**6**	**8**	**13**	**15**	**13**	**11**	**8**	**5**	**7**	**105**
	c	**4.3**	**3.8**	**3.6**	**4.5**	**5.3**	**6.5**	**6.7**	**6.7**	**6.3**	**4.9**	**4.2**	**4.1**	**5.1**

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.

Table V

MEAN RAINFALL (mm) AND NUMBER OF RAINY DAYS
MEGHALAYA

DISTRICT		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
East Garo Hills	a	5.6	18.5	66.6	274.0	405.7	547.3	543.4	370.8	358.3	148.5	53.4	8.9	2801.0
	b	0.5	0.8	3.9	11.0	16.1	18.7	19.1	14.4	13.6	5.4	1.7	1.0	106.2
East Khasi Hills	a	16.0	25.0	114.2	278.5	664.8	1323.3	1346.6	901.4	563.5	269.2	40.9	11.9	5555.3
	b	1.5	1.9	5.1	10.6	17.3	21.1	21.1	19.1	16.7	8.7	2.0	0.9	126.0
Jaintia Hills	a	34.8	44.2	113.8	292.0	614.2	1346.0	1623.0	941.1	714.3	528.7	115.2	10.2	6377.5
	b	1.5	2.5	5.6	10.3	16.8	22.4	24.4	20.9	17.1	10.0	2.5	0.9	134.9
Ri-bhoi	a	16.3	15.6	55.7	117.4	273.3	340.4	425.2	400.4	313.2	138.8	25.7	8.8	2130.8
	b	1.1	1.6	4.4	9.5	15.5	17.5	19.5	19.7	17.1	7.2	2.1	0.9	116.1
West Garo Hills	a	10.5	12.1	49.0	181.6	404.7	595.5	603.7	451.3	395.7	183.1	15.5	13.0	2915.7
	b	0.8	1.1	2.9	8.6	16.0	19.9	21.7	19.5	18.2	8.5	1.3	0.7	119.2
West Khasi Hills	a	19.9	32.0	60.4	160.6	352.2	651.4	1050.3	607.8	465.5	192.3	31.9	18.8	3643.1
	b	1.2	2.7	4.1	8.6	14.9	19.1	21.5	17.9	16.4	6.6	1.5	1.4	115.9
State Mean	**a**	**17.2**	**24.6**	**76.6**	**217.4**	**452.5**	**800.7**	**932.0**	**612.1**	**468.4**	**243.4**	**47.1**	**11.9**	**3903.9**
	b	**1.1**	**1.8**	**4.3**	**9.8**	**16.1**	**19.8**	**21.2**	**18.6**	**16.5**	**7.7**	**1.9**	**1.0**	**119.8**

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE-VI

MEAN RAINFALL(mm) OVER DIFFERENT RIVER CATCHMENTS OF MEGHALAYA STATE

Sr.No	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1	Streams of Assam, Tripura , Manipur,Mizoram, Meghalaya and Nagaland flowing into the Bay of Bengal. (catchment No.326)												
	Districts/Parts of districts of Meghalaya within this catchment:- EAST KHASI HILLS, JAINTIA HILS, WEST GARO HILLS , EAST GARO HILLS , SOUTH GARO HILLS, WEST KHASI HILLS.												
a	22.9	36.6	161.0	423.9	997.7	2034.3	2103.2	1440.0	838.5	396.4	63.6	12.5	8530.6
b	1.4	2.1	5.8	12.1	18.6	22.9	25.3	22.4	17.5	8.6	1.9	0.8	139.4
2	River Brahmaputra upto Bangladesh border ,including River Dihang,River Lohit,River kameng,streams betweenRiver Subanslri and Manas and between Manas and Tista,excluding Tista and its tributaries. (catchment No.504)												
	Districts/Parts of districts of Meghalaya within this catchment:-												
	EAST GARO HILLS, RI-BHOI, EAST KHASI HILLS, JAINTIA HILLS , WEST KHASI HILLS, WEST GAROHILLS.												
a	12.6	16.3	53.6	159.5	343.6	537.9	505.5	403.6	362.7	182.5	26.5	12.6	2617.0
b	1.1	1.5	3.7	8.7	15.6	19.3	20.0	17.8	16.8	8.1	1.6	0.9	115.1

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE – VII

STORMS AND DEPRESSIONS AFFECTING MEGHALAYA STATE

DURING 1891 – 2012

MONTH	NO. OF STORMS/ DEPRESSIONS	MONTH	NO. OF STORMS/ DEPRESSIONS	MONTH	NO. OF STORMS/ DEPRESSIONS
January	NIL	May	10	September	3
February	NIL	June	5	October	4
March	NIL	July	NIL	November	2
April	1	August	NIL	December	1
				TOTAL	**26**

TABLE VIII

DETAILS OF EARTHQUAKES OF INTENSITY OF 5.0 OR MORE AT RICHTER SCALE HAVING EPICENTRE WITHIN MEGHALAYA STATE DURING YEARS 1862-2012

MONTHS	YEARS	FREQUENCY	EARTHQUAKE OF HIGHEST INTENSITY			EPICENTRE			
			INTENSITY AT RICHTER SCALE	DEPTH IN km	YEAR	LAT - N		LONG - E	
						DEG	MIN	DEG	MIN
JANUARY									
FEBRUARY	1991, 1992	2	5.0	25.0	1991	25	31	91	10
			5.0	33.0	1992	25	30	92	30
MARCH	3[1932], 1933	4	5.8		1933	25	42	90	30
APRIL	1951	1	6.8		1951	25	54	90	30
MAY									
JUNE									
JULY	5[1930], 2[1932], 1982	8	7.1		1930	25	48	90	12
AUGUST	1982	1	5.0	32.0	1982	25	53	90	19
SEPTEMBER	1923, 1984	2	7.1		1923	25	18	91	0
OCTOBER									
NOVEMBER									
DECEMBER									
TOTAL		**18**							

EAST GARO HILLS DISTRICT

The district of East Garo Hills has a hilly terrain with plain. The hills are highly dissected and one major formation is the Arbella range which cuts through the central part of the district. The range consists of peaks with an average height of 700 metres above mean sea level. In the extreme southern part of the district Tura hill has a peak height is about 1350 metres. The climate of this district is characterized by cold in winter, mild hot in summer season and abundant rainfall during the period of April to September. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the first week of October. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at Bajengdoba (Hydro) for a period of 11 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 2801.0 mm. The variation in annual rainfall from year to year is large. During the southwest monsoon season (June to September), the district receives rainfall about 65% of the annual rainfall. June and July are the rainiest months with an average rainfall of 545.3 mm. In the pre-monsoon months; March to May, the district receives rainfall about 27% of the annual rainfall. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 173% of the annual normal occurred in year 1977, while the lowest annual rainfall amounting to 63% occurred in 1984. In this fifty year period there were two years in which the rainfall in the district was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall in the district was between 2201 mm and 3500 mm in 1 year out of 5. On an average there are 106 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Bajengdoba (Hydro) in the district was 218.6 mm on 12 April 1977.

TEMPERATURE

There is no meteorological observatory in the district. So, the description of climate which follows is based on the records of neighbouring observatory Tura (Alt. 370 m) in the West Garo Hills district. Temperatures begin to rise rapidly by the end of February. April is the hottest month with the mean maximum temperature about 30°C and mean minimum temperature about 19°C. On individual days, the maximum temperature in the summer season occasionally goes up to about 38°C. Even though day temperature during the summer season is not very high, sometimes the weather becomes pleasant with occurrence of thundershowers. Even after the onset of the southwest monsoon season, day temperatures become slightly low and night temperatures slightly increase from the summer season however, in between two spells of rain the weather is oppressive due to damp

heat. The temperatures decrease progressively with the withdrawal of the southwest monsoon and weather becomes gradually cool and pleasant during post monsoon season. The fall in both the temperatures is rapid from the middle of November. January is the coldest month with the mean maximum temperature at about 23°C and mean minimum temperature about 11°C. During the winter season, in association with the passage of western disturbances across Assam spells of cold weather occur in the district when the minimum temperature may go down up to about 3°C on individual days. The temperatures may be 2 - 5°C lower over hilly areas in the district.

HUMIDITY

The air is humid throughout the year. The relative humidity is the highest during the southwest monsoon season when it is between 80% and 85%. The driest part of the year is February and March months when the relative humidity is between 55% and 60% in the afternoons.

CLOUDINESS

The skies are heavily clouded to overcast during the monsoon season. Sometimes hill-tops are enveloped with clouds. During the months of November to March they are generally clear or lightly clouded. In the rest of the year, skies are lightly to moderately clouded.

WINDS

Winds are generally light throughout the year except during the summer season when winds are little stronger. Southwesterly to southeasterly winds prevail in the afternoons, throughout the year. Easterly winds can be seen in the morning during the period October to March. Southerly and southwesterly winds are predominant in the southwest monsoon and early part of pre-monsoon season. Sometimes wind is calm also.

SPECIAL WEATHER PHENOMENA

Some storms and depressions from the Bay of Bengal in latter part of pre-monsoon season and southwest monsoon season respectively reach into the district and its neighbourhood, and affect its weather. Thunderstorms occur in the district in the pre-monsoon and southwest monsoon seasons. Rain in the southwest monsoon season is sometimes associated with thunder. Fog occasionally occurs in the winter and post monsoon months.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
EAST GARO HILLS

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Bajengdoba (Hydro)	11	a	5.6	18.5	66.6	274.0	405.7	547.3	543.4	370.8	358.3	148.5	53.4	8.9	2801.0	173	63	218.6	12 Apr 1977
		b	0.5	0.8	3.9	11.0	16.1	18.7	19.1	14.4	13.6	5.4	1.7	1.0	106.2	(1977)	(1984)		
East Garo Hills District)		a	5.6	18.5	66.6	274.0	405.7	547.3	543.4	370.8	358.3	148.5	53.4	8.9	2801.0	173	63		
		b	0.5	0.8	3.9	11.0	16.1	18.7	19.1	14.4	13.6	5.4	1.7	1.0	106.2	(1977)	(1984)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE – 2
Frequency of Annual Rainfall in the District
EAST GARO HILLS
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1701 – 1800	1	2501 – 2600	0	3301 – 3400	0	4101 – 4200	0
1801 – 1900	0	2601 – 2700	0	3401 – 3500	0	4201 – 4300	0
1901 – 2000	1	2701 – 2800	0	3501 – 3600	0	4301 – 4400	0
2001 – 2100	0	2801 – 2900	0	3601 – 3700	0	4401 – 4500	0
2101 – 2200	0	2901 – 3000	0	3701 – 3800	0	4501 – 4600	0
2201 - 2300	0	3001 – 3100	0	3801 – 3900	0	4601 – 4700	1
2301 – 2400	0	3101 – 3200	0	3901 – 4000	0	4701 – 4800	0
2401 – 2500	1	3201 – 3300	0	4001 – 4100	0	4801 – 4900	1

(Data available for 5 years)

EAST KHASI HILLS DISTRICT

The climate of this district varies with elevation and its topography. The district has mostly hilly terrain with elevation up to 1965 metres above mean sea level, valleys and some areas of ravines on its southern part. The central part i.e. north to Cherrapunji (1313 m) and Mawsynram (1401 m) has high hill ridge with peak height about 1965 m above mean sea level. The physiographic characteristics of the district are mostly favourable to produce abundant rainfall in its southern part. Mawsynram and Cherrapunji stations lying in southern part receive the world's heaviest rainfall. The climatic conditions vary from place to place due to physiographic variation. In general the climate of the district is characterized by cold in winter, mostly pleasant in the summer season and abundant rainfall during the period of April to October. The year may be divided into four seasons. Winter season is from the middle of November to the beginning of March. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The monsoon season is followed by post monsoon season.

RAINFALL

Records of rainfall in the district are available for 6 raingauge stations for the period ranging from 14 to 48 years. The details of 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 5555.3 mm. There is very large variation in the annual rainfall from south to north due to physiographic variations in the district. At Cherrapunji and Mawsynram situated on the southern face of Khasi hills which rise straight from the plains of Bangladesh, the rainfall is very heavy. On an average of 50 years from 1951 to 2000, the annual rainfall at Mawsynram observatory is 12440.8 mm. This is considered as the highest annual rainfall received by station in the world. The records of the raingauge station at Cherrapunji which is around 15 km to the east of Mawsynram, show that the average annual rainfall is 11740.4 mm. These enormous amounts of rainfall are not common in other parts of district. The rainfall decreases very rapidly towards the north from the Cherrapunji and Mawsynram area. Shillong (CSO) observatory (altitude 1598 m) which is only 35 km away in north from Cherrapunji, its annual rainfall is only 2105.3 mm. June and July are the months with the heaviest rainfall at all the stations with an average of 1335 mm. December to February is the period of less rainfall. The rainfall during the southwest monsoon season is about 74% of the normal annual rainfall. In the pre-monsoon months of March, April and May, the district receives rainfall about 19% of annual rainfall. The variation in annual rainfall from year to year is large. The frequency of rainfall range is large in the district and it is between 4401 mm and 6700 mm for 16 years out of the available 49 years. In the same period there were 15 years when the rainfall was below 80% of the normal and there were two occasions of consecutive years of such a low rainfall, one each for six consecutive years and two consecutive years. In the fifty year period 1951 to 2000, the highest annual rainfall (12888.3 mm) in the district was 232% of the normal occurred in year 1974 and the lowest annual rainfall which was 30% of the normal occurred in 1961.

On an average there are 126 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 96 at Upper Shillong to 156 at Cherrapunji observatory.

The heaviest rainfall recorded in 24 hours at any station in the district was 1563.0 mm at Cherrapunji observatory on 16 June 1995.

TEMPERATURE

There are two meteorological observatories in the district at Cherrapunji, (1313 m) and Shillong C.S.O. (1598 m). These observatories have records for a long period of years as also two distinct rain patterns. The data of these stations may be taken as representative of the climatic conditions of the district as a whole. There is no distinct summer in this district. Day and night temperatures begin to rise gradually from the beginning of March till August. In the period April to September, there is no much variation in the day temperature, the mean maximum temperature during this period being 22°C to 23°C at Cherrapunji and about one degree low from Shillong. During summer season weather is mostly pleasant with occurrence of thundershowers. August is the hottest month with an average maximum temperature at 23.5°C and minimum temperature at 17.8°C. Both the temperatures gradually decrease from the middle of October after withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon season. January is usually the coldest month with the mean minimum temperature 5.7°C at Shillong and 6.7°C at Cherrapunji. The mean maximum temperature in January is 15.8°C at Cherrapunji while it is 14.6°C at Shillong. On individual days in the cold season, the minimum temperature may go down below 0°C in high altitudinal areas and weather is also chilly over hilly terrains. The temperatures may be 3°- 5°C higher in the extreme southern part of low elevation.

The highest maximum temperature ever recorded in the district was 31.1°C at Cherrapunji on 06 September 1969. The lowest minimum temperature ever recorded was -3.3°C at Shillong (C.S.O) on 30 December 1983.

HUMIDITY

The air is much humid nearly all the year round, being particularly high in the period of May to October in which relative humidity is about 80% to 95%. In the period from February to April, the relative humidity is comparatively less about 60% to 75%. The relative humidity in the afternoons is generally higher than in the mornings.

CLOUDINESS

The skies are generally heavily clouded to overcast in the period April to October. Sometimes hill-tops are enveloped with clouds. In the rest of the year lightly to moderately clouded skies are common, with a slight increase in cloudiness in the afternoons. In the winter months skies sometimes become obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light to moderate in the district. Sometimes winds become strong during summer and monsoon seasons as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion. Westerly to southwesterly winds prevail at Shillong (C.S.O) from February to September. Southeasterly or easterly wind can be seen from October which continues up to the month of January. Northwesterly winds are also observed in the afternoon in the month of January and February. Southwesterly winds are predominant at Cherrapunji from February to September. Easterly to northeasterly winds are predominant from the period October to January.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur almost throughout the year in the district. They are more frequent at Cherrapunji than at Shillong (C.S.O). Storms and depressions originating in Bay of Bengal reach the district and its neighbourhood causing heavy widespread rain and strong wind. Thunderstorms sometimes are violent accompanied with rain and hail in pre-monsoon season especially at Shillong (C.S.O) station. Sometimes thunderstorms occur in the post monsoon season also. Rain in the southwest monsoon season is also often associated with thunderstorms. Fog occasionally occurs over hilly areas throughout the year and its frequency is more during the months of July to February.

Table 3, 4, 5 and 6 and 3(a), 4(a), 5(a) and 6(a) give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Shillong (C.S.O) and Cherrapunji observatories.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
EAST KHASI HILLS

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Cherrapunji (Obsy)	48	a	20.7	53.7	276.8	717.8	1455.4	2818.0	2838.2	1870.7	1107.0	499.6	64.8	17.8	11740.4	194 (1974)	58 (1962)	1563.0	16 Jun 1995
		b	1.6	2.4	7.5	15.4	21.4	24.8	28.0	24.8	18.6	9.0	2.0	0.8	156.3				
Mawsynram (Obsy)	31	a	18.0	27.1	192.4	499.4	1464.9	3183.8	3313.4	2329.7	1037.3	320.5	50.7	3.6	12440.8	148 (1956)	55 (1978)	980.0	04 Aug 1982
		b	1.4	1.8	6.7	15.3	21.4	25.4	27.6	25.5	18.1	8.0	2.0	0.5	153.7				
Shillong (Obsy)	23	a	14.5	12.3	59.4	116.4	266.2	490.4	433.3	278.9	284.1	177.8	25.2	9.8	2168.3	152 (1952)	66 (1958)	262.1	05 Jun 1956
		b	1.6	1.2	4.6	8.3	16.7	21.1	19.8	17.3	16.7	9.6	2.1	1.0	120.0				
Shillong C.S.O(Obsy)	44	a	13.0	17.1	46.5	111.4	254.8	438.1	421.2	283.3	293.9	181.4	31.9	12.7	2105.3	181 (1988)	72 (1957)	302.2	15 Sep 1960
		b	1.4	1.9	4.0	8.7	15.8	18.7	17.7	16.1	15.5	8.6	2.2	1.1	111.7				
Shillong (V.R.C)	14	a	18.9	26.2	46.0	106.7	318.0	457.5	528.2	324.9	333.6	239.8	41.7	19.1	2460.6	153 (1988)	70 (1994)	334.5	10 Jul 1992
		b	1.9	2.7	3.8	8.1	16.4	19.6	18.4	16.7	18.1	8.4	2.0	1.4	117.5				
Upper Shillong	25	a	10.7	13.5	63.9	119.3	229.3	551.8	545.5	321.0	325.3	196.0	30.9	8.4	2415.6	258 (1991)	22 (1996)	437.6	20 Jun 1934
		b	1.0	1.2	4.3	7.5	12.2	17.1	15.0	14.1	12.9	8.5	1.5	0.7	96.0				
East Khasi Hills District		a	16.0	25.0	114.2	278.5	664.8	1323.3	1346.6	901.4	563.5	269.2	40.9	11.9	5555.3	232 (1974)	30 (1961)		
		b	1.5	1.9	5.1	10.6	17.3	21.1	21.1	19.1	16.7	8.7	2.0	0.9	126.0				

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2

Frequency of Annual Rainfall in the District

EAST KHASI HILLS

(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1601 – 1700	1	5901 – 6000	0
1701 – 1800	1	6001 – 6100	0
1801 – 1900	1	6101 – 6200	1
1901 – 2000	0	6201 – 6300	1
2001 – 2100	0	6301 – 6400	2
2101 – 2200	1	6401 – 6500	0
2201 – 2300	1	6501 – 6600	0
2301 – 2400	1	6601 – 6700	1
2401 – 2500	1	6701 – 6800	1
2501 – 2600	0	6801 – 6900	0
2601 – 2700	0	6901 – 7000	0
2701 – 2800	2	7001 – 7100	0
2801 – 2900	0	7101 – 7200	0
2901 – 3000	0	7201 – 7300	0
3001 – 3100	0	7301 – 7400	4
3101 – 3200	0	7401 – 7500	2
3201 – 3300	0	7501 – 7600	0
3301 – 3400	1	7601 – 7700	0
3401 – 3500	0	7701 – 7800	0
3501 – 3600	0	7801 – 7900	0
3601 – 3700	0	7901 – 8000	0
3701 – 3800	0	8001 – 8100	1
3801 – 3900	1	8101 – 8200	0
3901 – 4000	2	8201 – 8300	2
4001 – 4100	1	8301 – 8400	0
4101 – 4200	1	8401 – 8500	2
4201 – 4300	0	8501 – 8600	0
4301 – 4400	0	8601 – 8700	0
4401 – 4500	0	8701 – 8800	0
4501 – 4600	0	8801 – 8900	0
4601 – 4700	0	8901 – 9000	0
4701 – 4800	0	9001 – 9100	0
4801 – 4900	0	9101 – 9200	0
4901 – 5000	1	9201 – 9300	0
5001 – 5100	1	9301 – 9400	1
5101 – 5200	3	9401 – 9500	1
5201 – 5300	2	9501 – 9600	0
5301 – 5400	1	9601 – 9700	0
5401 – 5500	0	9701 – 9800	2
5501 – 5600	0	----------	
5601 – 5700	2	12001-12100	1
5701 – 5800	0	----------	
5801 – 5900	1	12801 – 12900	1

(Data available for 49 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(SHILLONG C.S.O)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	14.6	5.7	24.9	26/1/1969	-0.9	30/1/1971	61	87
February	16.8	7.2	26.1	23/2/1973	-2.4	4/2/1975	57	75
March	21.0	11.0	28.1	26/3/2010	2.7	16/3/1975	52	66
April	23.3	13.9	30.2	4/4/1973	6.6	7/4/1997	63	71
May	23.3	15.4	29.5	31/5/1979	8.5	3/5/2003	75	81
June	23.7	17.4	29.7	10/6/1999	10.0	23/6/1981	84	86
July	23.7	17.8	28.2	11/7/1973	12.3	5/7/1996	87	87
August	24.0	17.6	28.4	11/8/2006	10.0	29/8/1973	85	88
September	23.2	16.6	28.0	3/9/1992	10.7	20/9/1989	83	90
October	21.7	14.2	27.8	1/10/2009	6.7	30/10/1975	71	90
November	19.1	10.7	24.5	6/11/1997	-0.5	25/11/1975	62	88
December	15.9	7.1	22.5	15/12/1978	-3.3	30/121983	58	88
Annual	20.8	12.9	30.2	4/4/1973	-3.3	30/12/1983	70	83

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(SHILLONG C.S.O)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	17	14	14	6	1	0	0	0	0	4	11	16	83
b	1	1	1	4	7	13	15	10	8	4	1	1	66
c	1.5	2	2.2	3.6	5.4	6.5	6.8	6.4	5.9	3.7	2.1	1.5	4
1730 HOURS IST													
a	3	3	5	2	1	0	0	0	0	0	2	3	19
b	8	5	3	2	5	7	8	8	8	5	4	6	69
c	5.2	4.4	3.8	4.2	5.2	6.3	6.4	6.5	6.3	5.2	4.6	4.7	5.2

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(SHILLONG C.S.O)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	4.1	6.2	8.4	9.5	7.2	5.6	4.7	4.3	3.7	3.4	3.8	3.8	5.4
Direction in morning	C/E/W	W/SW	W/SW	SW/W	SW/W	C/SW	C/SW/W	C/SW/E	C/SW	C/E	C/E/SE	C/E/SE	
Direction in evening	C/NW	C/SW/NW	SW/C	SW/C	C/SW	C/SW	C/SW	C/SW/S	C/SW	C/SW/SE	C/SE	C/E/SE	

TABLE - 6
Special Weather Phenomena
(SHILLONG C.S.O)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.5	1.0	3.9	4.2	1.6	1.9	2.9	2.2	1.5	0.3	0.1	20.2
Hail	0.1	0.2	0.1	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Dust storm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Fog	3.3	0.3	0.1	0.2	0.4	0.6	0.5	1.4	2.1	1.7	1.7	2.3	14.6

TABLE – 3(a)
Normals of Temperature and Relative Humidity
(CHERRAPUNJI)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	15.8	6.7	26.7	22/1/1913	-1.0	20/1/1993	60	77
February	17.4	8.5	28.9	15/2/1913	0.3	23/2/1993	61	73
March	20.5	12.1	30.6	2/3/1913	0.6	27/3/1912	64	71
April	22.1	14.4	28.3	16/4/1938	3.9	4/4/1911	78	82
May	22.5	15.9	30.2	26/5/1962	3.3	2/5/1917	84	87
June	22.7	17.6	29.2	4/6/1962	9.2	10/6/1963	93	92
July	22.2	17.9	28.6	15/7/1971	10.0	25/7/1970	96	93
August	23.0	18.0	29.5	21/8/1991	6.0	7/8/1970	92	91
September	22.9	17.3	31.1	6/9/1969	12.4	23/9/1993	89	91
October	22.9	15.4	29.9	1/10/1962	7.8	24/10/1992	73	86
November	20.7	11.9	27.2	5/11/2010	3.7	21/11/1991	62	80
December	17.4	8.3	24.5	5/12/2010	1.7	18/12/1992	61	80
Annual	20.8	13.7	31.1	6/9/1969	-1.0	20/1/1993	76	84

TABLE – 4(a)
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(CHERRAPUNJI)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	14	12	11	3	1	0	0	0	0	4	7	12	64
b	1	2	3	7	11	20	24	20	15	5	1	1	110
c	1.9	2.3	2.9	4.9	5.9	7	7.4	6.9	6.3	3.8	2.4	1.8	4.5
1730 HOURS IST													
a	7	6	7	2	0	0	0	0	0	2	5	7	36
b	2	2	3	5	8	14	16	10	7	4	1	1	73
c	2.9	2.9	3.2	4.7	5.5	6.4	6.7	6.3	5.8	4.1	3.1	2.7	4.5

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE – 5(a)
Mean Wind Speed and Predominant Wind Direction
(CHERRAPUNJI)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	4.0	5.9	7.4	7.5	6.1	6.5	7.4	5.9	4.7	3.9	3.8	3.7	5.6
Direction in morning	E/NE	SW/E	SW	SW	SW	SW	SW	SW/E/SE	SW/E/C	E/NE	E	E	
Direction in evening	C/SW/W	SW	SW	SW	SW/C	SW/C	SW	SW/C	C/SW	C/NE/SW/W	C/NE/W	C/NE	

TABLE – 6(a)
Special Weather Phenomena
(CHERRAPUNJI)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.2	1.1	2.6	5.0	6.5	5.1	3.4	2.8	2.5	0.7	0.2	0.1	30.2
Hail	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
Dust storm	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
Fog	0.2	0.0	0.2	0.2	0.2	1.3	2.2	1.8	0.8	0.0	0.0	0.0	6.9

JAINTIA HILLS DISTRICT

The climate of this hilly district has almost similar physical features to that of East Khasi hills, is a part of Meghalaya plateau. This district has comparably more flat topography and gently hilly slope. The main elevation of hill ranges in the district varies from 1050 metres to 1350 metres above mean sea level. The highest hill in the district is Marangksih peak, having an elevation of 1631 m. The climatic conditions vary from place to place due to physiographic variation. In general the climate of the district is characterized by cold in winter, moderate temperature i.e. mostly pleasant in summer and abundant rainfall during the period of April to October. The year may be divided into four seasons. Winter season is from the middle of November to the beginning of March. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The monsoon season is followed by post monsoon season.

RAINFALL

There is only one raingauge station in the district at Jowai (Alt. 1340 m) which is the district headquarters and the data for this station is available for 28 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is about 6377.5 mm. There is large variation in annual rainfall from year to year and place to place due to topographic variation in the district. About 73% of the annual rainfall was received in the southwest monsoon season (June to September). July is the rainiest month with an average rainfall of 1623.0 mm. In the pre-monsoon months (March to May), the district receives rainfall about 16% of the annual rainfall. In the fifty year period 1951 to 2000 the highest annual rainfall (21492.2 mm) was 337% of the normal occurred in year 1984 while the lowest annual rainfall was 44% of the normal occurred in 1953. In this fifty year period, there were 10 years in which the annual rainfall was less than 80% of the normal and there were two occasions of two consecutive years of such a low rainfall. It is seen from Table 2 that the annual rainfall in the district was between 5101 mm and 7700 mm in 7 years out of 20. On an average there are 135 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded at Jowai in 24 hours in the district was 975.0 mm on 8 July 1984.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate which follows is based on the records of Shillong (C.S.O) observatory in the neighbouring district. There is no distinct summer in this district. Both the day and night temperature begin to rise gradually from the beginning of March. In the period April to September, the day temperatures have a very little variation, the mean maximum temperature during this period being about 23° - 24°C. The night temperatures, however gradually increase from the end of February till

August. During the summer season maximum temperature may reach up to 29°C on individual days. Sometimes weather becomes cool and pleasant with occurrence of thundershowers. August is the hottest month with mean maximum temperature about 24°C and mean minimum temperature about 18°C. Both the temperatures decrease gradually from the middle of October after withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon season. January is usually the coldest month with the mean minimum temperature of about 6°C and mean maximum temperature of about 15°C. On individual days in the cold season, the minimum temperature may go down below freezing point of water in high altitudinal areas and weather is also chilly over hilly terrain. The temperatures may be 3 - 5°C higher in the extreme southern part of low elevation.

HUMIDITY

The air is much humid nearly all the year round, being particularly high in the period May to October in which the relative humidity is about 80% to 90%. In the period from February to April, the relative humidity is comparatively less about 60% to 75%. The relative humidity in the afternoons is generally higher than in the mornings.

CLOUDINESS

The skies are generally heavily clouded to overcast in the period April to October. In the rest of the year lightly to moderately clouded skies are common, with a slight increase in cloudiness in the afternoons. Sometimes hill-tops are enveloped with clouds. In the winter months skies sometimes become obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light to moderate in the district. Sometimes winds become strong during summer and monsoon seasons as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion. Westerly to southwesterly winds prevail from February to September. Southeasterly and easterly components can be seen from October to January. Northwesterly winds are also observed in the afternoon in the month of January and February.

SPECIAL WEATHER PHENOMENA

Storms and depressions originating in Bay of Bengal which reach the district and its neighbourhood cause heavy widespread rain and strong winds. Thunderstorms occur almost throughout the year in the district. Thunderstorms sometimes violent and accompanied by hail occur in the pre-monsoon period March to May. Sometimes thunderstorms occur in the post monsoon season also. Rain in the southwest monsoon season is also often associated with thunderstorms. Fog occasionally occurs over hilly areas throughout the year and its frequency is more during the months of July to February.

TABLE – 1
NORMALS AND EXTREMES OF RAINFALL
JAINTIA HILLS

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Jowai	28	a	34.8	44.2	113.8	292.0	614.2	1346.0	1623.0	941.1	714.3	528.7	115.2	10.2	6377.5	337	44	975.0	08 Jul 1984
		b	1.5	2.5	5.6	10.3	16.8	22.4	24.4	20.9	17.1	10.0	2.5	0.9	134.9	(1984)	(1953)		
Jaintia Hills (District)		a	34.8	44.2	113.8	292.0	614.2	1346.0	1623.0	941.1	714.3	528.7	115.2	10.2	6377.5	337	44		
		b	1.5	2.5	5.6	10.3	16.8	22.4	24.4	20.9	17.1	10.0	2.5	0.9	134.9	(1984)	(1953)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
JAINTIA HILLS (DATA – 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
2801 – 2900	1	3901 – 4000	1	5001 – 5100	0	6101 – 6200	1	7201 – 7300	0
2901 – 3000	0	4001 – 4100	2	5101 – 5200	0	6201 – 6300	0	7301 – 7400	0
3001 – 3100	0	4101 – 4200	1	5201 – 5300	1	6301 – 6400	0	7401 – 7500	0
3101 – 3200	1	4201 – 4300	0	5301 – 5400	0	6401 – 6500	1	7501 – 7600	0
3201 – 3300	1	4301 – 4400	0	5401 – 5500	0	6501 – 6600	0	7601 – 7700	0
3301 – 3400	0	4401 – 4500	0	5501 – 5600	0	6601 – 6700	0	7701 – 7800	1
3401 – 3500	0	4501 – 4600	1	5601 – 5700	0	6701 – 6800	0	----------	
3501 – 3600	0	4601 – 4700	1	5701 – 5800	0	6801 – 6900	0	16401 – 16500	1
3601 – 3700	0	4701 – 4800	0	5801 – 5900	0	6901 – 7000	1	----------	
3701 – 3800	0	4801 – 4900	0	5901 – 6000	2	7001 – 7100	0	21401 – 21500	1
3801 – 3900	0	4901 – 5000	1	6001 – 6100		7101 – 7200	0		

(Data available for 20 years)

RI-BHOI DISTRICT

The climate of this district varies from place to place due to variation in orographic features. The district has a number of hill ranges with the highest peak about 1400 metres above mean sea level which gradually slope towards the north and some plain areas. In general the climate of this district is characterized by cold in winter, mild hot and pleasant in summer and good amount of rainfall in the monsoon period. The year may be divided into four seasons. Winter season starts from the end of November and lasts till first week of March, followed by summer (pre-monsoon) season of thunderstorms till May. Southwest monsoon season is from June to the first week of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station i.e. Nangpoh Hydro for 16 years. The details of the rainfall at this station and for the district at a whole are given in Tables 1 and 2. The average annual rainfall in the district is 2130.8 mm. The rainfall varies from place to place due to its topographic variation. It decreases from south to north. The district receives rainfall about 69% of the annual rainfall in the southwest monsoon season (June to September) and about 21% in the pre-monsoon season (March to May). July is the rainiest month with an average rainfall of 425.2 mm. The variation in the annual rainfall from year to year is not large. In the fifty year period 1951-2000, the highest annual rainfall amounting to 117% of the annual normal occurred in year 1991 while the lowest annual rainfall which was 83% of the annual normal occurred in 1996. In this fifty year period there was not a single year when the rainfall was less than 80% of the normal. It is seen from Table 2 that the annual rainfall was between 1701 mm and 2500 mm in 9 years. On an average there are 116 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Nangpoh Hydro was 168.2 mm on 15 October 1991.

TEMPERATURE

There is one meteorological observatory in the district at Barapani but its climate normals are not available. The description of climate which follows is based on the records of neighbouring observatories at Shillong (C.S.O) for hilly terrain and Guwahati for plain areas of the district. There is moderate temperature in the southern part of the district during summer season. Both day and night temperatures begin to rise gradually from the end of February. In the period April to September, the day temperatures do not vary much, the monthly mean maximum temperature being about 25ºC to 29ºC during this period in the southern part (hilly areas) of the district while it is 3ºC to 5ºC higher respectively in the northern part i.e. plain areas of low elevation of the district. Day and night temperatures, however, gradually increase from the end of February till August when they reach the highest value. Mean maximum temperature of August is about 29ºC and mean minimum temperature is about

22ºC at the district headquarter (Alt. 600 m approx.). The day and night temperatures gradually decrease from the middle of October after withdrawal of the southwest monsoon and weather becomes generally cool and pleasant during post monsoon season. January is the coldest month of the year when mean minimum temperature is about 9ºC and mean maximum temperature is about 21ºC at the district headquarters. On individual days in the cold season, the minimum temperature may go down to 3ºC in high altitudinal areas in the southern part of the district. The temperatures may be 2- 4 ºC higher over in northern part and about 3 -5 ºC lower over high altitudinal areas with reference to the district headquarters.

HUMIDITY

The atmosphere is much humid throughout the year and relative humidity is about 80% except in the period of February to April. The relative humidity in the afternoons is higher than in the mornings in a year. In February to April the humidity drops especially in the mornings and it is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and in the latter part of summer season. Skies are generally lightly or moderately clouded during the rest of the year. In the winter months skies sometimes become obscured in the mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in the period March to May when they are stronger. Winds are generally northeasterly or easterly or calm in the mornings throughout the year. Southwesterly or westerly winds blow in the afternoons in the southwest monsoon season. In the rest of the year winds are calm or northeasterly/westerly in the afternoon.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are common throughout the year but they are more frequent during the period March to October. Thunderstorms in the period March to May are very severe and similar to Norwesters of Bengal and they are sometimes violent. Some of the thunderstorms are accompanied with hail or squall in pre-monsoon season. Fog is frequent in the post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
RI-BHOI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Nangpoh (Hydro)	16	a	16.3	15.6	55.7	117.4	273.3	340.4	425.2	400.4	313.2	138.8	25.7	8.8	2130.8	117	83	168.2	15 Oct 1991
		b	1.1	1.6	4.4	9.5	15.5	17.5	19.5	19.7	17.1	7.2	2.1	0.9	116.1	(1991)	(1996)		
Ri-Bhoi (District)		a	16.3	15.6	55.7	117.4	273.3	340.4	425.2	400.4	313.2	138.8	25.7	8.8	2130.8	117	83		
		b	1.1	1.6	4.4	9.5	15.5	17.5	19.5	19.7	17.1	7.2	2.1	0.9	116.1	(1991)	(1996)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
RI-BHOI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1701 – 1800	1	2101 – 2200	1
1801 – 1900	1	2201 – 2300	1
1901 – 2000	0	2301 – 2400	0
2001 – 2100	1	2401 – 2500	4

(Data available for 9 years)

SOUTH GARO HILLS

South Garo Hills district is located in Meghalaya's southern part. It is the smallest district of the state. The landscape of the district contains undulating lands and is dotted with hills. The highest peak in the district is the Chitmang peak with an altitude of 1029 metres above mean sea level. Adjacent to this peak Balpakram Hills are lying with an average height of 863 m. The climate of this district is characterized by mild cold in winter, mild hot in summer and abundant rainfall in the monsoon season. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the first week of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are not available. So the following rainfall description is based on the average values of neighbouring raingauge stations in the adjacent districts viz. Nongstoin in West Khasi Hills district, Tura and Tura observatory in West Garo Hills district. The average annual rainfall of the district may be considered as about 3500 mm. The rainfall varies from place to place due to topography of the district. It is less in extreme northern part of the district. The district generally receives rainfall about 70% of the annual normal rainfall in the southwest monsoon season however; the district also receives good rainfall in April, May and October months. July is the rainiest month with an average rainfall of about 800 mm.

TEMPERATURE

There is no meteorological observatory in the district. So, the description of climate which follows is based on the records of neighbouring observatory Tura (Alt. 370 m) in West Garo Hills district. Temperatures begin to rise rapidly by the beginning of March. April is the hottest month with the mean maximum temperature about 30°C and the mean minimum temperature about 19°C. On individual days during summer season maximum temperatures occasionally go up to 38°C. The temperature during the summer season is not very high; sometimes the weather even becomes cool and pleasant with occurrence of thundershowers. Even after the onset of the southwest monsoon, day temperatures become slightly low, however, the night temperatures increase slightly from that of the summer season. The weather sometimes becomes oppressive due to damp heat especially in between two spells of rain. The temperatures decrease progressively after withdrawal of the southwest monsoon and weather becomes gradually cool and pleasant during post monsoons season. The fall in both the temperatures is rapid from the middle

of November. January is the coldest month with the mean maximum temperature of about 22°C and mean minimum temperature of about 11°C. During the winter season, in association with the passage of western disturbances across Assam spells of cold weather occur in the district when the minimum temperature may go down to about 3°C on individual days. The temperatures may be 2° - 5°C lower over hilly terrain.

HUMIDITY

The air over the district is humid throughout the year. The relative humidity is generally higher in the mornings than in the afternoons. It is the highest during the southwest monsoon season when it is between 80% and 85%. The driest part of the year is February and March months when it is between 55% and 60% in the afternoons.

CLOUDINESS

The skies are heavily clouded to overcast during the monsoon season. Sometimes hill-tops are enveloped with clouds. During the months of November to March they are generally clear or lightly clouded. In the rest of the year lightly to moderately clouded skies prevail.

WINDS

Winds are generally light throughout the year except during the summer season when winds are a little stronger. Southwesterly to southeasterly winds prevail in the afternoons, throughout the year. Easterly winds can be seen in the morning during the period October to March. Southerly and southwesterly winds are predominant in the southwest monsoon and early part of pre-monsoon season. Sometimes wind is calm also.

SPECIAL WEATHER PHENOMENA

Some storms and depressions from the Bay of Bengal in latter part of pre-monsoon and the monsoon season reach in to the district and its neighbourhood, and affect its weather. Rain in the southwest monsoon season is often associated with thunder. Fog occasionally occurs in the winter and post monsoon months especially at high altitudes.

WEST GARO HILLS DISTRICT

West Garo Hills district is hilly with plains fringing in the northern, western and southwestern borders. There are three important mountain ranges- Tura, Arbella and Ranggira in the district. Nokrek Peak in the Tura range is the highest peak at 1412 metres above mean sea level, Arbella Peak having a height of 999 m and Ranggira range with its Peak having an altitude of 673 m. The climate of this district is characterized by cold in winter, mild hot in summer and abundant rainfall during the monsoon season. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The period of October and November constitutes the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 5 raingauge stations for the period ranging from 10 to 32 years. The details of 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 was 2915.7 mm. The variation in annual rainfall from year to year in the district is large. The rainfall also varies from place to place due to topographic variation in the district. Rainfall in the southern part of the district is generally more than the northern part. During the monsoon season (June to September), the district receives rainfall about 70% of the annual rainfall. June and July are the rainiest months with an average rainfall of 599.6mm. Rainfall is received 22% of the annual during pre-monsoon season associated with thunderstorms. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 260% of the annual normal occurred in year 1995, while the lowest annual rainfall amounting to 50% occurred in 1980. In this fifty year period there were five years in which the rainfall in the district was less than 80% of the normal and only one occasion of three consecutive years of such a low rainfall. It is seen from Table 2 that the annual rainfall in the district was between 2301 mm and 3500 mm in 15 year out of 40.

On an average there are 119 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 96 at Jangrapara Hydro to 168 at Noonmati Hydro.

The heaviest rainfall in 24 hours recorded at any station in the district was 720.0 mm at Tura on 19 June 1995.

TEMPERATURE

There is one meteorological observatory in the district at Tura having elevation of 370 m. The description of climate which follows is based on the records of this observatory. Temperatures begin to rise rapidly by about the beginning of March. April is the hottest month with the mean maximum temperature at

30.4°C and mean minimum temperature at 19.3°C. On individual days, the maximum temperatures in the summer season occasionally go up to 38°C. Even though day temperature during the summer season is not very high, sometimes the weather becomes pleasant with occurrence of thundershowers. Even after the onset of the southwest monsoon, day temperatures become slightly low and night temperatures slightly increase from the summer season, sometimes weather is oppressive due to damp heat in between two spells of rain. Both the temperatures decrease progressively with the withdrawal of the southwest monsoon and weather becomes gradually cool and pleasant during post monsoon season. The fall in both the temperatures is rapid from the middle of November. January is the coldest month with the mean maximum temperature at 22.7°C and mean minimum temperature at 11.0°C. In association with the passage of western disturbances across Assam, during the winter season, spells of cold weather occur in the district when minimum temperature may go down to about 4°C on individual days. The temperatures may be 3° - 5°C lower over hilly areas in the district.

The highest maximum temperature ever recorded in the district was 39.4°C on 01 May 1960 at Tura and the lowest minimum temperature ever recorded was 2.5°C on 24 January 1973.

HUMIDITY

The air is some humid over the district throughout the year. The relative humidity is generally higher in the mornings than in the afternoons. It is the highest during the southwest monsoon season when it is between 80% and 85%. The driest part of the year is of February and March months when it is between 55% and 60% in the afternoons.

CLOUDINESS

The skies are heavily clouded to overcast during the monsoon season. Sometimes hill-tops are enveloped with clouds. During the months of November to March they are generally clear or lightly clouded. In the rest of the year lightly to moderately clouded skies prevail.

WINDS

Winds are generally light throughout the year except during the summer season when winds are a little stronger. Southwesterly to southeasterly winds prevail in the afternoons throughout the year. Easterly winds can be seen in the morning during the period October to March. Southerly and southwesterly winds are predominant in the southwest monsoon and early part of pre-monsoon season. Sometimes wind is calm also.

SPECIAL WEATHER PHENOMENA

Some storms and depressions from the Bay of Bengal in latter part of pre-monsoon and the monsoon season reach into the district and its neighbourhood, and affect its weather. Rain in the southwest monsoon season is often associated with thunderstorms. Fog occasionally occurs in the winter and post monsoon seasons.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Tura observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
WEST GARO HILLS

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Jangrapara (Hydro)	11	A	4.5	5.9	31.4	123.5	241.5	277.0	220.8	140.8	225.6	75.2	0.8	9.7	1356.7	131	72	80.0	16 May 1984
		b	0.4	0.6	2.1	8.5	14.9	18.3	17.0	12.2	16.2	5.6	0.1	0.5	96.4	(1982)	(1978)		
Tikrikilla (Hydro)	11	A	5.1	7.9	35.9	166.6	388.8	464.3	491.3	329.7	305.6	142.6	2.1	9.3	2349.2	141	80	184.0	17 May 1984
		b	0.6	1.2	2.8	8.9	15.5	19.2	20.8	18.6	16.4	6.0	0.4	0.7	111.1	(1984)	(1981)		
Tura	14	A	24.4	23.5	62.1	240.5	610.7	1068.5	1116.6	729.1	626.4	295.3	19.9	33.8	4850.8	156	77	720.0	19 Jun 1995
		b	1.1	1.4	2.7	7.5	15.2	18.7	22.1	18.2	16.7	7.1	1.0	1.2	112.9	(1995)	(1997)		
Tura (Obsy)	32	A	10.5	8.1	60.1	158.1	406.3	648.4	647.5	519.0	394.0	223.2	19.2	2.6	3097.0	133	68	411.6	30 Aug 1971
		b	1.3	0.7	3.1	6.0	13.8	19.0	20.2	18.9	14.9	1.2	1.2	0.1	107.7	(1952)	(1961)		
Noonmati (Hydro)	10	A	7.9	15.3	55.7	219.2	376.3	519.5	542.3	537.7	426.8	179.4	35.5	9.5	2925.1	151	68	133.4	05 May 1977
		b	0.8	1.5	4.0	12.0	20.4	24.4	28.4	29.4	26.9	15.1	3.9	1.1	167.9	(1977)	(1986)		
West Garo Hills District)		A	10.5	12.1	49.0	181.6	404.7	595.5	603.7	451.3	395.7	183.1	15.5	13.0	2915.7	260	50		
		b	0.8	1.1	2.9	8.6	16.0	19.9	21.7	19.5	18.2	8.5	1.3	0.7	119.2	(1995)	(1980)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2

Frequency of Annual Rainfall in the District

WEST GARO HILLS

(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1401 – 1500	1	4501 - 4600	1
1501 - 1600	0	4601 – 4700	0
1601 – 1700	0	4701 – 4800	0
1701 – 1800	1	4801 – 4900	1
1801 – 1900	0	4901- 5000	0
1901 – 2000	0	5001 – 5100	1
2001 – 2100	1	5101 – 5200	1
2101 – 2200	2	5201 – 5300	0
2201- 2300	0	5301 – 5400	1
2301 – 2400	1	5401 – 5500	0
2401 – 2500	0	5501 – 5600	0
2501 – 2600	1	5601 – 5700	0
2601 – 2700	2	5701 – 5800	0
2701 – 2800	1	5801 – 5900	0
2801 – 2900	2	5901 – 6000	0
2901 – 3000	0	6001 – 6100	0
3001 – 3100	1	6101 – 6200	0
3101 – 3200	4	6201 – 6300	0
3201 – 3300	1	6301 – 6400	0
3301 – 3400	0	6401 – 6500	0
3401 – 3500	2	6501 – 6600	1
3501 – 3600	2	6601 – 6700	0
3601 – 3700	5	6701 – 6800	0
3701 – 3800	2	6801 – 6900	0
3801 – 3900	0	6901 – 7000	0
3901 – 4000	0	7001 – 7100	0
4001 – 4100	1	7101 – 7200	0
4101 – 4200	1	7201 – 7300	0
4201 – 4300	1	7301 – 7400	0
4301 – 4400	0	7401 – 7500	0
4401 – 4500	1	7501 – 7600	1

(Data available for 40 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(TURA)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	22.7	11.0	31.5	14/1/1980	2.5	24/1/1973	71	65
February	24.8	12.7	35.9	27/2/1978	5.0	12/2/1950	67	59
March	29.0	16.8	37.2	29/3/1958	6.5	9/3/1973	63	56
April	30.4	19.3	38.5	30/4/1960	10.1	21/4/1984	71	67
May	29.7	19.4	39.4	1/5/1960	10.6	31/5/1984	76	72
June	29.1	20.5	36.9	2/6/1975	10.1	2/6/1984	82	80
July	28.6	21.6	39.1	26/71978	12.6	31/7/1983	82	82
August	28.7	21.5	36.8	31/8/1972	12.6	31/8/1983	83	84
September	29.0	21.0	37.2	21/9/1958	12.6	30/9/1983	81	82
October	28.8	19.1	36.6	16/10/1974	10.6	31/10/1972	78	78
November	26.4	15.6	34.0	8/11/1984	8.1	17/11/1972	72	70
December	23.3	12.5	30.7	4/12/1972	4.1	24/12/1972	71	68
Annual	27.5	17.6	39.4	1/5/1960	2.5	24/1/1973	75	72

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(TURA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	16	14	15	6	3	2	1	2	2	6	13	16	96
b	7	6	7	11	14	19	21	21	17	7	3	5	138
c	3.1	3.4	3.4	4.7	5.9	6.7	6.8	6.6	6.2	4.3	2.7	2.6	4.7
1730 HOURS IST													
a	5	7	13	6	3	1	0	0	0	2	4	4	45
b	13	10	8	10	11	17	21	22	18	15	9	13	167
c	4.9	4	3.7	4.7	5.3	6.7	7.1	7.2	6.8	5.5	4.8	5	5.5

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(TURA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	5.6	6.3	7.3	8.8	7.7	6.8	6.1	4.7	4.4	4.5	5.2	5.3	6.1
Direction in morning	E/C	E/C	E/SE	S/SW	S/C/ SW	C/S/ SW	S/C/ SW	C/S/ SW	C/S/ SW	C/E	E/C	C/E	
Direction in evening	C/SW/ S	SW	SW/S	S/SW/ SE	S/SW	S/SW	S/SW	SW/S	C/SW/ S	C/E/SE/ S/SW	C/SE /E	C/SW/E/ SE/S	

TABLE - 6
Special Weather Phenomena
(TURA)

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	0.0	0.0	0.2	0.1	0.3	0.4	0.2	0.0	0.0	1.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3

WEST KHASI HILLS

The climate of this district varies with elevation and its topography. West Khasi Hills district has mostly hilly terrains with dense forests, river systems and hill ranges from west to east. The eastern part of the district is hilly having peak height 1923 metres above mean sea level near Markasa. The climatic conditions vary from place to place due to physiographic variation. In general the climate of this district is characterized by cold in winter, mild hot and pleasant in summer and abundant rainfall in May to September months. The year may be divided into four seasons. Winter season starts from the end of November and continues till the first week of March. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The monsoon season is followed by post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at the district, Nongstoin for 15 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 3643.1 mm. The variation in the annual rainfall from year to year is large. In general the rainfall varies from place to place due to topographic variation in the district. About 76% of the annual rainfall is received in the southwest monsoon season (June to September). July is the rainiest month with an average rainfall of 1050.3 mm. In the pre-monsoon months (March to May), the district receives rainfall about 16% of the annual rainfall. In the fifty year period 1951 to 2000 the highest annual rainfall amounting to 170% of the annual normal occurred in year 1988 while the lowest annual rainfall which was 50% of the annual normal occurred in 1986. In this fifty year period there were 4 years in which the annual rainfall was less than 80% of the normal and one occasion of two consecutive years of such a low rainfall. It is seen from Table 2 that the annual rainfall in the district was between 2901 mm and 4400 mm in 6 years out of 14. On an average there are 116 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Nongstoin was 450.2 mm on 26 June 1992.

TEMPERATURE

There is no meteorological observatory in the district. So the description of climate which follows is based on the meteorological data of Shillong observatory (Alt. 1598 m) in the neighbouring East Khasi Hills district. There is no distinct summer in this district. Day and night temperature begins to rise gradually from the end of February. In the period April to September, the day temperatures do not have much variation, the mean maximum temperature during this period being 23°C to 24°C. During this period, maximum temperature may gradually increase from the end of February till July when they reach the highest value of about 18°C. August is

the warmest month with mean maximum temperature about 24°C and minimum temperature about 18°C. Both the temperatures decrease gradually from the middle of October after withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon season. January is usually the coldest month with the mean minimum temperature about 6°C and mean maximum temperature about 15°C. On individual days in the cold season, minimum temperature reaches to two to three degrees below 0°C in high altitudinal areas and weather is also chilly over this areas. The temperatures may be 4° - 6°C higher in plain areas of low elevation in southwestern part of the district.

HUMIDITY

The air is generally humid throughout the year, being particularly high in the period of May to October in which relative humidity is about 80% to 90%. From February to April, the relative humidity is comparatively less about 60% to 75%. The relative humidity in the afternoon is generally higher than in the mornings.

CLOUDINESS

The skies are generally heavily clouded to overcast in the period April to October. Sometimes hill-tops are enveloped with clouds. In the rest of the year lightly to moderately clouded skies are common, with slight increase in cloudiness in the afternoons. In winter months skies sometimes become obscured in the mornings due to lifted fog which clears with advance of the day.

WINDS

Winds are generally light to moderate in the district. Sometimes winds become strong during summer and monsoon seasons as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion. Westerly to southwesterly winds prevail in the district from February to September. Southeasterly or easterly wind can be seen from October which continues till January. Northwesterly winds are also observed in the afternoon in January and February. Sometimes wind is calm also.

SPECIAL WEATHER PHENOMENA

Storms and depressions originating in Bay of Bengal reach the district and its neighbourhood causing heavy widespread rain accompanied with strong winds. Thunderstorms occur almost throughout the year in the district. Thunderstorms sometimes are violent accompanied with rain and hail in the pre-monsoon season.

Sometimes thunderstorms occur in the post monsoon season also. Rain in the southwest monsoon season is sometimes associated with thunderstorms. Fog occasionally occurs over hilly areas throughout the year and its frequency is more during the months of July to February.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
WEST KHASI HILLS

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Nongstoin	15	a	19.9	32.0	60.4	160.6	352.2	651.4	1050.3	607.8	465.5	192.3	31.9	18.8	3643.1	170	50	450.2	26 Jun 1992
		b	1.2	2.7	4.1	8.6	14.9	19.1	21.5	17.9	16.4	6.6	1.5	1.4	115.9	(1988)	(1986)		
West Khasi Hills (District)		a	19.9	32.0	60.4	160.6	352.2	651.4	1050.3	607.8	465.5	192.3	31.9	18.8	3643.1	170	50		
		b	1.2	2.7	4.1	8.6	14.9	19.1	21.5	17.9	16.4	6.6	1.5	1.4	115.9	(1988)	(1986)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
WEST KHASI HILLS
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1801 – 1900	1	2901 – 3000	1	4001 – 4100	1	5101 – 5200	0
1901 – 2000	0	3001 – 3100	1	4101 – 4200	0	5201 – 5300	0
2001 – 2100	0	3101 – 3200	0	4201 – 4300	0	5301 – 5400	0
2101 – 2200	0	3201 – 3300	0	4301 – 4400	0	5401 – 5500	0
2201- 2300	0	3301 – 3400	0	4401 – 4500	0	5501 – 5600	0
2301 – 2400	0	3401 – 3500	0	4501 - 4600	1	5601 – 5700	0
2401 – 2500	0	3501 – 3600	0	4601 – 4700	0	5701 – 5800	0
2501 – 2600	1	3601 – 3700	1	4701 – 4800	1	5801 – 5900	0
2601 – 2700	0	3701 – 3800	0	4801 – 4900	0	5901 – 6000	0
2701 – 2800	1	3801 – 3900	2	4901- 5000	0	6001 – 6100	0
2801 – 2900	1	3901 – 4000	0	5001 – 5100	1	6101 – 6200	1

(Data available for 14 years)

CLIMATE OF ARUNACHAL PRADESH

General Description

Arunachal Pradesh is situated in the northeastern part of India in the eastern Himalayas. The state is located between $26^0$30'N and $29^0$30'N latitude and $91^0$30'E and $97^0$30'E longitude with an area of 83,743 km^2. It is bounded by Myanmar to the east (440 km), China (1080 km), to the north and northeast, Bhutan to the west (160 km) and Assam to the south. The low region of Arunachal Pradesh bordering Assam is a part of the plains of Brahmaputra river in the south. The state is mostly mountainous where the altitude is up to about 7,090 metres above mean sea level with several high hills along the northern borders criss-crossed with ranges running north-south. The extreme north and northeastern regions are covered with snow throughout the year however, general tendency of hills is found sloping towards the plains of Assam. The state is mostly covered by several hills of elevation more than 2000 m, being high hills - Kangte (7090 m), Nyegi Kangsang, Gorichen, Eastern Gorichen, Patkai etc. However, parts of Lohit, Changlang and Tirap districts are covered by the Patkai hill. All districts of the state have hills of peak height more than 2500 m. Wild jungles with hilly terrain remain throughout 82% of total areas of state, rock and snow about 8%, leaving a modest 10% in towns and farm-land.

The topography of Arunachal Pradesh is characterized by an undulating hilly terrain, enchanting river valleys and majestic peaks. There is a wide variation in the topography of land with elevation from 150 m to 7090 m above mean sea level. The climate within the state varies from place to place due to significant variation in elevation and topography.

Rivers

Arunachal Pradesh is drained by innumerable rivers and a number of streams. Six major rivers flow through the state, namely Kameng, Subansiri, Siang, Tirap, Dibang and Lohit. The snow fed rivers originating from Himalayas divide the state into six rivers/valleys systems.

Siang or Dihang river: Siang is a principal tributary of Brahmaputra known as Yarlung Zangdo in China. It originates from the glacier mass of the Kailas range of the Himalayas at an elevation of about 5300 metres and flows through China. It flows eastward for about 1600 km through the Tibetan plateau. Before entering India, river Siang or Dihang flows through deep gorges across eastern extremity of the Himalayas. The river then flows through Arunachal Pradesh in a south and southeastward for about 230 kilometres to reach Passighat. Dibang and Lohit rivers join Siang just south to Pasighat in Assam at near state border, where it finally becomes Brahmaputra.

Kameng river: Kameng river drains the land of Kurung Kumey, East Kameng and West Kameng districts of Arunachal Pradesh. It is flowing from the north joined by river Bicham at Palazi. It descends

southward, after flowing eastward and westward directions. It enters in the plains of Assam and drain out into Brahmaputra.

Subansiri river : It is an important river which flows in Lower Subansiri and Upper Subansiri districts. It flows from northwest to southeast marking eastern boundary at Lower Subansiri district. Main tributaries of this river are Kamla, Khru and Dikrang rivers.

Tirap river: It originates from a high peak in southwestern border section of Tirap and Changlang districts. It flows southwest to northeast through Tirap district to meet Burhi-Dihing river in Assam state.

Dibang river: It is a main river of Dibang Valley and Lower Dibang Valley districts. It originates from the snow covered southern flank of Great Himalayan Ranges. It flows from north to south and finally meets river Lohit near Sadiya.

Lohit river: It is a main tributary of Brahmaputra river. It rises from the mountains across the northeast border, in the Zayal Chu range and flows through Anjaw and Lohit districts of the state for about 190 kilometres, before it reaches the plains of Assam.

Arunachal Pradesh represents only one meteorological sub-division and consists of the following sixteen districts: 1) Anjaw, 2) Changlang, 3) Dibang Valley, 4) East Kameng, 5) East Siang, 6) Kurung Kumey 7) Lohit 8) Lower Dibang Valley, 9) Lower Subansiri, 10) Papumpare, 11) Tawang, 12) Tirap, 13) Upper Siang 14) Upper Subansiri, 15) West Kameng, 16) West Siang .

Climate

The climate of the state varies with elevation hence it can be broadly divided into three regions viz.

- The high altitude tundra region
- The middle altitude temperate region and
- The low altitude sub tropical region

In the Upper Himalayas, where elevation is really high, alpine or tundra type climate is experienced while temperate climate is enjoyed in the Middle Himalayas. In the areas of low elevation in the sub-Himalayan, the climate is humid sub-tropical, specifically, hot in summer and cold in winter.

Areas in the state under each climatic pattern based on Koppen's classification are shown in Fig.2. This broad classification is based on mean annual and monthly values of precipitation in centimeters and temperature in ^{o}C. Lohit and Papum Pare districts, northern part of districts- Changlang and Tirap along the border of Assam,

western part of Anjaw and southern part of the districts- East Siang, West Siang, Upper Subansiri, Lower Subansiri, East Kameng and West Kameng come under the climate type :- Sub-tropical monsoon with mild and dry winter, hot summer (Cwa). Lower Dibang Valley district and southern part of Changlang and Tirap along the border of Myanmar, central parts of districts- West Kameng, East Kameng, Upper Subansiri, West Siang and Anjaw, northern parts of districts: East Siang, Lower Subansiri and southern parts of districts- Tawang, Upper Siang, Dibang Valley and Kurung Kumey come under the climate type: Tropical upland, mild and dry winter, short warm summer (Cwb). Small parts of north-central Lower Dibang Valley and south-central Dibang Valley come under the climate type :- Humid sub-tropical, mild winter, moist all seasons, long hot summer (Cfa). Small portion of East Kameng in north comes under the climate type:- Marine, mild winter, moist all seasons, warm summer(Cfb). Northernmost hilly part of the state is not classified due to unavailability of meteorological data.

The year is divided into four seasons. In general the summer season starts from March to May, the plains of low elevation near Assam border being quite warm and humid. The southwest monsoon season arrives in first week of June and lasts till the middle of October in the most part of the state. The period from October to mid-November constitutes post-monsoon season. Winter season arrives in mid- November and prevails till the first week of March. The areas situated at high altitude become immensely cold during winters and precipitation in the form of snowfall is experienced so that there are only two seasons- winter and rainy seasons.

Sea level Pressure and Winds

The seasonal variation in atmospheric pressure over the state occurs in a systematic way with a maximum in the winter and a minimum in the southwest monsoon season. The pressure is slightly lower over the western portion of the state while slightly high pressure is noticed towards north and east almost throughout the year. The pressure gradient over the state is generally weak except during summer and post-monsoon seasons when it increases eastwards strongly with the Tirap and Changlang districts exhibiting the highest pressure. The pressure increases after the monsoon season; however the trend remains the same.

Table I gives the monthly mean wind speed in kilometer per hour and predominant wind direction in the morning and evening for observatory stations in the state. The state being mountainous, winds are generally varies in speed and direction with space and time. Sometimes winds are strong over hilly terrain of the state as anabatic and katabatic winds blow over the areas of hills and valleys, and play a dominant role in air motion. In valleys and plains along the border of Assam winds are light and mainly blow between the northwest and southeast directions during southwest monsoon season whereas, a southwesterly component is also seen in the evenings. October onwards, the wind strengthens and mainly blow from northwest, northeast and south east direction, whereas, a southwesterly component is also seen in the evenings. Pressure begins to change from October to January and wind pattern also changes.

Temperature

Table II gives the mean maximum and minimum temperatures at the observatory stations of the state. The spatial distribution of the mean maximum temperature for the representative months of the four seasons of a year is depicted in Fig. 2(a,b,c,d). In the plain part of the Arunachal Pradesh adjoining Assam border and in valleys, the period of April to August is the warmest period of the year, while winter is the coldest period of the year. The state is mountainous where the altitude is up to 7,090 metres with the hill range along the northern borders criss-crossed with ranges running north-south. As such in the mountainous nature in the state, according to the topography, the temperature varies from place to place. In general temperature sharply decreases from south to north in all regions except in some districts like Tirap, Changlang and Lohit where it decreases eastward. The temperatures begin to rise by March and steadily rise till it reaches its peak in July and August which are the hottest months, when the mean maximum temperature is about 32^0C in the plains towards Assam border, whereas it is less than 10^0C over high elevated areas in the north as shown in Fig. 2(b). The mean maximum temperature in October month (Fig. 2(c)) is 2^0C to 4^0C lower than July month. During pre-monsoon season mean maximum temperature ranges from 5^0 C to 30^0 C over the state, values decreasing towards north (Fig. 2(a)). The highest values are observed over the plains of the state along the boundary of Assam. Thus, there is no distinct summer in the state and temperatures in the monsoon months are equal or slightly more than the summer months. January is the coldest month of the year when mean maximum temperature is about 22^0C in plains and -5^0C or less in northern part as shown in Fig. 2(d).

The spatial distribution of the mean minimum temperature for representative months of the four seasons of the year is depicted in Fig. 3(a.b.c.d). In the month of January which is the coldest month of the year, the lowest minimum temperature values are observed over northern mountainous region. The temperature is between 12^0C and -10^0C or less (Fig. 3(a)). In the month of April, minimum temperature rises sharply in the southern plain region along the Assam boundary. The temperature is 19^0C in the southern plains and less than 0^0C in the mountainous region (Fig. 3(b)). During July and August spatial distribution of minimum temperature is mostly same as of April but a little high temperatures are observed in the southern plains along Assam boundary and in the northern mountainous region with values range from 24^0C in the southern plains and about 0^0C in the mountainous region (Fig. 3(c)). During the month of October, the value of mean minimum temperature is about 21^0C in the southern plains and less than 0^0C in the mountainous region (Fig. 3(d)). A lower temperature may be experienced in the state in the wake of western disturbances during winter. The diurnal variation of temperature is large in the state. In the southern part of the state it is around 10^0C to 13^0C during summer, post monsoon and winter seasons and around 8^0C to 9^0C in the monsoon months.

The highest maximum temperature and the lowest minimum temperature ever recorded based on data up to 2011 are depicted in Fig. 4 and 5, respectively.

The highest maximum temperature ever recorded in the state was 40.0°C on 30 May and 1 Jun 1990 at Tezu observatory. In the southern part of the state the lowest minimum temperature ever recorded in the state was -6.7°C on 7 January 1979 at Ziro observatory, whereas it may be -20°C or less in northern and eastern regions.

Humidity

Table III gives the mean relative humidity at 0830 and 1730 HRS IST for individual observatory stations in the state.

Atmosphere over the state is generally humid throughout the year. Relative humidity is the highest during the period June to September when it is about 80% to 90%.In the other months it is about 70% to 80%. As such there is not much diurnal variation between the mornings and afternoons throughout the year.

Cloudiness

Table IV and IV (a) give the mean monthly and total cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 HRS IST respectively.

There is cloudiness almost throughout the year. During summer and southwest monsoon seasons, the skies are heavily clouded to overcast more so in the mornings. On an average the skies are overcast for 11 to 13 days during this period in the mornings while it is overcast for 5 to 9 days in the afternoons. By October the cloudiness decreases and the skies are clear at an average around 6 to 12 days during November to January.

Rainfall

Table V gives the district wise and state wise mean monthly and annual rainfall and number of rainy days (i.e. days with rainfall of 2.5 mm or more). Fig. 6 and Fig. 6 (a to d) depict the spatial distribution of the annual and seasonal rainfall respectively over the state.

The total annual rainfall of Arunachal Pradesh is 271 cm and it has about 126 rainy days (i.e days with rainfall of 2.5 mm or more). It is seen that there is good rainfall in the state. The rainfall is around 130 cm to 440 cm in the state. It decreases towards the high elevated areas in the north and northeast where it is less than 200 cm. East Siang district receives maximum amount of rainfall (4381.2 mm) in a year, whereas Upper Subansiri district receives the minimum amount of rainfall (1299.4 mm.) The Pattern of spatial distribution of the southwest monsoon season (June to September) as shown in Fig.6(c) generally resembles to that of spatial distribution of

generally resembles to that of spatial distribution of the annual rainfall (Fig. 6). During the pre-monsoon season (March to May) the state receives an average rainfall of about 741 mm (Fig. 6(b)) while in the post monsoon season (October and November) it receives about 189 mm of rainfall (Fig. 6(d)). It may be seen that the rainfall over the state during post-monsoon season increases northeastwards.

Southwest monsoon season is the principal rainy season over the state. Of the total annual rainfall, 59% is received during the southwest monsoon season whereas 27% is received during the pre-monsoon months of March to May which is significant amount of rainfall. 7% of the annual rainfall is received in post monsoon months of October and November and 7% is received during the winter months of December to February.

The percentage of seasonal number of rainy days with respect to the annual indicate that 51% occurs during the southwest monsoon season, whereas, 30% occurs during the pre-monsoon season, 8% occurs during the post monsoon season and 11% during the winter season.

The southwest monsoon sets in by the first week of June over the entire state. June and July are the rainiest months accounting for 34% of the annual rainfall with June accounting for 16% and July accounting for 18% of the annual. The number of rainy days in a month during the southwest monsoon season ranges from 14 to 19 with a maximum of 19 in July whereas it is from 10 to 14 during pre-monsoon season.

The withdrawal of the southwest monsoon begins by the first week of October and completely withdraws from the state by the middle of the month. The occasional winter rains accounting for around 7% of the annual and which is very vital for agriculture occurs in association with the induced lows arising due to the passage of western disturbances moving east over the region.

The most common rain giving systems over the state are depressions and cyclones originating in the Bay of Bengal and low pressure developed with convective activity in this region or its neighbourhood.

The features of rainfall described above are also evident from Fig. 7(c), which shows the annual and seasonal rainfall for the individual districts as well as for the state and provides a measure for comparison of seasonal rainfall with the annual for both district wise and state wise rainfall.

Table VI gives the monthly and annual rainfall for various river catchments (No. 501, 502, 503 and 504) in the state. The annual rainfall of these river catchments are shown in Fig. 8. Table VI show that catchment No. 501 formed by the rivers Brahmaputra-trans-Himalayan, including Dibang river which covers the districts of Dibang Valley, Lower Dibang Valley, Upper Siang and parts of West Siang and East Siang districts receives an annual rainfall of 3474.3 mm with about 128 rainy days. Catchment No. 502 formed by river Subansiri that covers the districts of Lower Subansiri, Upper Subansiri and parts of Kurung Kumey, Papum Pare, West Siang and East

Siang districts receives an annual rainfall of 2260 mm with about 122 rainy days. Catchment No. 503 formed by river Manas that covers Tawang district receives an annual rainfall of 1561.6 mm. Catchment No. 504 formed by the river Brahmaputra up to Bangladesh border, including other rivers Dihang, Kameng, Lohit and streams between Subansiri and Manas, and between Manas and Tista (excluding Tista) and its tributaries that cover the districts of Anjaw, Changlang, Tirap, East Kameng, Lohit, West Kameng and parts of Papum Pare and Kurung Kumey receives an annual rainfall of 2970.0 mm with about 129 rainy days.

Rainfall Variability

The spatial distribution of variation of annual rainfall over Arunachal Pradesh is depicted in Fig. 9. Coefficient of Variation (CV) which is expressed as percentage is defined as:

$$C.V. = \frac{\text{Standard deviation } (\sigma)}{\text{Normal } (N)} \times 100$$

It is observed from Fig. 9 that the values of CV of annual rainfall range between 4.0% and 50.5% over the entire state of Arunachal Pradesh

The spatial distribution of CV of seasonal rainfall over Arunachal Pradesh is shown in Fig. 9(a), 9(b), 9(c) and 9(d) for the seasons: pre-monsoon season (March to May), southwest monsoon season (June to September), post-monsoon season (October and November) and the winter season (December to February) respectively.

It is observed that the values of CV range between 2.5% and 100% (Fig. 9(a)) in the pre-monsoon season. Small portion of Upper Subansiri district exhibits the highest variability exceeding 80%. The some areas viz. north western part of Tawang and West Kameng, some part of the Lower Dibang Valley, Upper Siang, Lower Subansiri, Upper Subansiri, Kurung Kumey, Changlang, Lohit and West Siang districts exhibit the lowest CV less than 20%. The some part of the districts West Kameng, Lower Subansiri and Upper Subansiri exhibit the higher variability with values of CV between 60% and 80%, while the remaining regions of the state exhibit the CV of about 20% to 60%.

During the southwest monsoon season CV ranges between 0.6% and 106.8% (Fig. 9(b)). The central and eastern sectors of West Kameng district in the southwestern part of the state exhibits the highest variability with values of CV more than 60%, while the some extreme eastern part of Dibang Valley and eastern part of Anjaw district and some central, northern and southwestern parts of the state exhibit the variability with values of CV between 30% and 60%. In the remaining most of the regions the CV is at an average value of less than 30%.

During the post-monsoon season the values of CV range between 8.2% and 141.4% (Fig. 9(c)). Some parts of West Siang, Upper Siang, Kurung Kumey and East Kameng districts exhibit the lowest variability with values of CV less than 30%, while some part of Dibang Valley and Upper Siang and Lower Dibang Valley, Papum Pare, and Lower Subansiri, districts exhibit the variability with values of CV exceeding 90%. Extreme northeastern part of Papum Pare exhibits the highest variability with values of CV exceeding 120%. In the remaining most of the regions of the state values of CV range between 30% and 90%.

During the winter season the values of CV show a steep gradient with range between 12.4% and 123% (Fig. 9(d)). The most of the state exhibit a variability of about 60% to 90% with some areas of higher variability in the Lower Subansiri, Papum Pare, West Kameng, East Kameng, Anjaw and Upper Siang districts more than 90%. Some parts of districts of West Kameng, East Kameng and Kurung Kumey exhibit variability ranging between 30% and 60%. Lower variability is seen in Upper Siang, Lohit and Lower Dibang Valley districts with values of CV less than 30%.

The variability of annual rainfall over Arunachal Pradesh state ranges between 4.0% and 50.5% (Fig. 9). The variability of annual rainfall over the state is low. The rainfall variability during the pre-monsoon and southwest monsoon seasons is some high and as the variability of seasonal rainfall for the other seasons is relatively higher.

Droughts:

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

Following districts of the state were affected by drought during some year during the period 1929-2000. The details of year wise occurrence of drought over each district during the 71-year period of 1929-2000 are given below. The figures within the brackets against each district indicate the number of occasions during the 71-year period when these districts were affected by drought.

West Kameng (7), Lohit (7),East Kameng (4),East Siang (3), Kurung Kumey (2), Lower Subansiri (2), Anjaw (1), Upper Subansiri (1) and West Siang (1).

There is no drought in Tawang, Pampumpare, Upper Siang, Dibang Valley, Lower Dibang Valley, Changlang and Tirap during this period.

Occurrence of drought conditions in successive years is not frequent in the state. However, some individual districts have had successive years of drought. Severity of drought not only depends upon the order of the 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 year may not be as high as in a single year.

The following table (i) depicts district wise years of successive drought during the 71-year period 1929-2000.

Table (i)

Sr. No.	Name of Affected districts	Years of Successive Drought
1.	Kurung Kumey	1981- 1982.
2.	Lohit	1996- 1997
3.	West Kameng	1966- 1967- 1968- 1969, 1973- 1974.

Fig. 10 shows the percentage frequency of drought and years of successive drought in the districts during the period 1929-2000. The following table (ii) shows the years of severe drought for various districts, with actual rainfall expressed as percentage of normal rainfall given in brackets, against each district.

Table (ii)

Sr. No.	Names of district affected	Years of severe drought (Rainfall less than 50%)
1.	East Kameng	1966 (39%)
2.	West Kameng	1966 (27%), 1967, 1968, 1969, 1971, 1973, 1974.

It is observed that the lowest percentage of annual rainfall was in West Kameng district (27%) of the normal rainfall in the year 1966. Incidence of widespread and fairly widespread drought over the state in any particular year was not very common.

There were no drought conditions in the state in the following years: 1929 to 1965, 1972, 1975, 1977, 1979, 1980, 1983 to 1985, 1987, 1988, 1990, 1991, 1993, 1995, 1998 and 2000.

Excessive Rainfall:

Rainfall sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall regions. An annual rainfall of 125% or more of the normal is considered as excessive rainfall.

Fig. 11 shows the percentage frequency of excessive rainfall years and successive years of excessive rainfall during the period 1929 - 2000. It is seen from the figure that frequency of excessive rainfall is generally higher in the Upper Subansiri , Upper Siang and West Kameng districts of the state.

The following table (iii) gives the district wise excessive rainfall years and the highest annual rainfall (expressed as percentage of normal) with the years of occurrence.

Table (iii)

S. No.	District	Years of excessive Rainfall	Highest amount of Rainfall in cm	Rainfall in % to normal	Year
1	Anjaw	1977, 1988.	347.2	153%	1988
2	Changlang	1991, 1995, 1998.	341.0	131%	1998
3	Dibang Valley	1977.	546.3	175%	1977
4	East Kameng	1980.	419.3	208%	1980
5	East Siang	1974, 1998.	657.2	150%	1974
6	Kurung Kumey	1985.	313.5	142%	1985
7	Lohit	1977, 1984.	546.9	162%	1977
8	Lower Dibang Valley	1977.	506.0	131%	1977
9	Lower Subansiri	1974.	383.7	220%	1974
10	Papumpare	1991.	439.6	130%	1991
11	Tawang	-	162.4	104%	2008
12	Tirap	1938, 1948.	352.7	135%	1938
13	Upper Siang	1985,1987, 1989.	352.0	141%	1987
14	Upper Subansiri	1999	172.8	133%	1999
15	West Kameng	1983, 1985, 1987, 1990, 1991, 1993, 1995.	552.5	163%	1990
16	West Siang	1980	387.1	128%	1980

From the above table, it is seen that during the period of consideration, there were 17 years in which some districts or the other in the state recorded excessive rainfall. In the year 1974, Lower Subansiri the district received the highest percentage of excessive rainfall, at 220% of the annual normal rainfall, however the highest annual rainfall (657.2 cm) was received by East Siang district. In the year 1977, 4 out of the 16 districts of the state experienced excessive rainfall, which is also the highest in any year. West Kameng district experienced maximum number of excessive rainfall years (7) while the remaining districts, for which data is available,

experienced excessive rainfall for at least one year except Tawang district. West Kameng district has experienced excessive rainfall in successive years 1990-1991.

The heaviest one-day rainfall on record at any station in the state was 570.2 mm on 11 June 1976 at Bomdila (obsy) in West Kameng district.

Cyclonic storms and depressions

Table VII depicts the total number of storms/depressions, which affected the state during the period 1891-2012. The cyclonic storms and depressions that affect India mostly originate and/or intensify over the Bay of Bengal, mainly during the months of May to November. They usually travel northwestwards or westwards and cross the east coast of India so that state does not come in the way of cyclonic storms and depressions. During the course of their movement, they sometimes turn or recurve towards north or northeast. These disturbances when form over Head Bay or far away from coast and recurve while still out in Bay of Bengal. Hence, exceptionally few of them cross the coast at Bangladesh and travel inland, affecting the weather of the state. In general, storms and depressions weaken on entering land. Arunachal Pradesh is an inland state and the coast is about 700 km away. The state therefore does not experience the full fury of severe storms/depressions like the coastal regions especially in the post monsoon months. However, in association with these systems, heavy to very heavy rainfall occurs over the affected areas of the state.

During the months from January to May, July, August and December the state was not affected by storms/depressions even on a single occasion from 1891 to 2012, but during the remaining months, it was affected only 5 times. The number of storms/depressions that affected the state in June was 2 which was the maximum number. During September, October and November the state was affected on one occasion each.

Other Weather Phenomena

(a) Thunderstorms and Dust storms

Convective activity is essential for the occurrence of thunderstorms and dust storms. With the advance of the summer, convective activity becomes pronounced due to heating of the land and thunderstorms occur in humid atmosphere over the state. When the moisture in the atmosphere is insufficient, dry thunderstorms or dust storms occur. The thunderstorms occur more during summer and monsoon season as sufficient moisture is available. During the winter season, the state may experience thunderstorm activity resulting from low pressure areas induced due to eastward moving upper air disturbances known as “Western Disturbances”. Thunderstorm activity is the least and minimum in December. Thunderstorm activity is more in the lower reaches of the state than in high altitudinal regions. Thunderstorm activity attains its maximum in March to June.

Hailstorms occasionally occur over hilly terrain in the state during the winter and pre-monsoon seasons. Squalls occasionally occur in the state, mainly during the pre-monsoon months.

(b) Fog

Fog is experienced during the post monsoon and winter months, when the air is still moist and is easily cooled below the dew point while rising over high elevations. Convective fog occasionally occurs over hilly terrain in the state during the monsoon and latter part of pre-monsoon season. Their frequency of occurrence is maximum during the month November to February. The high altitudinal meteorological station of Ziro recorded fog about 88 days in a year.

(c) Earthquakes

Arunachal Pradesh state is prone to seismic activity and comes under seismic zone V. Details of earthquake of intensity 5.0 or more at Richter scale having epicenter in the state are given in table - VIII. The state has experienced 87 earthquakes under moderate and high intensity (≥ 5.0 Richter scale) during the period of 1862-2012. Moderate to heavy damage in property and human life occurred due to these events of the earthquakes in the state as well as neighboring regions. It is seen from the table -VIII that the state has experienced maximum number of earthquakes in the month of August. Arunachal Pradesh state has experienced an earthquake of maximum intensity of 8.5 at Richter scale in August 1950, whose epicenter was at 28º 28' N and 96º 36' E.

TABLE - I
MEAN WINDSPEED (kmph) AND PREDOMINANT WIND DIRECTION
ARUNACHAL PRADESH

OBSERVATORY		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
Hayuliang	a													
	m	SE\E	SE\E	E\SE	E\SE	NW/W/E	NW\W	NW	NW	NW	SE	SE	SE	
	e	SE	SE	SE\E	SE\E	NW\SE\W/E	NW	NW	NW	NW	SE\NW	SE	SE	
Pasighat	a	11.4	11.1	12.5	8.2	5.8	3.5	1.5	2.2	2.8	6.3	11.1	12.3	7.4
	m	NW	NW	NW	NW	NW\C	C\NW	C	C\NW	C\NW	NW	NW	NW	
	e	C\NW	NW	NW\C	C\NW	C\NW	C\NW	C	C	C	C\NW	C\NW	NW\C	
Ziro	a													
	m	C/NE	C/NE	C/NE	C\SE\S\NE	C/NE/SE	C/SW/SE	C/S/SE/SW	C/S	C\NE	C/NE	C/SW	C/NE	
	e	C/SW	C/SW	C/SW	C/SW/W	C/SW/W	C/SW	C/SW/W/S	C/SW/W/S	C/SW	C/SW	C/SW	C/W/SW	

a : Mean Wind Speed in km per hour
m: Predominant wind direction in the morning
e : Predominant wind direction in the evening
C : Calm

TABLE – II
ARUNACHAL PRADESH
MEAN DAILY MAXIMUM AND MEAN DAILY MINIMUM TEMPERATURE (°C)

STATION	TEMP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
Hayuliang	MAX	18.9	18.8	21.0	22.7	27.0	29.2	29.2	30.6	29.2	26.9	23.8	20.9	24.9
	MIN	8.3	9.7	11.9	14.2	17.2	20.3	21.2	21.5	20.4	16.8	13.3	10.0	15.4
Pasighat	MAX	22.9	23.1	26	27.4	29.9	31.2	30.3	31.9	30.3	29.6	27.6	24.2	27.9
	MIN	12.4	13.9	16.9	18.9	21.5	23.4	23.6	24	23.1	20.8	16.8	13.5	19.1
Tezu	MAX	23.2	23.6	26.6	27.8	30.5	31.9	31.6	32.9	32.1	31	27.9	24.8	28.7
	MIN	7.5	10.4	13.9	16.5	19.5	22.7	23.3	23.5	22.6	19.3	13.3	8.6	16.8
Ziro	MAX	12.9	13.2	16.8	19.1	21	23.3	25	25.1	24	23.4	18.3	15.8	19.8
	MIN	-0.2	2.3	4.7	8.3	12.4	14.7	15.8	15.1	13.7	10.1	4.4	0.4	8.5
State	MAX	19.5	19.7	22.6	24.3	27.1	28.9	29.0	30.1	28.9	27.7	24.4	21.4	25.3
Mean	MIN	7.0	9.1	11.9	14.5	17.7	20.3	21.0	21.0	20.0	16.8	12.0	8.1	14.9

TABLE III
MEAN RELATIVE HUMIDITY (%)
ARUNACHAL PREDESH

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Hayuliang	M	72	74	77	79	78	82	82	78	80	74	69	70	76
	E	76	76	79	79	81	80	82	81	81	80	77	77	79
Pasighat	M	70	72	70	76	77	85	90	85	85	75	67	69	77
	E	77	74	70	76	77	82	86	83	87	85	82	78	80
Tezu	M	81	80	75	77	78	83	87	84	83	76	73	77	80
	E													
Ziro	M	75	81	82	82	79	81	82	82	81	82	82	76	80
	E	75	76	78	79	75	77	76	77	77	81	79	75	77
State Mean	**M**	**75**	**77**	**76**	**79**	**78**	**83**	**85**	**82**	**82**	**77**	**73**	**73**	**78**
	E	**76**	**75**	**76**	**78**	**78**	**80**	**81**	**80**	**82**	**82**	**79**	**77**	**79**

M – MORNING E - EVENING

TABLE IV

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

ARUNACHAL PRADESH

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Hayuliang	a	7	3	4	3	3	3	2	1	2	1	4	6	39
	b	6	10	15	15	12	12	15	8	11	8	6	4	122
	c	3.5	4.7	4.7	5.4	5.1	6.0	6.3	5.3	5.6	4.3	3.6	3.0	4.8
Pasighat	a	7	2	3	1	0	0	0	0	0	1	5	8	27
	b	4	7	8	13	12	15	19	12	13	6	2	3	114
	c	3.6	5.0	5.3	6.0	5.8	6.5	7.0	6.4	6.4	4.5	3.0	3.1	5.2
Tezu	a	18	9	8	7	7	4	4	4	4	9	14	19	107
	b	7	12	15	15	15	16	17	15	15	11	5	5	148
	c	3.2	4.7	5.0	5.1	5.1	5.9	5.8	5.5	5.6	4.0	2.6	2.7	4.6
Ziro	a	11	6	7	6	6	4	5	6	5	6	7	13	82
	b	5	4	6	7	7	8	1	7	7	4	3	2	61
	c	4.2	4.5	4.5	4.7	4.8	5.0	5.3	5.2	5.1	4.4	3.7	3.4	4.6
State Mean	**a**	**11**	**5**	**6**	**4**	**4**	**3**	**3**	**3**	**3**	**4**	**8**	**12**	**66**
	b	**5**	**8**	**11**	**13**	**12**	**13**	**13**	**11**	**12**	**7**	**4**	**4**	**113**
	c	**3.7**	**4.7**	**4.9**	**5.3**	**5.2**	**5.9**	**6.1**	**5.6**	**5.7**	**4.3**	**3.2**	**3.1**	**4.8**

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 1/8 th of the sky covered.

TABLE IV-A

ARUNACHAL PRADESH

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

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Hayuliang	a	7	3	6	4	3	3	2	1	2	1	5	8	45
	b	7	9	11	13	10	10	11	6	6	6	4	4	97
	c	3.6	4.5	4.3	5.0	4.6	5.1	5.3	4.4	4.5	3.9	3.1	2.8	4.3
Pasighat	a	6	1	1	0	0	0	0	0	0	2	9	9	28
	b	5	6	6	8	7	8	9	4	6	4	2	3	68
	c	3.7	5.1	5.7	6.0	5.4	5.6	5.7	4.8	5.2	4.0	2.5	2.7	4.7
Tezu	a													
	b													
	c													
Ziro	a	6	3	9	7	5	4	6	6	5	5	9	12	77
	b	6	7	7	7	7	7	7	4	5	4	3	4	68
	c	4.5	5.1	4.7	4.9	4.7	4.8	4.8	4.5	5.0	4.3	4.0	4.2	4.6
State Mean	**a**	**6**	**2**	**5**	**4**	**3**	**2**	**3**	**2**	**2**	**3**	**8**	**10**	**50**
	b	**6**	**7**	**8**	**9**	**8**	**8**	**9**	**5**	**6**	**5**	**3**	**4**	**78**
	c	**3.9**	**4.9**	**4.9**	**5.3**	**4.9**	**5.2**	**5.3**	**4.6**	**4.9**	**4.1**	**3.2**	**3.2**	**4.5**

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 1/8 th of the sky covered.

TABLE-V
MEAN RAINFALL AND NUMBER OF RAINY DAYS
ARUNACHAL PRADESH

DISTRICT		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Anjaw	a	45.7	122.3	303.3	373.7	256.7	286.7	272.3	235.3	172.7	144.9	30.7	25.2	2269.5
	b	4.0	7.6	15.0	16.6	13.1	16.1	16.3	14.8	11.8	7.2	2.7	2.0	127.2
Changlang	a	37.0	69.5	171.5	287.6	237.6	392.3	533.8	366.3	319.1	140.3	25.5	22.7	2603.2
	b	4.0	5.9	11.3	15.1	14.0	17.1	21.0	15.6	14.4	7.2	2.5	2.4	130.5
Dibang Valley	a	80.0	195.3	342.8	541.7	315.5	466.7	317.7	178.8	320.3	201.6	85.4	75.8	3121.6
	b	6.5	11.6	16.1	15.5	10.7	14.7	14.6	8.9	13.3	8.0	4.3	4.2	128.4
East Kameng	a	49.0	84.1	96.0	166.6	213.7	349.0	366.5	251.5	273.0	104.8	34.3	27.4	2015.9
	b	5.1	7.5	7.8	10.8	12.3	18.0	19.8	14.4	15.5	8.1	3.8	3.1	126.2
East Sang	a	46.3	94.4	141.2	241.2	397.0	848.7	1058.8	723.6	556.6	217.9	29.1	26.4	4381.2
	b	3.8	6.8	9.9	12.4	14.5	19.0	21.8	16.5	14.2	7.4	2.2	2.0	130.5
Kurung Kumey	a	82.7	70.0	128.3	240.9	271.5	292.5	403.8	276.2	283.6	79.9	36.2	42.4	2208.0
	b	8.6	7.8	10.3	13.9	18.0	19.9	23.3	18.6	17.2	9.3	3.6	4.4	154.9
Lohit	a	59.2	119.6	224.1	452.1	325.9	509.1	645.4	437.9	317.2	185.2	50.2	50.1	3376.0
	b	4.8	7.9	11.6	15.7	13.8	17.5	20.6	14.9	13.3	27.7	3.6	3.4	134.8
L.Dibang Valley	a	85.4	187.0	437.3	628.5	335.7	601.3	486.1	331.3	380.7	234.2	68.1	87.0	3862.6
	b	5.0	8.6	14.3	15.5	12.0	15.8	16.6	11.6	13.5	7.5	4.3	3.8	128.5
Lower Subansiri	a	88.7	106.1	78.3	169.0	199.5	292.5	249.0	232.4	199.9	64.1	51.2	13.6	1744.3
	b	5.2	7.3	6.8	10.8	13.1	15.7	14.5	14.6	12.8	4.8	3.4	1.5	110.5
Papumpare	a	33.7	67.6	106.1	226.8	468.7	633.2	577.7	503.0	492.3	241.6	19.2	11.3	3381.2
	b	2.5	5.3	6.9	12.2	14.4	19.7	20.5	16.4	16.2	8.5	1.8	1.0	125.4
Tirap	a	38.0	76.0	144.5	255.4	308.3	451.6	488.4	325.0	336.8	126.9	36.8	24.6	2612.3
	b	4.1	7.6	11.0	14.1	15.0	17.8	18.3	14.5	13.8	7.7	3.4	2.6	129.9
Upper Siang	a	46.2	115.6	193.8	358.5	328.3	395.1	358.8	249.7	243.4	150.9	29.4	27.1	2496.8
	b	4.7	8.8	13.5	14.5	14.9	17.0	15.9	10.8	13.9	8.1	2.0	1.7	125.8
Upper Subansiri	a	27.9	48.3	85.2	101.4	140.4	228.4	217.3	182.9	159.7	75.9	20.2	11.8	1299.4
	b	4.2	5.4	8.8	9.6	12.6	16.2	14.6	13.3	10.7	5.1	2.7	1.9	105.1
West Kameng	a	36.6	46.0	58.8	134.5	343.7	706.4	742.3	580.4	486.3	198.0	33.0	23.4	3389.4
	b	2.9	4.3	4.5	9.1	14.8	18.0	21.4	18.9	15.6	7.1	2.1	1.6	120.3
West Siang	a	23.0	66.1	72.4	206.3	244.5	514.2	745.8	512.4	435.0	141.0	31.2	32.2	3024.1
	b	2.6	6.1	7.1	13.1	12.1	17.6	20.5	14.3	14.1	6.3	2.3	2.8	118.9
Tawang	a	1.6	9.0	105.2	213.5	183.7	167.0	299.4	252.5	195.9	98.6	31.8	3.4	1561.6
State	**a**	**48.8**	**92.3**	**168.1**	**287.4**	**285.7**	**445.9**	**485.2**	**352.4**	**323.3**	**150.4**	**38.3**	**31.5**	**2797.3**
Mean	**b**	**4.5**	**7.2**	**10.3**	**13.3**	**13.7**	**17.3**	**18.6**	**14.5**	**14.0**	**7.3**	**3.0**	**2.6**	**126.3**

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE-VI

MEAN RAINFALL(mm) OVER DIFFERENT RIVER CATCHMENTS OF ARUNACHAL PRADESH STATE

Sr.No	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1	**Brahmaputra-trans-Himalayan,including River Dihang. (catchment No.501)**												
	Districts/Parts of districts of Arunachal Pradesh within this catchment:- **DIBANG VALLEY,LOWER DIBANG VALLEY, UPPER SIANG , EAST SIANG, WEST SIANG.**												
a	70.5	162.4	315.9	490.0	338.0	563.3	504.2	332.2	367.0	206.7	60.9	63.2	3474.3
b	5.2	9.4	14.0	14.8	12.5	16.2	16.7	11.4	13.6	7.8	3.5	3.3	128.3
2	**River Subansiri. (catchment No.502)**												
	Districts/Parts of districts of Arunachal Pradesh within this catchment:- **KURUNG KUMEY, WEST SIANG, EAST SIANG, PAPUM-PARE, UPPER SUBANSIRI, LOWER SUBANSIRI.**												
a	49.1	71.3	87.3	184.8	220.1	368.3	472.4	343.3	302.6	100.4	34.0	26.4	2260.0
b	4.6	6.5	8.0	12.1	13.6	17.4	18.7	15.0	13.8	6.4	2.9	2.7	121.7
3	**River Manas (catchment No.503)**												
	Districts/Parts of districts of Arunachal Pradesh within this catchment:- **TAWANG.**												
a	1.6	9.0	105.2	213.5	183.7	167.0	299.4	252.5	195.9	98.6	31.8	3.4	1561.6
b													
4	**River Brahmaputra upto Bangladesh border ,including River Dihang,River Lohit,River kameng,streams betweenRiver Subanslri and Manas and between Manas and Tista, excluding Tista and its tributaries. (catchment No.504)**												
	Districts/Parts of districts of Arunachal Pradesh within this catchment:- **ANJAW, CHANGLANG, EAST KAMENG, LOHIT, PAPUM-PARE,TIRAP, WEST KAMENG, KURUNG KUMEY.**												
a	46.3	87.3	159.1	295.2	306.5	501.3	572.9	415.3	348.7	168.2	37.1	32.1	2970.0
b	4.1	6.6	9.5	13.4	13.9	17.7	20.2	15.8	14.3	7.6	3.0	2.5	128.6

a: Normal rainfall in mm.

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE – VII

STORMS AND DEPRESSIONS AFFECTING ARUNACHAL PREDESH STATE

DURING 1891 – 2012

MONTH	NO. OF STORMS/ DEPRESSIONS	MONTH	NO. OF STORMS/ DEPRESSIONS	MONTH	NO. OF STORMS/ DEPRESSIONS
January	NIL	May	NIL	September	1
February	NIL	June	2	October	1
March	NIL	July	NIL	November	1
April	NIL	August	NIL	December	NIL
TOTAL					**05**

TABLE - VII

DETAILS OF EARTHQUAKES OF INTENSITY OF 5.0 OR MORE AT RICHTER SCALE HAVING EPICENTRE WITHIN ARUNACHAL PRADESH STATE DURING YEARS 1862-2012

MONTHS	YEARS	FREQU-ENCY	EARTHQUAKE OF HIGHEST INTENSITY			EPICENTRE			
			INTENSITY AT RICHTER SCALE	DEPTH IN km	YEAR	LAT - N		LONG - E	
						DEG	MIN	DEG	MIN
JANUARY	1941, 3[1951], 1958, 1984, 1987	7	6.6		1951	28	42	94	12
FEBRUARY	1940, 1941, 1943, 1951, 1954, 1958, 1959, 1970, 1995	9	6.5		1954	27	48	91	42
MARCH	1937, 1946, [1951], 2[1967], 1983, 1989	8	6.5		1951	28	42	94	12
APRIL	2[1951]	2	6.5		1951	28	42	94	12
MAY	1952, 1955, 1960, 2[1988], 1993	6	6.0		1952	28	30	94	30
					1955	27	12	97	0
JUNE	2005	1	5.7	49.0	2005	28	57	94	43
JULY	2[1951]	2	6.0		1951	28	42	96	36
AUGUST	24[1950], 1952, 1956	26	8.5		1950	28	28	96	36
SEPTEMBER	1941,6 [1950], 1964, 1966, 1979, 1998	11	7.0		1950	27	30	96	24
OCTOBER	2[1950], 1964, 1985,2006	5	6.4		1950	27	30	96	24
NOVEMBER	1950, 1951, 1959, 1982, 2002	5	5.5		1950	27	30	96	24
			5.5		1951	29	0	96	0
DECEMBER	1950, 1965, 1979, 1984, 1994	5	6.6		1950	29	0	96	0
TOTAL		**87**							

ANJAW DISTRICT

The district lies in the extreme northeastern part of India which is in the region of eastern Himalayas. It has mostly hilly terrain, rivers and valleys. The extensive valley and river systems are deep and narrow and land rises towards north and northeast, forming rugged mountainous and thickly forested terrain. The ridges formed by these mountains run in northwest and southeast direction. The elevation of the district ranges from about 300 metres in some valleys region in the southwest and about 4350 metres above mean sea level in the north and northeast.

The climate of the district is largely influenced by nature of the mountain. The mountain peaks are covered with snow and lower hills are mostly covered with dense ever-green forests. Owing to rapid changes in the nature of the terrain there are variations in the climatic conditions in the district. The climate of the district is generally characterized by chilly weather in winter, cold and humid throughout the year. In the district cold weather is experienced from November to March and significant rain occurred in the rest of the year. There is no distinctive summer in the region. In general the year may be divided into four seasons. Winter season begins from the middle of November till mid-March. The period of mid-March to May is of pre-monsoon season associated with thunderstorms and is followed by southwest monsoon season which lasts till the middle of October. Mid-October to mid- November is a transition period between the monsoon season and winter.

RAINFALL

Records of rainfall are available for only one rainguage station at Hawai for a period of 25 years. Annual normal rainfall at this station is 2269.5 mm. Rainfall varies from place to place due to topographic variation in the district. However, rainfall increases with elevation from southwest to north and northeast up to certain height. Sometimes rainfall in the high elevated areas above 2000 metres occurs in the form of snow and hails. March to September comprising of pre-monsoon and southwest monsoon seasons is a chief rain bearing period which constitutes about 84% of the annual rainfall. The rainfall in the southwest monsoon season is about 43% of the annual, while 41% of the annual rainfall is received in the pre-monsoon season (March to May) which is associated with thunderstorms and hails. April is the rainiest month in the year with an average rainfall of 373.7 mm and June is the rainiest month in the southwest monsoon season with an average rainfall of 286.7 mm. During the period of October to February the district receives about 16% of the annual rainfall. In this period the rainfall is generally received in the form of snow and hail in the high elevated areas. During the period 1976 – 2000 the highest annual rainfall occurred in the year 1988 when it amounted to 153% of the normal. However, lowest annual rainfall was 58% of the normal occurred in 1986. The annual rainfall was less than 80% of the normal occurred only on one occasion. It is seen from Table 2 that the annual rainfall in the district was between 1801 mm and 2800 mm in 12 years out of 16 for which full year data is available.

On an average there are 127 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours in the district was 220.0 mm at Hawai on 22 May 1976.

TEMPERATURE

There is no meteorological observatory in the district and therefore parameters recorded at Hayuliang observatory at an elevation of 1373 m a.m.s.l. in the neighbouring Lohit district may be considered for the climatic conditions of the district. As the headquarter of the district is Hawai lying at an elevation of about 1500 m. Temperature mainly depends on elevation of the place, as it decreases with the height in troposphere, therefore, it varies considerably from place to place in the district. The day and night temperatures, begin to decrease rapidly from the middle of November till mid-February. January is usually the coldest month with mean maximum temperature of about 17°C and mean minimum temperature of about 5°C at district headquarter. Slightly high temperature is experienced over the plains and valleys. On individual days in winter season the minimum temperature may even go down below -6°C in the highly elevated areas of the district. The day and night temperatures begin to rise from the middle of March, rapidly till August. July and August are generally the warmest months with mean maximum temperature being about 29°C and mean minimum temperature of about 20°C at district headquarters. The temperatures may be 10°C to 15°C lower at high elevated areas with reference to Hawai town. On individual days in July and August, the maximum temperature is about 35°C in the valleys and below 20°C in the highly elevated regions. Day and night temperatures begin to decrease from October after withdrawal of the monsoon. Thereafter, the weather becomes gradually cool and pleasant in the regions of low and middle hills till November.

HUMIDITY

The humidity is generally high throughout the year. The relative humidity is the highest in the monsoon season when it is about 80% or more in the valleys. Winter months are slightly less humid, when the relative humidity is about 70% in the mornings.

CLOUDINESS

Skies are generally heavily clouded to overcast during pre-monsoon and southwest monsoon seasons. The hill-tops are frequently enveloped with clouds. In post monsoon months skies are moderately clouded. The cloudiness decreases from November. In winter cloudiness is less but on some days skies are heavily clouded to overcast in wake of the western disturbances.

WINDS

Winds are generally light, while strong winds blow for a short period in association with thunderstorms. Anabatic and katabatic winds blow over hilly terrains and play a dominant role in air motion. Sometimes winds become strong. Northwesterly winds generally prevail during the southwest monsoon season and in the rest of the year southeasterly and easterly winds are noticed.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur in the pre-monsoon season and sometimes they become violent. Fog occurs in the post monsoon and winter months especially in the valleys. Fog is common over hilly areas during the monsoon season. During winter and pre-monsoon seasons, snow and hails sometimes occur over the high elevated areas.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
ANJAW

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Hawai	25	a	45.7	122.3	303.3	373.7	256.7	286.7	272.3	235.3	172.7	144.9	30.7	25.2	2269.5	153	58	220.0	22 May 1976
		b	4.0	7.6	15.0	16.6	13.1	16.1	16.3	14.8	11.8	7.2	2.7	2.0	127.2	(1988)	(1986)		
Anjaw		a	45.7	122.3	303.3	373.7	256.7	286.7	272.3	235.3	172.7	144.9	30.7	25.2	2269.5	153	58		
(District)		b	4.0	7.6	15.0	16.6	13.1	16.1	16.3	14.8	11.8	7.2	2.7	2.0	127.2	(1988)	(1986)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more).
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1976 - 2000)
ANJAW

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO.OF YEARS	RANGE IN MM	NO. OF YEARS
1301 - 1400	1	2101 - 2200	2	2901 - 3000	0
1401 - 1500	0	2201 - 2300	1	3001 - 3100	1
1501 - 1600	0	2301 - 2400	2	3101 - 3200	0
1601 - 1700	0	2401 - 2500	1	3201 - 3300	0
1701 - 1800	0	2501 - 2600	0	3301 - 3400	0
1801 - 1900	1	2601 - 2700	1		
1901 - 2000	0	2701 - 2800	1		
2001 - 2100	3	2801 - 2900	1		

(Data available for 16 years only)

CHANGLANG DISTRICT

Changlang district lies in the northeastern part of India in eastern Himalayas which is having a narrow strip of mountainous terrain with rivers and narrow valleys. The altitudes vary from 200 metres in the northwest adjoining Assam to 4500 metres above mean sea level in northeastern part at the international boundary with Myanmar. Owing to the mountainous nature of terrain, meteorological conditions vary considerably from place to place. In northeastern and southern areas of the district weather is experienced as very cold from November to March and significant rain occurred in the rest of the year so that there is no summer in this region. The climate in areas of low elevation and valleys in the western part of the district is characterized by hot and humid in summer and monsoon season. The headquarters of the district is Changlang town lying at an elevation of about 580 m. In general, the year may be divided into four seasons. Winter season is from the end of November to first week of March. The period of March to May is of pre-monsoon season associated with thunderstorms and is followed by southwest monsoon, which lasts till the first week of October. October to November is a period of post monsoon season.

RAINFALL

Records of rainfall in the district are available for two rainguage stations Nampong Hydro at 350 m and Miao Hydro at 215 m for period 12 and 22 years respectively. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. Owing to the mountainous nature of terrain, ranging from 200 m to 4500 m. in height, rainfall varies significantly from place to place. It is seen from Table 1 that the annual normal rainfall in the district is 2603.2 mm. The rainfall in the district increases from northwest to northeast due to orographic variation. Sometimes rainfall in the high elevated areas above 2000 m occurs in the form of snow and hails. During the monsoon season (June to September) district receives rainfall about 62% of the annual rainfall while the pre-monsoon season (March to May) contributes about 27% of the annual rainfall and rainfall is generally associated with thunderstorms and occasionally hails. July is the rainiest month in the year with an average rainfall of 533.8 mm. In the period 1969-2000 the highest annual rainfall in the district was 131% of the annual normal recorded in the year 1998 while the lowest was 81% recorded in 1986. The annual rainfall from year to year has some variation. It is seen from Table 2 that the annual rainfall in the district was between 2001 mm and 3200 mm in 16 out of 19 years for which full year data is available. On an average there are 131 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number is 128 at Miao Hydro and 132 at Nampong Hydro. The heaviest rainfall in 24 hours recorded at any station in the district is 183.7 mm at Miao Hydro on 6 July 1993.

TEMPERATURE

There is no meteorological observatory in the district, hence, the meteorological parameters recorded at the meteorological observatory Tezu and Hayuliang in the neighbouring Lohit district have been considered to describe the climate of this district. Broadly climatic condition in the plains and valleys regions (Changlang town at 580 m), is represented by meteorological data of Tezu station at a height of 197 m and that of elevated areas of low and middle height region is represented by meteorological data at Hayuliang which is at a height of 1373 m as temperature decreases with elevation. Day and night temperatures begin to decrease rapidly from the middle of November till January. January is the coldest month with mean maximum and mean minimum temperatures of about 22°C and 7°C respectively over the plains and low elevated areas. Lower temperatures are experienced over the mountainous regions. At places with elevation 1.5 km and above, the mean maximum and minimum temperatures are less than 16°C and 0°C respectively. On individual days in winter season the minimum temperature may go below - 6°C in the hilly terrain. The day and night temperatures begin to rise from the beginning of March, and rises rapidly till August. August is generally the warmest month with mean maximum temperature of about 32°C in the plains and about 15°C or less in the high elevated areas of the district while the mean minimum temperatures would be 22°C over the plains and about 9°C or less over the mountainous regions. On individual days in summer, the maximum temperature reaches at 38°C in plain areas and as the atmosphere is very humid, sometimes oppressive weather is experienced over the plains between two spells of rain. Weather becomes gradually cool and pleasant in the elevated areas of low and middle hills during October and November months.

HUMIDITY

The humidity is generally high throughout the year. Relative humidity is the highest in the monsoon season when it is about 80%. Winter months are slightly less humid, when the relative humidity is less than 70%. Although the humidity is high but weather is less oppressive in the high altitudinal regions on account of the low temperatures.

CLOUDINESS

Skies are generally heavily clouded to overcast during pre-monsoon and southwest monsoon seasons. The hill-tops are frequently enveloped with the clouds. In post monsoon months skies are moderately clouded. In winter cloudiness decreases but on some days skies are heavily clouded to overcast due to the passage of the western disturbances through the district. In the winter season the skies are sometimes obscured on many mornings due to lifted fog, which clears with the advancement of the day.

WINDS

Winds are generally light, while strong winds blow for a short period in association with thunderstorms. Winds become stronger in the pre-monsoon and monsoon seasons, as anabatic and katabatic winds blow over hilly terrains and play a dominant role in air motion. Northwesterly winds prevail during the southwest monsoon season and during the rest of the year southeasterly and easterly winds are predominant.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from the Bay of Bengal, which sometimes move into Assam valley, sometimes affect the district Thunderstorms occur in the pre-monsoon season are sometimes violent. Snow/hails sometimes occur over high altitudinal areas during the period of November to May. Fog occurs in the post monsoon and winter months especially in the areas of low elevation and valleys. Fog is common over hilly areas during the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
CHANGLANG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Miao Hydro	22	a	35.8	76.6	201.7	295.1	273.2	380.1	509.0	365.2	301.5	153.1	23.0	23.9	2638.2	129	79	183.7	06 Jul 1993
		b	3.9	6.6	12.2	14.5	13.9	1.6	19.8	16.0	12.7	7.8	2.5	2.4	128.3	(1988)	(1986)		
Nampong Hydro	12	a	38.2	62.3	141.2	280.1	202.0	404.6	558.6	367.4	336.7	127.4	28.1	21.6	2568.2	117	85	131	22 Sep 1977
		b	4.1	5.1	10.3	15.8	14.1	18.2	22.1	15.2	16.0	6.5	2.4	2.4	132.2	(1980)	(1978)		
Changlang (District)		a	37.0	69.5	171.5	287.6	237.6	392.3	533.8	366.3	319.1	140.3	25.5	22.7	2603.2	131	81		
		b	4.0	5.9	11.3	15.1	14.0	17.1	21.0	15.6	14.4	7.2	2.5	2.4	130.5	(1998)	(1986)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more).

* Based on all available data upto 2010 .** Years of occurrence given in brackets.

TABLE – 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1969 - 2000)
CHANGLANG

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
2001 - 2100	1	2801 - 2900	1
2101 - 2200	2	2901 - 3000	0
2201 - 2300	1	3001 - 3100	1
2301 - 2400	2	3101 - 3200	0
2401 - 2500	2	3201 - 3300	1
2501 - 2600	1	3301 - 3400	1
2601 - 2700	2	3401 - 3500	1
2701 - 2800	3		

(Data available for 19 years)

DIBANG VALLEY DISTRICT

Dibang Valley district lies in the extreme part of northeastern region of India in the eastern Himalayas. The terrain of the district consists of undulated-rugged mountains mostly with snowcapped hills, deep gorges, valleys, rivers and turbulent streams and by The elevation ranges from 800 metres to about 5200 metres above mean sea level towards north and east directions. There is a significant variation in meteorological conditions from place to place due to the mountainous nature of the terrain. Extreme north and eastern parts of the district are covered by snow throughout the year. In northern areas of the district cold weather is experienced from November to March and significant rain occurred in the rest of the year. There is no summer in this region. The climate of the district is characterized by humid and cold throughout the year, but it is very cold in winter season. In general the year may be divided into four seasons. Winter season is from November to mid-March. The period of mid-March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. This is followed by a transition period between the monsoon and winter seasons.

RAINFALL

Records of rainfall are available for 2 rainguage stations for period of 11 years each. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. It is seen from Table 1 that average annual rainfall of the district is about 3121.6 mm. The rainfall varies from place to place due to mountainous terrain, depending mostly on elevation and other geographical features of the place. The period of March to September (southwest monsoon and pre-monsoon seasons) is of chief rainy period and contributes to about 79% of the annual rainfall. The southwest monsoon season contributes 41% of the annual rainfall while pre-monsoon season (March-May) contributes 38% associated with thunderstorms. April is the rainiest month in the year with an average rainfall of 541.7 mm, while June is the rainiest month in the southwest monsoon season with an average rainfall of 466.7 mm. Precipitation in winter months December to February, especially in the elevated areas occurs in the form of snowfall, and contributes to about 11% of the annual normal rainfall. During the summer and post monsoon seasons heavy showers associated with thunderstorms and hails occur frequently. In the period 1976-1986 the highest annual rainfall in the district was 175% of the annual normal recorded in year 1977 while the lowest was 78% recorded in 1982. During this period there was one year, when the annual rainfall was less than 80% of the normal. It is seen from Table 2 that the annual rainfall in the district was between 2401 mm and 3800 mm in 5 out of 6 years for which full year data is available. On an average there are 128 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The number is 125 at Etalin and 131 at Anini. The heaviest rainfall in 24 hours recorded at any station in the district was 289.4 mm on 12 May 1982 at Etalin.

TEMPERATURE

There is no meteorological observatory in the district. The meteorological parameters recorded at Hayuliang observatory situated at an elevation of 1373 m in the neighbouring Lohit district are considered for describing the meteorological conditions of the district. The district headquarter is Anini situated at 1968 m. Temperature depends on elevation and topography therefore; it varies considerably from place to place in the district. Day and night temperatures begin to decrease rapidly from the middle of November till January. January is usually the coldest month with mean maximum and mean minimum temperature of about 14°C and 4°C respectively at district headquarter. At places above the elevation of 3000 m, the mean maximum temperature is less than 8°C and mean minimum is less than -4°C. On individual days in the winter season the minimum temperatures may go down to less than 0°C in the low elevated areas while it goes down below -6°C in the hilly terrain. Day and night temperatures begin to rise rapidly from the middle of March till August. July and August are generally the warmest months with mean maximum and mean minimum temperatures of about 26°C and 14°C respectively in the valleys and a much lower temperatures by 10°- 20°C are experienced over the mountainous region of high elevation. On individual days during summer season, the maximum temperature may go up to 30°C or a little more in low elevated areas. Day and night temperatures begin to decrease from October after withdrawal of the monsoon. Thereafter, the weather becomes gradually cool and pleasant over the region of low and middle hills till November and chilly over high altitudinal region.

HUMIDITY

The humidity is generally high throughout the year. The relative humidity is the highest in the pre-monsoon and monsoon seasons when it is about 80%. Winter months are slightly less humid, when the relative humidity is about 70%. However, it is bearable in the hilly terrain.

CLOUDINESS

The district is cloudy throughout the year. In the cold season the sky is obscured on many mornings due to lifted fog, which clears with the advancement of the day. Heavily clouded to overcast skies prevail in the pre-monsoon and monsoon seasons. The hill-tops are frequently enveloped with clouds. Lightly clouded or clear skies are common during the post monsoon and winter seasons.

WINDS

Winds are generally light, while strong winds blow for a short period in association with thunderstorms. Winds are stronger in the pre-monsoon and monsoon seasons, as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion. Northwesterly winds prevail during the southwest monsoon season and during the rest of the year southeasterly and easterly winds are predominant.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from the Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Some of the thunderstorms particularly those in the months of May are violent. Some of the thunderstorms are accompanied by hail. Sometimes snowfall generally occurs over high altitudinal areas from mid-November to February. Fog occurs frequently in the post monsoon and cold seasons especially in the valleys. It is also common over the hilly areas during the monsoon season.

TABLE – 1
NORMALS AND EXTREMES OF RAINFALL
DIBANG VALLEY

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Anini	11	a	82.8	168.0	303.7	383.6	267.9	374.1	271.9	162.9	267.1	137.5	63.9	56.2	2539.6	121	96	202.0	20 May 1978
		b	7.6	11.3	16.4	14.8	11.3	15.3	15.6	9.8	13.6	7.7	4.4	3.7	131.5	(1985)	(1982)		
Etalin	11	a	77.2	222.5	381.9	699.8	363.1	559.3	363.6	194.6	373.5	265.7	106.8	95.4	3703.4	147	84	289.4	12 May 1982
		b	5.4	11.9	15.8	16.3	10.1	14.1	13.6	8.0	12.9	8.4	4.1	4.7	125.3	(1977)	(1984)		
D. Valley		a	80.0	195.3	342.8	541.7	315.5	466.7	317.7	178.8	320.3	201.6	85.4	75.8	3121.6	175	78		
District		b	6.5	11.6	16.1	15.5	10.7	14.7	14.6	8.9	13.3	8.0	4.3	4.2	128.4	(1977	1982)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1976 - 1986)
DIBANG VALLEY

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
2401 - 2500	1	3501 - 3600	0	4501 - 4600	0
2501 - 2600	0	3601 - 3700	0	4601 - 4700	0
2601 - 2700	0	3701 - 3800	0	4701 - 4800	0
2701 - 2800	0	3801 - 3900	0	4801 - 4900	0
2801 - 2900	1	3901 - 4000	0	4901 - 5000	0
2901 - 3000	0	3301 - 3400	0	5001 - 5100	0
3001 - 3100	1	4001 - 4100	0	5101 - 5200	0
3101 - 3200	1	4101 - 4200	0	5201 - 5300	0
3201 - 3300	0	4201 - 4300	0	5301 - 5400	0
3301 - 3400	0	4301 - 4400	0	5401 - 5500	1
3401 - 3500	1	4401 - 4500	0		

(Data available for 6 years)

EAST KAMENG DISTRICT

The entire district except southernmost areas adjacent to the border of Assam is of mountainous terrain. The climate of district is influenced by hilly terrain that consists of high ranges of hills of the eastern Himalayan with ravines, narrow valleys and rivers. The southern part of the district where elevation is about 200 metres to 2000 metres above mean sea level, experiences a humid and hot climate in summer and monsoon season. Cool temperate climate is experienced over hilly terrain with peak height up to 6850 metres in northern part which is covered by snow throughout the year.

The climate of the district varies from place to place due to variation in elevation and topography. In northern areas of the district cold weather is experienced from November to March and significant rain occurred in the rest of the year. There is no summer in this region. In general the year may be divided into four seasons. Cold season is from the middle of November to March. It is very cold in the high elevated areas during this period. Thereafter summer or pre-monsoon season associated with thunderstorms and hails is experienced up to May. This is followed by southwest monsoon season which continues till the middle of October. This monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only two raingauge stations namely Chyang Tajo Hydro and Sepla/Seppa for period 11 and 22 years respectively. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. The average annual rainfall of the district is about 2015.9 mm. The rainfall varies from place to place due to variation in elevation and topography and it may be less in northern part of the district where the elevation is much high. It is seen from Table 1 that southwest monsoon season (June to September) is the chief rainy season which contributes about 62% of the annual rainfall. July is the rainiest month with an average rainfall of 366.5 mm, while in pre-monsoon season (March to May) it is about 24% associated with thunderstorms and hails. In the region of high elevations particularly northern part, the precipitation is received mostly in the form of snow and hails. During the summer and post monsoon seasons heavy showers associated with thunderstorms occur frequently. The variation in the annual rainfall from year to year is large. In the period 1966-2000 the highest annual rainfall in the district was 208% of the annual normal recorded in year 1980, while the lowest annual rainfall which was 39% recorded in 1966. In the same period there were five years, when the annual rainfall was less than 80% of the normal and none of them were consecutive years. It is seen from Table 2 that the annual rainfall in the district was between 1601 mm and 2500 mm in 3 years out of 9 for which full year data is available.

On an average there are 126 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The number of rainy days is 109 at Sepla/Seppa and 143 at Chyang Tajo Hydro. The heaviest rainfall in 24 hours recorded at any station in the district was 212.0 mm on 21 July 1989 at Sepla/Seppa.

TEMPERATURE

There is no meteorological observatory in the district. The description of meteorological conditions of the district which follows is based on data recorded at Ziro observatory situated at an altitude of 1476 m in the neighbouring district Lower Subansiri. Seppa is the headquarters of the district at an elevation of about 414 m. The day and night temperatures in the district vary from place to place due to altitudinal variation. Weather is experienced very cold during the period December to February. January is the coldest month with mean maximum temperature around 20°C and mean minimum temperature about 8°C at Seppa town or in southern part of the district. On individual days during winter minimum temperature may go down to -15°C in the northern part of the district and around 5°C in the southern region. The temperature gradually begins to rise from March and continues till August. July and August are the warmest months in the district with average maximum temperature about 30°C or more and average minimum temperature about 20°C in southern part. The temperatures in northern hilly areas are about 15°-25°C lower than in the southern part of the district. In the summer season the highest maximum temperature reaches at about 35°C or more on individual days in southern part of the district. There is no distinctive summer season in the hilly terrain and weather becomes pleasant from the latter part of the summer season except in the southern part where it becomes oppressive due to hot humid atmosphere. The southwest monsoon season is warmer than the summer season. The weather becomes gradually cool and pleasant in southern region after withdrawal of the southwest monsoon till November.

HUMIDITY

The atmosphere is highly humid throughout the year more so in the southern parts of the district. In the mornings, the relative humidity is generally about 80% or more while in the afternoons it is at about 75% or more.

CLOUDINESS

In the winter season the sky is obscured on many mornings due to lifted fog, which clears with the advance of the day. Heavily clouded to overcast skies prevail in the pre-monsoon and southwest monsoon seasons. The hill-tops are frequently enveloped with clouds. Lightly clouded or clear skies are common during the post monsoon season.

WINDS

Winds are generally northeasterly in mornings and southwesterly in afternoons throughout the year**.** Sometimes southeasterly component appears in the mornings. Winds become stronger in pre-monsoon and monsoon seasons. As anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Some thunderstorms particularly those in the months March to May are violent. Some thunderstorms during winter and pre-monsoon season are accompanied with hail. Fog occurs in morning throughout the year over hilly areas. Fog occurs frequently in the post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
EAST KAMENG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Chyang Tajo Hydro	11	a	3.9	127.1	155.8	229.8	241.2	333.8	354.5	237.3	298.3	120.7	49.0	37.5	2258.9	186	70	116.2	13 Sep1984
		b	6.9	10.7	10.7	13.7	12.7	18.4	19.4	13.4	16.6	10.6	5.9	4.1	143.1	(1980)	(1978)		
Sepla/Seppa	22	a	4.0	41.1	36.1	103.4	186.2	364.2	378.6	265.6	247.7	88.9	19.7	17.3	1772.8	177	44	212.0	21 Jul 1989
		b	3.3	4.2	4.9	7.9	11.8	17.6	20.2	15.3	14.3	5.6	1.8	2.1	109.0	(1982)	(1966)		
E. Kameng		a	49.0	84.1	96.0	166.6	213.7	349.0	366.5	251.5	273.0	104.8	34.3	27.4	2015.9	208	39		
(District)		b	5.1	7.5	7.8	10.8	12.3	18.0	19.8	14.4	15.5	8.1	3.8	3.1	126.2	(1980)	(1966)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1966 - 2000)
EAST KAMENG

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
701 - 800	1	1301 - 1400	2
801 - 900	0	1401 - 1500	0
901 - 1000	0	1501 - 1600	1
1001 - 1100	0	1601 - 1700	1
1101 - 1200	0	1701 - 1800	2
1201 - 1300	1	4201 - 4300	1

(Data available for 9 years)

EAST SIANG DISTRICT

East Siang district lies in the catchment areas of Siang river and valleys, plain (low elevated) areas and hilly terrain with high elevation up to 3700 metres above mean sea level. On account of the existence of the hilly ridges and valleys its topography has a typical character. The climatic conditions in the district therefore vary significantly from place to place due to mountainous nature of the terrain. Pasighat is the headquarters of the district at an elevation of about 157 m. The climate of this district is characterized by abundant rains, cold in winter and mild hot and humid in summer. In general, the year may be divided into four seasons. Winter season is from December to the first week of March. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The southwest monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one rainguage station i.e. Pasighat for 43 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The rainfall in the district varies from place to place due to its mountainous terrain. The annual rainfall at Pasighat Aero observatory is 4381.2 mm. The variation in annual rainfall from year to year is not large. It is seen from Table 1 that southwest monsoon (June to September) is the chief rainy season constituting about 73% of the annual rainfall. July is the rainiest month with an average rainfall of 1058.8 mm and rainy days about 22 days. Pre-monsoon season (March to May) also contributes significant amount of rainfall about 779.4 mm i.e. 18% of the annual rainfall which is mostly associated with thunderstorms. In the fifty year period 1951-2000, the highest annual rainfall occurred in year 1974 when it amounted to 150% of the annual normal rainfall. While the lowest was 63% of the annual normal occurred in 1992. There were three years in this period when the rainfall was less than 80% of the annual normal and none of them were consecutive. It is seen from Table 2 that the annual rainfall in the district was between 3501 mm to 5300 mm in 24 years out of 29. On an average there are 131 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Pasighat was 410.5 mm on 19 June 1974.

TEMPERATURE

There is one meteorological observatory in the district at Pasighat (altitude 157 m). The meteorological description of the district which follows is based on the records of this observatory which is located in the plain area. Day and night temperatures vary considerably from place to place, depending upon elevation. The temperatures in the plain area begin to decrease rapidly from the end of November till January. January is the coldest month when mean maximum and mean minimum temperatures are 22.9°C and 12.4°C respectively. But

temperatures are experienced much lower at the mountainous regions depending on the elevation. Cold weather condition occasionally occurs in winter season and minimum temperature may go down to about 7°C over the plain areas and below 0°C at hilly areas. The day and night temperatures both, rise rapidly from the beginning of March and till August. August is the warmest month with mean maximum temperature of 31.9°C and mean minimum temperature of 24°C over the plains. The temperature may be around 10°-15°C lower in hilly areas of the district. On individual days in the monsoon season the maximum temperature reaches up to 37°C when oppressive weather is experienced in the plain areas in between two spells of rain. The weather becomes gradually cool and pleasant in areas of low elevation after withdrawal of the southwest monsoon by first week of October during post monsoon season. The extreme temperatures ever recorded at Pasighat observatory are 38.8°C recorded as maximum on 07 July 1986 and 6.5°C recorded as minimum on 15 January 2003.

HUMIDITY

The relative humidity is generally high throughout the year being around 80%. During winter months it is slightly less about 73%. The monsoon season is mostly humid when the relative humidity is about 85%.

CLOUDINESS

Skies are overcast to heavily clouded during pre-monsoon and southwest monsoon months i.e. March to September. Sometimes the hill-tops are enveloped with the clouds. In post monsoon and winter seasons skies are moderately clouded. On some days in winter season skies are heavily clouded or overcast when western disturbance passes through its neighbourhood areas.

WINDS

Winds are generally light during southwest monsoon season. In the rest of the year winds are generally moderate, sometimes it becomes strong in association with thunderstorms. Due to the mountainous nature of terrain the wind is highly local and strong due to convective motion. Winds generally blow from northwest throughout the year. Sometimes wind is also calm.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur throughout the year. Thunderstorm activity is more pronounced during February to September, its frequency being a maximum in April and minimum in December. Fog occurs in

valleys during post monsoon and winter seasons. Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions and special weather phenomena respectively for Pasighat observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
EAST SIANG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Pasighat (A) (Obsy)	43	a	46.3	94.4	141.2	241.2	397.0	848.7	1058.8	723.6	556.6	217.9	29.1	26.4	4381.2	150	63	410.5	19 Jun 1974
		b	3.8	6.8	9.9	12.4	14.5	19.0	21.8	16.5	14.2	7.4	2.2	2.0	130.5	(1974)	(1992)		
E. Siang (District)		a	46.3	94.4	141.2	241.2	397.0	848.7	1058.8	723.6	556.6	217.9	29.1	26.4	4381.2	150	63		
		b	3.8	6.8	9.9	12.4	14.5	19.0	21.8	16.5	14.2	7.4	2.2	2.0	130.5	(1974)	(1992)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. .
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
EAST SIANG
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
2701 - 2800	1	4701 - 4800	1
2801 - 2900	0	4801 - 4900	2
2901 - 3000	0	4901 - 5000	2
3001 - 3100	0	5001 - 5100	1
3101 - 3200	1	5101 - 5200	0
3201 - 3300	1	5201 - 5300	0
3301 - 3400	0	5301 - 5400	0
3401 - 3500	0	5401 - 5500	0
3501 - 3600	0	5501 - 5600	0
3601 - 3700	5	5601 - 5700	0
3701 - 3800	1	5701 - 5800	0
3801 - 3900	2	5801 - 5900	0
3901 - 4000	0	5901 - 6000	0
4001 - 4100	0	6001 - 6100	0
4101 - 4200	4	6101 - 6200	0
4201 - 4300	1	6201 - 6300	0
4301 - 4400	3	6301 - 6400	0
4401 - 4500	1	6401 - 6500	0
4501 - 4600	1	6501 - 6600	1
4601 - 4700	0		

(Data available for 29 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(PASIGHAT)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	22.9	12.4	29.6	30/01/1973	6.5	15/01/2003	70	77
February	23.1	13.9	31.5	28/02/1975	7.5	02/02/1959	72	74
March	26.0	16.9	34.0	27/03/1973	10.6	01/03/1962	70	70
April	27.4	18.9	37.3	28/04/1979	12.5	040/4/1965	76	76
May	29.9	21.5	37.4	29/05/1961	11.3	22/05/1993	77	77
January	22.9	12.4	29.6	30/01/1973	6.5	15/01/2003	70	77
June	31.2	23.4	38.6	21/06/1996	18.9	19/06/1966	85	82
July	30.3	23.6	38.8	07/07/1986	19.1	03/07/1983	90	86
August	31.9	24.0	38.5	15/08/1978	20.1	11/08/1965	85	83
September	30.3	23.1	38.0	11/09/1977	17.4	29/09/1966	85	87
October	29.6	20.8	36.2	01/10/1983	13.4	29/10/1986	75	85
November	27.6	16.8	33	11/11/1974	8.3	30/11/1996	67	82
December	24.2	13.5	29.2	13/12/1996	7.2	16/12/1961	69	78
Annual	27.9	19.0	38.8	7/7/1986	6.5	15.01.2003	77	80

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (PASIGHAT)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	7	2	3	1	0	0	0	0	0	1	5	8	27
b	4	7	8	13	12	15	19	12	13	6	2	3	114
c	3.6	5.0	5.3	6.0	5.8	6.5	7.0	6.4	6.4	4.5	3.0	3.1	5.2
1730 HOURS IST													
a	6	1	1	0	0	0	0	0	0	2	9	9	29
b	5	6	6	8	7	8	9	4	6	4	2	3	69
c	3.7	5.1	5.7	6.0	5.4	5.6	5.7	4.8	5.2	4.0	2.5	2.7	4.7

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (PASIGHAT)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	11.4	11.1	12.5	8.2	5.8	3.5	1.5	2.2	2.8	6.3	11.1	12.3	7.4
Direction in morning	NW	NW	NW	NW	NW\C	C\NW	C	C\NW	C\NW	NW	NW	NW	
Direction in evening	C\NW	NW	NW\C	C\NW	C\NW	C\NW	C	C	C	C\NW	C\NW	NW\C	

TABLE - 6
Special Weather Phenomena (PASIGHAT)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.0	2.0	2.7	4.2	2.5	2.8	1.4	2.0	1.3	0.7	0.4	0.2	21.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	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
Squall	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

KURUNG KUMEY DISTRICT

Kurung Kumey district lies in high hilly terrain, catchment areas of rivers and valleys in part of eastern Himalayas. Two major rivers kurung and kumey originated from high hills flow in the district from which district's name is derived. The district has hilly ranges from 500 metres to 6000 metres above mean sea level, deep gorges and narrow valleys. The northwestern part of the district is mostly covered by snow throughout the year as it is high hilly terrain. Climatic conditions of the district vary largely with topography and altitude. In north and northwestern areas of the district chilly weather is experienced from November to March and significant rain occurred in the rest of the year. There is no summer in this district. The climate of the district is characterized by humid, rain and chilly particularly in winter. In general the year may be divided into four seasons. Cold season commences from November and lasts till late March. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. The southwest monsoon season is followed by post monsoon season till November.

RAINFALL

There is only one raingauge station in the district at Koloriang Hydro having an altitude of 1000 m. Details of rainfall at this station which may be taken as representative for the district as a whole are given in Tables 1 and 2. The district receives some rainfall throughout the year. The average annual rainfall at this station is 2208.0 mm. The southwest monsoon season is the chief rainy season, which constitutes about 57% of the average annual rainfall, while about 29% rainfall is received in the pre-monsoon season (March to May) associated with thunderstorms. July is the rainiest month with an average rainfall of 403.8 mm. Thundershower also occurs in the post monsoon season. Snow generally occurs over high altitudinal areas from November to February and hails generally occur in the pre-monsoon season. In the period 1966-1986 the highest annual rainfall in the district was 142% of the annual normal recorded in year 1985 while the lowest annual rainfall was 51% recorded in 1981. In this period there were three years, when the annual rainfall was less than 80% of the normal and there was one occasion of such a low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall in the district was between 1701 mm and 2700 mm in 3 out of 6 years for which full year data is available. On an average there are approximately 155 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Koloriang Hydro was 131.2 mm on 25 July 1986.

TEMPERATURE

There is no meteorological observatory in the district. The description of meteorological conditions of the district, which follows, is based on data of the meteorological observatory at Ziro situated at an altitude of 1476 m in the neighbouring district of Lower Subansiri. Laying-Yangte is the headquarters of the district at an elevation of about 1310 m. The day and night temperatures in the district vary from place to place due to large variation in elevation and orographic. The temperature decreases rapidly from the middle of November till mid February. Weather experienced during the period December to February is very cold and snowfall is frequently seen in the high elevated areas of the district. Northern part of the district is mostly covered by snow. January is the coldest month with mean maximum temperature about 13°C and mean minimum temperature about 0°C at Laying-Yangte town or in south and southeastern parts of the district, while the temperatures are 10° to 15°C lower at high altitudinal areas in north and northwestern of the district. On individual days in the winter season the minimum temperature at Laying-Yangte may go down to below -6°C. The temperature gradually rises from March and continues till August. July and August are the warmest months with average maximum temperature of about 25°C and an average minimum temperature of about 15°C in south and southeastern part of the district whereas the temperatures are about 10°- 20°C lower in other parts (high elevated areas in north) of the district. There is no distinctive summer in the district as the temperatures in the southwest monsoon season are equal or higher than in summer. The temperatures may be higher by 4° to 6°C in the low-lying areas. The weather is pleasant by the latter part of the summer season. The weather becomes gradually cool and pleasant in areas of low elevation after withdrawal of the southwest monsoon during October and November months and it becomes chilly over high altitudinal region.

HUMIDITY

The atmosphere is highly humid throughout the year. In the morning, the relative humidity is generally about 80% while in the afternoon, it is at about 75% or more.

CLOUDINESS

The district is cloudy throughout the year. In the cold season the sky is obscured on many mornings due to lifted fog, which clears with the advancement of the day. Heavily clouded to overcast skies prevail in the pre-monsoon and monsoon seasons. Sometimes the hill-tops are enveloped with the clouds. Lightly clouded or clear skies are common during the post monsoon season.

WINDS

Winds are generally northeasterly in the mornings and southwesterly in the afternoons throughout the year**.** It is the mountainous nature of the district that ensures light to moderate wind throughout the year. Sometime winds become stronger in pre-monsoon and monsoon seasons. As anabatic and katabatic winds blow over hilly terrains and play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from the Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Some of the thunderstorms particularly those in the months March to May are violent. Some thunderstorms in April and May are accompanied by hails. Sometimes snow and hail occur in winter and pre-monsoon season. Fog occurs in the morning throughout the year. Fog frequently occurs in the post monsoon and cold seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KURUNG KUMEY

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Koloriang (Hydro)	10	a	82.7	70.0	128.3	240.9	271.5	292.5	403.8	276.2	283.6	79.9	36.2	42.4	2208.0	142 9	51	131.2	25 Jul
		b	8.6	7.8	10.3	13.9	18.0	19.9	23.3	18.6	17.2	9.3	3.6	4.4	154.9	(1985)	(1981)		1986
Kurung Kumey District		a	82.7	70.0	128.3	240.9	271.5	292.5	403.8	276.2	283.6	79.9	36.2	42.4	2208.0	142	51		
		b	8.6	7.8	10.3	13.9	18.0	19.9	23.3	18.6	17.2	9.3	3.6	4.4	154.9	(1985)	(1981)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data. ** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1966 - 1986)
KURUNG KUMEY

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
1101 - 1200	1	2201 - 2300	0
1201 - 1300	0	2301 - 2400	0
1301 - 1400	0	2401 - 2500	0
1401 - 1500	1	2501 - 2600	0
1501 - 1600	0	2601 - 2700	1
1601 - 1700	0	2701 - 2800	0
1701 - 1800	1	2801 - 2900	0
1801 - 1900	0	2901 - 3000	0
1901 - 2000	0	3001 - 3100	0
2001 - 2100	1	3101 - 3200	1
2101 - 2200	0		

(Data available for 6 years)

LOHIT DISTRICT

This district lies in the catchment areas of Lohit river and extreme northeastern part of India in eastern Himalayas. The district has plain areas of low elevation in southwest and mountainous (high elevation) regions in east and north. The extensive valleys and rivers systems across the mountainous terrain are deep and narrow. The climate of the district varies from place to place due to altitudinal variation as elevation in the district varies from 200 metres to 4500 metres above mean sea level. The climate of this district is generally characterized by cold in winter, mild hot in summer in southern part and abundant rain in the monsoon and summer seasons. In north and eastern regions of the district, cold to very cold weather is experienced from November to March and significant rain occurs in the rest of the year. There is no distinct summer in this region. In general the year may be divided into four seasons. Cold season is from the end of November to beginning of mid-March. The period of mid-March to May is of summer (pre-monsoon) season which is followed by southwest monsoon season till the middle of October. The period of October and November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for five raingauge stations for period ranging from 10 to19 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1and 2. It is seen from Table 1 that the annual normal rainfall in the district is 3376.1 mm. Rainfall varies from place to place in the district due to mountainous nature of the terrain i.e. large altitudinal variations. The rainfall in the district increases from southwest to northeast. The period of March to September received rainfall about 86% of the annual rainfall. During the monsoon season (June to September) district receives rainfall about 56% of the annual normal rainfall. July is the rainiest month with an average rainfall of 645.4 mm. The pre-monsoon season (March to May) contributes rainfall about 30% of the annual i.e. 1002.1 mm which is significant amount occurred with thundershowers and hails. In the fifty year period 1951-2000 the highest annual rainfall in the district was 162% of the annual normal recorded in year 1977 and the lowest was 52% of the annual normal recorded in 1989. The annual rainfall from year to year has some variation. In this period there were 8 years, when the annual rainfall was less than 80% of the normal and there were two occasions when such a low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall in the district was between 2601 mm and 3900 mm in 13 out of 23 years for which full year data is available. On an average there are 135 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 124 at Tezu observatory to 152 at Lohitpur (Hydro). The heaviest rainfall in 24 hours recorded at any station in the district was 338.4 mm at Tezu observatory on 2nd July 1974.

TEMPERATURE

There are two meteorological observatories in the district at Tezu and Hayuliang. The meteorological description of the district which follows is mainly based on records of these observatories. Temperature depends on elevation and exposure to the sun; therefore it varies considerably from place to place in the district. Broadly climatic condition in the plains/ valleys is represented by meteorological data at Tezu which is at a height of 185 m. and that of higher elevation is represented by meteorological data at Hayuliang which is at a height of 1373 m. The day and night temperatures begin to decrease rapidly from the middle of November till January which is usually the coldest month with mean maximum and mean minimum temperatures of about 23.2°C and 7.5°C respectively over the plain areas of low elevation. On individual days in winter season occasionally in the wake of western disturbances, the minimum temperature may go down to 2°C to 3°C in plains and below -10°C in a hilly terrain. The day and night temperatures begin to rise from the middle of March rapidly till August. August is generally the warmest month with mean maximum and mean minimum temperatures of about 32.9°C and 23.5°C respectively over the plains. The temperatures are experienced by about 10° - 20°C lower over the mountainous regions. On individual days in May and June, the maximum temperature exceeds 38°C in plain areas and sometimes oppressive weather is experienced over the plains between two spells of rain. Day and night temperatures begin to decrease appreciably from October onwards. Weather becomes gradually cool and pleasant during post monsoon season.

The highest maximum temperature ever recorded at Tezu observatory was 40.0°C on 30 May and 01 June 1990, whereas the lowest minimum temperature ever recorded at Tezu was 0.6°C on 17 December 1969.

HUMIDITY

The humidity is generally high throughout the year. The relative humidity is the highest in the monsoon season when it is between 80% and 85%. Winter months are slightly less humid. The relative humidity is about 75% during November to February.

CLOUDINESS

Skies are generally heavily clouded to overcast during pre-monsoon and southwest monsoon seasons i.e. March to September. The hill-tops are enveloped with the clouds. In the post monsoon months skies are moderately

clouded. In winter cloudiness decreases but on some days skies are heavily clouded to overcast and sometimes sky is obscured on many mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light, while strong winds blow for a short period in association with thunderstorms. As anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion. Northwesterly winds prevail during the southwest monsoon season and southeasterly and easterly winds blow during the rest of the year.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depression from Bay of Bengal, which sometimes move into Assam valleys, affect the district. Thunderstorms occur in the pre-monsoon season. Such thunderstorms are sometimes violent. Snow sometimes occurs over hilly terrain from mid November to February and sometimes thunderstorms accompanied with hail during pre-monsoon season. Fog occurs in the post monsoon and winter months especially in the valleys. Fog is common over hilly areas during the monsoon season.

Tables 3, 4, 5 give the temperature, mean wind speed and special weather phenomena for Tezu observatory whereas Tables 3(a), 4(a), 5(a) and 6(a) give the temperature, humidity, cloudiness, mean wind speed and predominant wind directions and special weather phenomena for Hayuliang observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
LOHIT

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Lohitpur Hydro	10	a	71.0	128.3	218.7	363.5	361.2	658.4	764.0	684.8	400.9	205.3	93.1	74.9	4024.1	162	82	320.4	16 Jul 1978
		b	5.7	8.9	11.8	15.2	12.8	19.8	23.3	17.0	16.8	6.7	8.7	151.8	151.8	(1977)	1982)		
Tezu (Obsy)	19	a	46.3	76.0	144.3	326.0	290.9	462,9	710.7	429.5	343.9	181.5	20.0	31.3	3063.3	130	74	338.4	02 Jul 1974
		b	4.3	6.8	9.6	13.7	13.7	17.4	20.1	14.5	12.5	6.8	2.1	2.5	124.0	(1974)	(1980)		
Hayuliang (Obsy)	15	a	97.5	233.6	396.3	779.1	360.1	580.3	421.7	214.3	239.6	251.7	58.5	83.5	3696.1	153	67	280.0	03 Oct 1979
		b	6.4	10.3	14.4	16.9	13.2	14.9	16.5	9.7	10.1	8.1	3.2	3.6	127.3	(1984)	(1978)		
Wakro Hydro	10	a	57.6	89.2	205.0	543.5	355.2	507.2	858.3	510.4	325.7	152.5	58.7	42.5	3705.8	127	104	210.3	11 Jul 1977
		b	4.3	7.1	11.5	17.8	16.0	17.7	23.0	17.4	14.4	7.3	4.3	3.8	144.6	(1984)	(1983)		
Namsai Hydro	17	a	23.4	71.1	156.3	248.4	262.5	356.9	472.2	350.4	275.9	134.9	20.5	18.2	2390.7	126	74	162.8	05 Sep 2000
		b	3.2	6.4	10.6	15.1	13.5	17.5	19.9	15.8	12.9	7.6	1.9	1.8	126.2	(1995)	(1989)		
Lohit (District)		a	59.2	119.6	224.1	452.1	326.0	509.1	645.4	437.9	317.2	185.2	50.2	50.1	3376.1	162	52		
		b	4.8	7.9	11.6	15.7	13.8	17.5	20.6	14.9	13.3	7.7	3.6	3.4	134.8	(1977)	(1989)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

`TABLE – 2
Frequency of Annual Rainfall in the District
LOHIT
(Data 1971-2000)

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
1701 - 1800	1	3601 - 3700	0
1801 - 1900	0	3701 - 3800	1
1901 - 2000	0	3801 - 3900	0
2001 - 2100	3	3901 - 4000	0
2101 - 2200	1	4001 - 4100	1
2201 - 2300	2	4101 - 4200	0
2301 - 2400	0	4201 - 4300	0
2401 - 2500	0	4301 - 4400	0
2501 - 2600	1	4401 - 4500	0
2601 - 2700	1	4501 - 4600	0
2701 - 2800	4	4601 - 4700	0
2801 - 2900	1	4701 - 4800	0
2901 - 3000	1	4801 - 4900	0
3001 - 3100	1	4901 - 5000	0
3101 - 3200	1	5001 - 5100	0
3201 - 3300	2	5101 - 5200	0
3301 - 3400	0	5201 - 5300	0
3401 - 3500	0	5301 - 5400	0
3501 - 3600	1	5401 - 5500	1

(Data available for 23 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(TEZU)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	23.2	7.5	31.8	25/01/1973	1.1	30/01/1969	81	
February	23.6	10.4	30.3	28/02/1975	1.2	01/02/1969	80	
March	26.6	13.9	35.5	25/03/1973	7.1	01/03/1976	75	
April	27.8	16.5	36.1	28/04/1979	6.9	24/04/1980	77	
May	30.5	19.5	40.0	30/05/1990	9.9	09/05/1980	78	
June	31.9	22.7	40.0	01/06/1990	17.1	04/06/1976	83	
July	31.6	23.3	38.9	07/07/1981	17.1	04/07/1971	87	
August	32.9	23.5	38.3	14/08/1982	19.3	23/08/1978	84	
September	32.1	22.6	39.7	12/09/1974	18.9	28/09/1978	83	
October	31.0	19.3	----	----------	7.5	31/10/1969	76	
November	27.9	13.3	34.1	09/11/1984	3.5	29/11/1969	73	
December	24.8	8.6	30.1	03/12/1973	0.6	17/12/1969	77	
Annual	28.7	16.8	40.5	19/10/1990	0.6	17/12/1969	80	

TABLE - 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(TEZU)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	18	9	8	7	7	4	4	4	4	9	14	19	107
b	7	12	15	15	15	16	17	15	15	11	5	5	148
c	3.2	4.7	5.0	5.1	5.1	5.9	5.8	5.5	5.6	4.0	2.6	2.7	4.6
1730 HOURS IST													
a													
b													
c													

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Special Weather Phenomena
(TEZU)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.1	0.5	0.2	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	1.3
Hail	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Dust storm	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
Fog	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

TABLE – 3(a)
Normals of Temperature and Relative Humidity
(HAYULIANG)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	18.9	8.3	26.0	28 Jan 1982	3.0	08 Jan 1983	72	76
February	18.8	9.7	27.4	28 Feb 1975	5.0	08 Feb 1983	74	76
March	21.0	11.9	31.8	26 Mar 1973	8.0	02 Mar 1981	77	79
April	22.7	14.2	32.5	28 Apr 1979	5.5	13 Apr 1983	79	79
May	27.0	17.2	34.6	31 May 1974	10.0	03 May 1985	78	81
June	29.2	20.3	39.0	25 Jun 1985	14.0	06 Jun 1985	82	80
July	29.2	21.2	35.7	11 Jul 1973	15.2	25 Jul 1984	82	82
August	30.6	21.5	38.9	19 Aug 1971	17.0	09 Aug 1985	78	81
September	29.2	20.4	38.0	09 Sep 1982	16.0	15 Sep 1982	80	81
October	26.9	16.8	34.0	10 Oct 1983	10.5	31 Oct 1985	74	80
November	23.8	13.3	31.0	06 Nov 1985	8.0	30 Nov 1981	69	77
December	20.9	10.1	30.5	06 Dec 1984	4.0	27 Dec 1982	70	77
Annual	24.8	15.4	39.0	25 Jun 1985	3.0	08 Jan 1983	76	79

TABLE – 4 (a)
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(HAYULIANG)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	7	3	4	3	3	3	2	1	2	1	4	6	38
b	6	10	15	15	12	12	15	8	11	8	6	4	130
c	3.5	4.7	4.7	5.4	5.1	6.0	6.3	5.3	5.6	4.3	3.6	3.0	4.8
1730 HOURS IST													
a	7	3	6	4	3	3	2	1	2	1	5	8	45
b	7	9	11	13	10	10	11	6	6	6	4	4	95
c	3.6	4.5	4.3	5.0	4.6	5.1	5.3	4.4	4.5	3.9	3.1	2.8	4.3

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE –5(a)
Mean Wind Speed and Predominant Wind Direction
(HAYULIANG)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr													
Direction in morning	SE\E	SE\E	E\SE	E\SE	NW/W/E	NW\W	NW	NW	NW	SE	SE	SE	
Direction in evening	SE	SE	SE\E	SE\E	NW\SE\W\E	NW	NW	NW	NW	SE\NW	SE	SE	

TABLE – 6(a)
Special Weather Phenomena
(HAYULIANG)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.2	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Hail	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Dust storm	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
Fog	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

LOWER DIBANG VALLEY DISTRICT

Lower Dibang Valley district lies in the catchment area of Dibang river in the northeastern part of India in eastern Himalayas. The district may be broadly divided into two main parts - lower plain areas in south and hilly terrains in north with deep valleys and rivers. The district rises from foothills to the hill ranges with elevations from 200 metres to 5000 metres above mean sea level. The meteorological conditions in the district vary from place to place due to mountainous nature of the terrain with rugged and steep slopes. In northern region of the district cold weather is experienced from November to March and significant rain occurred in the rest of the year. There is no distinct summer in this region. The climate in areas of low elevation and valleys in the southern part of the district is characterized by hot and humid in summer and monsoon seasons. The climate of this district is generally characterized by cold in winter, mild hot in summer and humid throughout the year, whereas it is very cold in winter in hilly region. In general the year may be divided into four seasons. Winter season is from the end of November to the first week of March. The period of March to May is of pre-monsoon season and is followed by southwest monsoon season till the middle of October. Mid-October and November is a transition period between the monsoon and winter season.

RAINFALL

Records of rainfall in the district are available for two stations for period of 11 years each. The details of rainfall at these stations are given in Table 1 and 2. In general, rainfall in the district increases from south to north over the areas of low elevation. Annual rainfall at some places exceeds 400 cm. On account of mountainous nature the rainfall varies from place to place in the district. It is seen from Table 1 that annual rainfall at Desali Hydro and Anelih Hydro are 3463.4 mm and 4261.7 mm respectively while the district average is 3862.6 mm. Rainfall in the southwest monsoon season (June-September) is about 47% of the annual normal rainfall, while during pre-monsoon (March-May) it amounted to 36% of the annual which is a significant amount of rainfall due to frequent occurrence of thunderstorms in presence of acute moisture. April is the rainiest month in the year with an average rainfall of 628.5 mm and June is second rainiest month with an average rainfall of 601.3 mm. In the high elevated areas of the northern parts of the district, precipitation occasionally occurs in the form of snow during the winter months and hails during pre-monsoon season. In the period 1976-1986, the highest annual rainfall occurred in year 1977 when it amounted to 131% of the annual normal. The lowest annual rainfall was 84% of the normal and it occurred in 1978. There is less variation in annual rainfall from year to year. It is seen from Table 2 that the annual rainfall in the district was between 3201 mm to 4700 mm in 9 years out of 10 for which whole year data is available.

On an average there are 129 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number is 105 at Anelih and 152 at Desali. The heaviest rainfall in 24 hours in the district was 330.0 mm on18 April 1986 at Desali.

TEMPERATURE

There is no meteorological observatory in the district. The description of meteorological conditions in the district, which follows, is based on parameters recorded at Hayuliang and Pasighat observatories situated in the neighboring districts: Lohit and East Siang respectively. Temperature in the district depends on the elevation and exposure conditions; therefore it varies considerably from place to place. Roing is the headquarter of the district at an elevation of 390 m. Broadly climatic condition in the plains/valleys in southern part is represented by meteorological data at Pasighat observatory (altitude 157m) and that of higher elevation in northern part of the district is represented by meteorological data at Hayuliang (altitude 1373 m). Day and night temperatures begin to decrease rapidly from the middle of November till January which is usually the coldest month with a mean maximum and a mean minimum temperature of about 23°C and about 12°C respectively over the plains. At places with elevation of about 1500 m or more, i.e. places of medium elevations mean maximum and mean minimum temperatures of about 15°C to 20°C and 0°C to 4°C respectively may be observed, whereas the maximum and minimum temperatures less than 15°C and 0°C respectively are experienced over the high mountainous regions. On individual days in winter season the minimum temperature may go down to below 0°C in the hilly terrain. The day and night temperatures begin to rise from the beginning of March, rapidly till August. August is the warmest month with mean maximum and mean minimum temperature of about 31°C and 23°C respectively over the plain areas in southern part and lower by 10°C to 20°C over the mountainous region. On individual days in May and June, the maximum temperature over the plain region reaches 36°C and sometimes oppressive weather is experienced over the plains due to hot humid atmosphere in absence of rain. Day and night temperatures begin to decrease gradually from October after withdrawal of the monsoon and weather becomes gradually cool and pleasant in southern part of the district till November.

HUMIDITY

The humidity is generally high throughout the year. The relative humidity is the highest in the monsoon season when it is between 80% and 85%. November to February is slightly less humid, when the relative humidity is less than 75%.

CLOUDINESS

Skies are generally heavily clouded to overcast during pre-monsoon and southwest monsoon seasons. Sometimes the hill-tops are enveloped with clouds. In post monsoon months skies are moderately clouded. In winter cloudiness decreases but on some days skies are heavily clouded and sometimes the sky is obscured on many mornings due to lifted fog, which clears with the advance of the day.

WINDS

Winds are generally light, while strong winds blow for a short period in association with thunderstorms. As anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion. Winds are generally northeasterly in the mornings and southwesterly in the afternoons throughout the year. Northwesterly winds prevail during the southwest monsoon season.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from the Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Some of the thunderstorms particularly those in the months March to May are violent. Some of the thunderstorms in winter and pre-monsoon months are accompanied with hail. Fog occurs frequently in the post monsoon and cold seasons and it is common over hilly terrain during the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
LOWER DIBANG VALLEY

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Desali	11	a	73.1	159.4	316.9	588.0	305.0	563.5	438.5	323.1	374.7	178.5	72.0	70.7	3463.4	129	78	330.0	18 Apr 1986
		b	5.8	9.7	16.2	18.2	15.1	18.6	19.6	15.0	16.3	7.8	5.2	4.1	151.6	(1977)	(1978)		
Anelih	11	a	97.6	214.6	557.8	669.0	366.4	639.2	533.7	339.5	386.6	289.9	64.2	103.2	4261.7	133	85	270.0	8 Apr 1977
		b	4.1	7.6	12.4	12.8	8.8	13.0	13.6	8.1	10.6	7.1	3.3	3.5	104.9	(1977)	(1981)		
L.Dibang Valley (Disrict)		a	85.4	187.0	437.3	628.5	335.7	601.3	486.1	331.3	380.7	234.2	68.1	87.0	3862.6	131	84		
		b	5.0	8.6	14.3	15.5	12.0	15.8	16.6	11.6	13.5	7.5	4.3	3.8	128.5	(1977)	(1978)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data.. ** Years of occurrence given in brackets.

TABLE-2
Frequency of Annual Rainfall in the District
LOWER DIBANG VALLEY
(DATA – 1976-1986)

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
3201 - 3300	1	3701 - 3800	2	4201 - 4300	1	4701 - 4800	0
3301 - 3400	1	3801 - 3900	0	4301 - 4400	0	4801 - 4900	0
3401 - 3500	0	3901 - 4000	1	4401 - 4500	0	4901 - 5000	0
3501 - 3600	1	4001 - 4100	0	4501 - 4600	0	5001 - 5100	1
3601 - 3700	2	4101 - 4200	0	4601 - 4700	0		

(Data available for 10 years)

LOWER SUBANSIRI DISTRICT

Lower Subansiri district has hilly terrain and catchment areas of rivers and valleys. The topography of this district is mostly mountain terrain, where hill ranges varies approximately from 100 metres to 3047 metres above mean sea level and some areas of low lying land in the catchment of rivers. The heart land of the district is in Apatani plateau at about 1600 m above mean sea level where the district headquarter Ziro is located. In high elevated areas of the district cold weather is experienced from November to March and significant rain occurred in the rest of the year. There is no distinct summer in this region. The climate of the district varies from place to place due to altitudinal variation. The climate of this district is characterized by very cold in winter, and humid air throughout the year. In general the year may be broadly divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms and is followed by southwest monsoon season which continues till the middle of October. This monsoon season is followed by post monsoon season till November.

RAINFALL

There is only one raingauge station Ziro lying at an altitude of 1476 m in the district. Details of rainfall at this station and for the district as a whole are given in Table 1 and 2. The annual rainfall for this district is 1744.3 mm. The rainfall in the district varies from place to place due to altitudinal variation. The southwest monsoon season (June to September) is the chief rainy season which constitutes about 56% of the annual normal rainfall. June is the rainiest month with average rainfall of 292.5 mm. The pre-monsoon season constitutes rainfall about 26% of the annual rainfall. The rainfall in summer season is mostly in the form of thundershowers. The precipitation over high altitudinal areas sometimes occurs in the form of snow during winter and hail in pre-monsoon season. In the fifty years 1951 to 2000 the highest annual rainfall amounting to 220% of the normal occurred in year 1974 while the lowest annual rainfall amounting to 71% of the normal occurred in 1970. From the sparse data available at Ziro it can be seen that rainfall was less than 80% during three years, none of them being consecutive.

On an average there are 111 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded in the district at Ziro was 150.7 mm on 04 February 1974.

TEMPERATURE

There is an observatory in the district at Ziro having an altitude of 1476 metres. Cold weather begins in the district by about the end of November and continues till the beginning of March. January is the coldest month with mean maximum temperature at 12.9°C and mean minimum temperature at about -0.2°C. The temperature in the district varies from place to place. On individual days minimum temperature may go down below -6°C during winter season. The temperature gradually rises from March and continues till August. July and August are the warmest months in the district with average maximum temperature at 25.1°C and the average minimum temperature at 15.5°C. The temperatures may be 6° to 8°C lower in high elevated areas and 4°C to 6°C higher in low lying areas. In hilly regions the weather is pleasant during summer season. The southwest monsoon season is warmer than the summer period (March-May). The weather becomes gradually cool and pleasant after withdrawal of the southwest monsoon during post monsoon season.

The highest maximum temperature ever recorded at Ziro observatory is 33.4°C on 13 June 1971 and the lowest minimum temperature ever recorded is -6.7°C on 07 January 1979.

HUMIDITY

The atmosphere is humid throughout the year. In the morning, the relative humidity is generally about 80% while in the afternoon, it is 75% or more.

CLOUDINESS

In the winter season the sky is obscured on mornings due to lifted fog which clears with the advance of the day. Heavily clouded to overcast skies prevail in the monsoon and pre-monsoon seasons. Sometimes the hill-tops are enveloped with the clouds. Lightly clouded skies are common during the post monsoon season.

WINDS

Winds are generally northeasterly and in the mornings and southwesterly in the afternoons during the period September to May. It is generally southeasterly and southwesterly during the rest of the year**.** Winds become stronger in pre-monsoon and monsoon seasons as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from Bay of Bengal which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Some of the thunderstorms particularly those in the months March to May are violent. Some thunderstorms during winter and pre-monsoon season are accompanied with hail. Dust storms occur sometimes in latter part of pre-monsoon season in low lying areas. Fog occurs frequently in the post monsoon and winter seasons and sometimes it is observed over hilly terrain during monsoon season. Its frequency is maximum in December month with average 18 days.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, predominant wind directions, special weather phenomena respectively for Ziro observatory.

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TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
LOWER SUBANSIRI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Ziro Obsy	17	a	88.7	106.1	78.3	169.0	199.5	292.5	249.0	232.4	199.9	64.1	51.2	13.6	1744.3	220	71	150.7	04 Feb 1974
		b	5.2	7.3	6.8	10.8	13.1	15.7	14.5	14.6	12.8	4.8	3.4	1.5	110.5	(1974)	(1970)		
Lower Subansiri (District)		a	88.7	106.1	78.3	169.0	199.5	292.5	249.0	232.4	199.9	64.1	51.2	13.6	1744.3	220	71		
		b	5.2	7.3	6.8	10.8	13.1	15.7	14.5	14.6	12.8	4.8	3.4	1.5	110.5	(1974)	(1970)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010 .
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
LOWER SUBANSIRI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1201 - 1300	2	1601 - 1700	0
1301 - 1400	1	1701 - 1800	1
1401 - 1500	0	3801 - 3900	1
1501 - 1600	1		

(Data available for 6 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(ZIRO)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	12.9	-0.2	21.5	8/1/1969	-6.7	7/1/1979	75	75
February	13.2	2.3	19.7	28/2/1971	-3	17/2/1972	81	76
March	16.8	4.7	26.2	17/3/1969	-0.4	2/3/1976	82	78
April	19.1	8.3	28.3	27/4/1970	1.4	14/4/1977	82	79
May	21	12.4	30.3	30/5/1971	3.4	1/5/1972	79	75
June	23.3	14.7	33.4	13/6/1971	7.6	18/6/1977	81	77
July	25	15.8	31.9	13/7/1972	9.2	15/7/1974	82	76
August	25.1	15.1	32.3	23/8/1972	10.2	28 /8/1976	82	77
September	24	13.7	32.3	08/09/1970	9	8/9/1974	81	77
October	23.4	10.1	30.2	29/10/1970	2	28/10/1969	82	81
November	18.3	4.4	28.9	04/11/1969	-4.2	30/11/1971	82	79
December	15.8	0.4	25.2	01/12/1977	-5.7	20/12/1971	76	75
Annual	19.8	8.5	33.4	13/6/1971	-6.7	7/1/1979	80	77

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(ZIRO)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	11	6	7	6	6	4	5	6	5	6	7	13	82
b	5	4	6	7	7	8	1	7	7	4	3	2	1
c	4.2	4.5	4.5	4.7	4.8	5.0	5.3	5.2	5.1	4.4	3.7	3.4	4.6
1730 HOURS IST													
a	6	3	9	7	5	4	6	6	5	5	9	12	77
b	6	7	7	7	7	7	7	4	5	4	3	4	8
c	4.5	5.1	4.7	4.9	4.7	4.8	4.8	4.5	5.0	4.3	4.0	4.2	4.6

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(ZIRO)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr													
Direction in morning	C/NE	C/NE	C/NE	C\SE\S\NE	C/NE/SE	C/SW/SE	C/S/SE/SW	C/S	C\NE	C/NE	C/SW	C/NE	
Direction in evening	C/SW	C/SW	C/SW	C/SW/W	C/SW/W	C/SW	C/SW/W/S	C/SW/W/S	C/SW	C/SW	C/SW	C/W/SW	

TABLE - 6
Special Weather Phenomena
(ZIRO)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.2	0.2	0.3	0.7	0.3	0.6	0.5	0.6	0.3	0.8	0.0	0.0	4.5
Hail	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2
Dust storm	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Fog	14.8	11.2	7.4	4.5	3.1	1.0	1.2	2.7	4.1	7.0	13.3	17.9	88.2

PAPUM PARE DISTRICT

Papum Pare district lies in mountainous region and catchment areas of rivers and valleys of the eastern Himalayas. The area of the district comprises of the foothill region forming the plains of the district adjoining the northern border of Lakhimpur and Sonitpur districts of Assam, the lower hills and the lofty mountains having peaks height about 3800 metres above mean sea level extending northwards. The climate of the district varies from place to place due to altitudinal variation. The climate is characterized by abundant rain, cold in winter and mild hot in summer in southern part and very cold in winter in northwestern part of the district. The foothills region receives heavy rainfall during the monsoon and summer season. In general the year may be divided into four seasons. Cold season is from the middle of November till the first week of March. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms, and is followed by southwest monsoon season which continues till the middle of October. The southwest monsoon season is followed by post monsoon season till November.

RAINFALL

There is only one raingauge station in the district at Itanagar Hydro having an altitude of 350 m a.m.s.l. Details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall at this station is 3381.2 mm. The rainfall in the district varies from place to place due to altitudinal and orographic variation. The southwest monsoon season is the chief rainy period which constitutes about 65% of the annual rainfall, followed by about 24% in the pre-monsoon season (March to May). June is the rainiest month with an average rainfall of 633.2 mm. In the summer and post monsoon season heavy showers associated with thunderstorms occur in high elevated areas and sometimes it accompanied with hails. Sometimes snowfall occurs over high altitudinal areas from November to February. In the period 1966-2000 the highest annual rainfall in the district was 130% of the annual normal recorded in year 1991 while the lowest annual rainfall was 76% in 1992. In the same period there was only one year, when the annual rainfall was less than 80% of the normal. It is seen from Table 2 that the annual rainfall in the district was between 2701 mm and 4100 mm in 4 out of 6 years for which full year data is available.

On an average there are 125 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Itanagar Hydro was 342.0 mm on 03 August 1991.

TEMPERATURE

There is one meteorological observatory in the district at Itanagar having an altitude of 350 m. However, data at this observatory is not available for sufficiently long period for studying the weather conditions in the district, hence, the description of meteorological conditions of the district which follows is based on the data of Ziro observatory (altitude 1476 m) situated in the neighboring Lower Subansiri district. Day and night temperatures in the district vary from place to place due to altitudinal variation. Cold season begins in the district by about the middle of November and lasts till mid March. Weather experienced during the period December to February is usually very cold in hilly terrain. January is the coldest month with mean maximum temperature of about 23°C and mean minimum temperature about 11°C at Itanagar or in the southern plains of the district, while it gradually reduces northwards over the hilly region where the mean maximum and mean minimum temperatures are less than 12°C and 0°C respectively. On individual days in the winter season minimum temperature may go down to 6°C in the plains and below -3°C in the northern hilly regions. The temperature gradually rises from March and continues till August. July and August are the warmest months in the district with average maximum temperature about 32°C and mean minimum temperature about 23°C in the southern plains, while in the northern hilly regions these temperatures are about 20°C and 12°C or less respectively. There is no distinctive summer season in most parts of the district as the summer temperatures are equal or slightly less than that experienced in the monsoon months. On individual days during the monsoon season maximum temperature may reach to 36°C in the plain areas. The weather becomes gradually cool and pleasant in the southern plains after withdrawal of the southwest monsoon during post monsoon season.

HUMIDITY

The atmosphere is highly humid throughout the year. The relative humidity is generally about 80% to 85% in the southwest monsoon months in the southern plains. The northern hilly regions experience a slightly lower humidity around 80% in the southwest monsoon season.

CLOUDINESS

The district is cloudy throughout the year. In the cold season the sky is obscured on many mornings due to lifted fog in the high reaches, which clears with the advancement of the day. Heavily clouded to overcast skies prevail

in the pre-monsoon and monsoon seasons. Sometimes the hill-tops are enveloped with the clouds. Lightly clouded skies are common during the post monsoon season.

WINDS

Winds are generally northeasterly in the mornings and southwesterly in the afternoons almost throughout the year. The winds are stronger in the late summer and in the monsoon seasons as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Some of the thunderstorms particularly those in the months March to May are violent. Some thunderstorms are accompanied by hail. Dust storms occur sometimes in latter part of pre-monsoon season in southern part of the district. Fog occurs frequently in the post monsoon and cold seasons. In the hilly areas (northern part) of the district fog occurs throughout the year.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
PAPUM PARE

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Itanagar (Hydro)	5	a	33.7	67.6	106.1	226.8	468.7	633.2	577.7	503.0	492.3	241.6	19.2	11.3	3381.2	130	76	342.0	3 AUG 1991
		b	2.5	5.3	6.9	12.2	14.4	19.7	20.5	16.4	16.2	8.5	1.8	1.0	125.4	(1991)	(1992)		
Pampum Pare (District)		a	33.7	67.6	106.1	226.8	468.7	633.2	577.7	503.0	492.3	241.6	19.2	11.3	3381.2	130	76		
		b	2.5	5.3	6.9	12.2	14.4	19.7	20.5	16.4	16.2	8.5	1.8	1.0	125.4	1991	1992		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - II
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(1966 - 2000)
PAPUM PARE

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
2501 - 2600	1	3501 - 3600	1
2601 - 2700	0	3601 - 3700	0
2701 - 2800	0	3701 - 3800	0
2801 - 2900	0	3801 - 3900	0
2901 - 3000	0	3901 - 4000	0
3001 - 3100	0	4001 - 4100	0
3101 - 3200	1	4101 - 4200	0
3201 - 3300	0	4201 - 4300	0
3301 - 3400	0	4301 - 4400	1
3401 - 3500	2		

(Data available for 6 years)

TABLE-3
NORMALS OF TEMPERATURE AND RELATIVE HUMIDITY
(ITANAGAR)

Month	Mean Daily Maximum	Mean Daily Minimum	Highest Maximum ever recorded	Date	Lowest Minimum ever recorded	Date	Relative humidity %	
	°C	°C	°C		°C		0830 IST	1730 IST
January	23.4	10.8	27.2	22-01-2009	6.6	03-01-2009	85	85
February	25.0	11.2	30.0	11-02-2009	5.2	03-02-2008	81	77
March	27.8	14.2	33.9	24-03-2009	8.8	01-03-2008	75	71
April	29.0	17.8	33.7	27-04-2009	13.6	02-04-2009	79	75
May	31.0	20.8	35.6	29-05-2009	18.7	04-05-2008	81	78
June	31.4	22.8	35.8	04-06-2006	20.0	11-06-2009	87	84
July	31.9	23.3	38.0	20-07-2007	20.5	26-07-2007	87	83
August	31.6	23.6	36.6	07-08-2007	21.3	01-08-2008	84	86
September	31.5	22.9	35.2	16-09-2008	17.4	22-09-2007	83	89
October	30.3	20.2	35.6	06-10-2010	15.6	27-10-2007	78	87
November	28.1	13.8	31.3	02-11-2008	9.8	30-11-2008	73	85
December	25.2	10.7	28.9	05-12-2008	7.4	20-12-2007	80	86
Annual	28.8	17.7	38.0	20-07-2007	5.2	03-02-2008	81	82

TAWANG DISTRICT

Tawang district of Arunachal Pradesh lies in eastern Himalayas showing boundaries with Tibet in the north, Bhutan in southwest and Sela ranges in east. Tawang is hilly district as a whole and has elevation ranging from 2000 metres to 6858 metres above mean sea level. The altitudinal areas up to 3500 m have plateau and narrow valleys and more high elevated areas up to the highest peak Gorithan (altitude of 6858 m) in the district which is covered with snow throughout the year. The district has tundra type climate in high altitudinal areas where snowfall is experienced throughout the year. Owing to its topography and rapid changes in the nature of the terrain, there are variations in the climatic conditions even within short distances. The climate varies from place to place due to variation in elevation and topography. The climate of the district is characterized by chilly in winter and cold in the rest of the year. Cold season, which is generally bitter especially in the higher elevated areas, commences from early November and lasts till the end of March and followed by pre-monsoon season till May. The period of June to the first week of October is of southwest monsoon season. October is transition month between the monsoon and winter season.

RAINFALL

There is only one raingauge station at Tawang town in the district. Rainfall data is not available for a minimum period of 10 years, which is required for a detailed study. However, data is available for the rainguage at Tawang town, which is the headquarters of the district, for a period of only 5 years (2006 to 2010). This may be taken for a representative study of rainfall in the district. The average annual rainfall of the district is about 1561.6 mm which in comparison to the other districts of the state has relatively low rainfall. July is the rainiest month with an average rainfall of about 300 mm. 59% of the annual rainfall of the district is received in the southwest monsoon season while 32% of the annual rainfall is received during the pre-monsoon season (March to May), which is mostly in the form of thunderstorms. Precipitation occurs over the district in the form of snow during winter and post monsoon seasons and hails during summer season. The rainfall decreases northwards, where the elevation is high. In the five year period 2006 to 2010 the highest annual rainfall amounting to 104% of the normal occurred in 2008 while the lowest annual rainfall amounting to 79% of the normal occurred in 2009. On an average there could be approximately 100 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

TEMPERATURE

There is no meteorological observatory in the district. The neighbouring observatory Ziro in the Lower Subansiri district, which is at an elevation of 1476 m may be considered as a representative observatory for studying the climate and other parameters in the district. Tawang is the headquarters of the district with an altitude of 2914 m. The climatic conditions may vary in different areas of the district due to elevation and

topographic variations. Due to topography of the district, temperature decreases with the height to northwards in the district by 4° to 8°C per km. Winter season begins in the southern part of district by about the beginning of November and continues till the end of March. Weather is usually experienced very cold especially during the period December to February. While the high mountains are permanently snowcapped and chilly weather is experienced throughout the year. January is the coldest month with mean maximum temperature about 8°C and mean minimum temperature about -4°C at Tawang town whereas the temperature are experienced by about 10°C to 15°C lower in the north where elevation is much high up to 6850 m. On individual days in winter season minimum temperature may go down to about -10°C or below. The temperature gradually rises from March and continues till August. July and August are the warmest months with average maximum temperature of about 20°C and the average minimum temperature of about 8°C at Tawang town whereas temperatures are experienced by about 10°C to 15°C lower at high altitudinal areas. There is no summer in this district and the weather is pleasant during the pre-monsoon season in southern part. The southwest monsoon season is slightly warmer than the summer period. The weather becomes gradually cool and chilly after withdrawal of the southwest monsoon by first week of October.

HUMIDITY

The atmosphere is humid throughout the year especially in the southern part of the district. In the morning, the relative humidity is generally higher while in the afternoon, it is a little more.

CLOUDINESS

The district is cloudy throughout the year. In the cold season the sky is obscured on many mornings due to lifted fog, which clears with the advance of the day. Heavily clouded to overcast skies prevail in the pre-monsoon and monsoon seasons. The hill-tops are frequently enveloped with clouds. Lightly clouded or clear skies are common during the post monsoon season.

WINDS

The winds in the district are generally similar to most of the far northern districts of state**.** Winds are generally northeasterly in the morning and southwesterly in the afternoon almost throughout the year. Winds become stronger in pre-monsoon and monsoon season as anabatic and katabatic winds prevail over hilly terrain and play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Thunderstorms particularly in the months March to May are violent. Some thunderstorms are also accompanied with hail. Fog occasionally occurs over hilly areas throughout the year especially in morning. Fog occurs frequently in the post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
TAWANG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**	
																HIGHEST	LOWEST
Tawang	5	a	1.6	9.0	105.2	213.5	183.7	167.0	299.4	252.5	195.9	98.6	31.8	3.4	1561.6	104 (2008)	79 (2009)
Tawang (District)		a	1.6	9.0	105.2	213.5	183.7	167.0	299.4	252.5	195.9	98.6	31.8	3.4	1561.6	104 (2008)	79 (2009)

a: Normal rainfall in mm.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
(Data 2006-2010)

TAWANG

Range in mm	No. of years
1201 - 1300	1
1301 - 1400	1
1401 - 1500	1
1501 - 1600	1
1601 - 1700	1

(Data available for 5 years)

TIRAP DISTRICT

Tirap district is the second smallest district of Arunachal Pradesh, lying in extreme southeastern part of the state. The elevation of land varies from about 100 metres in the northwest to about 2620 metres above mean sea level over the mountains towards the southeast. The climate of the district therefore is influenced by its topography, which is marked by hills, deep gorges and valleys. The climate of the district is characterized by mild hot and humid in summer, cold in winter and good amount of rainfall in the monsoon season. In general the year may be divided in to four seasons. Winter season starts from December and lasts to the beginning of March and is followed by pre-monsoon season till May which is characterized by thunderstorms. The period of June to the first week of October is of southwest monsoon season followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at Sunpura for a period of 25 years. The details of rainfall at this station which may be taken as representative for the district as a whole are given in Tables 1 and 2. It is seen from Table 1 that the annual normal rainfall in the district is 2612.3 mm. Rainfall varies from place to place in the district due to its altitudinal variations and mountainous nature. During the monsoon season (June to September) the district receives about 61% of the annual rainfall. July is the rainiest month with an average rainfall of 488.4 mm. The pre-monsoon season (March to May) contributes rainfall about 27% of the annual rainfall. During this period rainfall is associated with thunderstorms. In the period 1929-1953 the highest rainfall in the district was 135% of the annual normal recorded in year 1938 and the lowest was 77% of the annual normal recorded in 1945. The annual rainfall from year to year has some variation. In the same period there was one year, when the annual rainfall was less than 80% of the normal. It is seen from Table 2 that the annual rainfall in the district was between 2001 mm and 3200 mm in 18 out of 20 years for which full year data is available. On an average there are 130 rainy days (i.e. days with rainfall of 2.5 mm or more). The heaviest rainfall in 24 hours recorded at the Sunpura station is 222.3 mm on 9th July 1946.

TEMPERATURE

There is no meteorological observatory in the district and hence the description that follows is based on the observations recorded at Hayuliang and Tezu observatories in the neighbouring Lohit district. Temperature varies

according to the elevation and topography existing at the place and hence it varies considerably from place to place in the district. The district headquarter Khonsa is situated at an altitude of 1278 m. Broadly the climatic condition in the plains and valleys can be represented by meteorological conditions at Tezu observatory which is at a height of 197 m and places at a higher elevation can be represented by meteorological conditions at the Hayuliang observatory (height of 1373 m). In northern part of the district i.e. plain areas, the day and night temperatures begin to decrease rapidly from the middle of November till January. January is usually the coldest month with mean maximum and mean minimum temperature of about 20°C and 8°C respectively at Khonsa town. On individual days in winter season the minimum temperature may go down to 0°C or less in the hilly terrain. The day and night temperature begin to rise rapidly from the middle of March till August. July and August are generally the warmest months with an average maximum and average minimum temperature of about 30°C and 22°C respectively at Khonsa town. The temperatures may be experienced 6°C to 8°C lower over the mountainous region and 4° -5 °C high in the plain areas of low elevation with reference to Khonsa town. On individual days during summer and monsoon seasons, maximum temperature reaches 38°C and together with the high humid level over the plains where oppressive weather is experienced in gaps between two spells of rain. Both day and night temperatures begin to decrease from October after withdrawal of the monsoon. Thereafter, the weather becomes gradually cool and pleasant during post monsoon season.

HUMIDITY

The humidity is generally high throughout the year. The relative humidity is the highest in the monsoon season when it is around 80%. Winter months are slightly less humid, when the relative humidity is less than 70%.

CLOUDINESS

Skies are generally heavily clouded to overcast during pre-monsoon and southwest monsoon seasons. Sometimes the hill-tops are enveloped with clouds. In post monsoon months skies are moderately clouded. In winter cloudiness decreases but on some days skies are heavily clouded to overcast due to the passage of western disturbance through the district. Sometimes sky is obscured on many mornings due to lifted fog which clears with the advance of the day.

WINDS

Winds are generally light, however strong winds blow for short periods in association with thunderstorms, as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion. Northwesterly winds prevail during the southwest monsoon season and southeasterly and easterly winds blow during the rest of the year.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions from Bay of Bengal which sometimes move into Assam valley affect the district. Sometimes hails occur over hilly terrain during pre-monsoon season. Thunderstorms occur in the pre-monsoon season. Such thunderstorms are sometimes violent. Fog occurs in the post monsoon and winter months especially in the valleys. Fog is common over hilly areas during the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
TIRAP

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Sunpura	25	a	38.0	76.0	144.5	255.4	308.3	451.6	488.4	325.0	336.8	126.9	36.8	24.6	2612.3	135	77	222.3	9 Jul 1946
		b	4.1	7.6	11.0	14.1	15.0	17.8	18.3	14.5	13.8	7.7	3.4	2.6	129.9	(1938)	(1945)		
Tirap		a	38.0	76.0	144.5	255.4	308.3	451.6	488.4	325.0	336.8	126.9	36.8	24.6	2612.3	135	77		
(District)		b	4.1	7.6	11.0	14.1	15.0	17.8	18.3	14.5	13.8	7.7	3.4	2.6	129.9	(1938)	(1945)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - II
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1929 - 1953)
TIRAP

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
2001 - 2100	1	2801 - 2900	0
2101 - 2200	3	2901 - 3000	2
2201 - 2300	1	3001 - 3100	1
2301 - 2400	3	3101 - 3200	0
2401 - 2500	0	3201 - 3300	0
2501 - 2600	1	3301 - 3400	0
2601 - 2700	3	3401 - 3500	0
2701 - 2800	3	3501 - 3600	2

(Data available for 20 years)

UPPER SIANG DISTRICT

Upper Siang district lies in high hilly terrain and low lying areas in the catchment of river Siang. The district has a mountainous region, with deep gorges and fast flowing streams and rivulets, which form the tributaries of the mighty Siang river. The elevations in the district vary from 200 metres in valleys to about 5500 metres above mean sea level in northern part of the district. The climatic condition in the district varies significantly from place to place due to mountainous nature of the terrain, depending mostly on elevation and topography. The climate of the district is generally characterized by chilly in winter, and cold and moderate temperature in the rest of the year. In general the year may be divided into four seasons. Winter season is from mid-November to late March and is followed by pre-monsoon season of thunderstorms till May which is generally very mild with low and moderate temperature at hilly terrain. Southwest monsoon season is from June and lasts till the middle of October. The period of mid-October and mid-November is of transition period between the monsoon and winter season.

RAINFALL

Records of rainfall are available for Yingking Hydro the only one raingauge station in the district, for 14 years. Details of rainfall at this station may be taken as representative of the district are given in Table 1 and 2. Rainfall in the district varies from place to place depending on elevation. Broadly beyond elevations of about 2 km, rainfall decreases. Annual normal rainfall at the district as a whole is 2496.8 mm. It is seen from Table 1 that pre- monsoon (March to May) and southwest monsoon seasons are the chief rainy period and contribute about 35% and 50% of the annual normal rainfall respectively. June is the rainiest month with an average rainfall of 395.1 mm. The post monsoon and winter months contribute rainfall about 15% of the annual normal rainfall. Precipitation received during this period is mostly as snowfall over the high mountains. During pre-monsoon season precipitation occurs in the form of hails which is associated with thunderstorms. In the period 1977-1997 the highest rainfall in the district was 141% of the annual normal recorded in year 1987 while the lowest was 84% in 1990. In the same period the annual rainfall was never less than 80% of the normal. It is seen from Table 2 that the annual rainfall in the district was between 2001 mm and 3000 mm in 6 out of 9 years for which full year's data is available. On an average there are 126 days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Yingking Hydro was 281.6 mm on 7th May 1994.

TEMPERATURE

There is no meteorological observatory in the district. The description of meteorological conditions of the district, which follows, is based on parameters recorded at Ziro observatory situated in the district of Lower Subansiri having an altitude of 1476 m. Yingkiong is the headquarters of the district with an altitude of 465 m.

The day and night temperatures in the district vary from place to place due to altitudinal variation. Cold season begins in the district from the middle of November and lasts till mid-March. Severe cold Weather is experienced during the period December to February when the high mountains are snowcapped. January is the coldest month with mean maximum temperature about 18°C and mean minimum temperature is about 7°C at Yingkiong town (valleys of low lying elevation about 500 m). On individual days in the winter season minimum temperature may go down to below -10°C in the high reaches of the mountains. The temperature gradually rises from March and continues till August. July and August are the warmest months in the district with an average maximum temperature of about 30°C and average minimum temperature of about 20°C in the valleys however the temperatures over the high altitudinal areas are 10°C to 20°C lower than those are in valley areas. The southwest monsoon season is sometimes warmer than the summer season and as such there is not summer season in this district. The weather becomes pleasant by the latter part of the summer season in the areas of low hills. The weather becomes gradually cool and pleasant in the areas of low elevation after the withdrawal of the southwest monsoon and it becomes chilly over high altitudinal region during the post monsoon season.

HUMIDITY

The atmosphere is highly humid throughout the year. In the morning, the relative humidity is generally about 80%, while in the afternoon it is about 75**%** or more.

CLOUDINESS

The district is cloudy throughout the year. In the cold season the sky is obscured on many mornings due to lifted fog, which clears with the advance of the day. Heavily clouded to overcast skies prevail in the pre-monsoon and monsoon seasons. The hill-tops are frequently enveloped with clouds. Lightly clouded or clear skies are common during the post monsoon season.

WINDS

Winds are generally moderate during the southwest monsoon season. In the rest of the year winds are generally light, sometimes becoming strong in association with thunderstorms. Due to mountainous nature of terrain the direction of wind is highly local and strong as anabatic and katabatic winds blow over hilly terrain and play dominant role in the air motion. Winds are generally northeasterly in the mornings and southwesterly in the afternoons almost throughout the year.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from the Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Sometimes thunderstorms particularly those in the months of March to May are violent. Some thunderstorms during January to May are also accompanied with hail. Snow sometimes occurs over high altitudinal areas from mid-November to February. Fog generally occurs in the post monsoon and winter seasons. Fog is also experienced over hilly terrain in the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
UPPER SIANG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Yingking Hydro	14	a	46.2	115.6	193.8	358.5	328.3	395.1	358.8	249.7	243.4	150.9	29.4	27.1	2496.8	141	84	281.6	7 May 1994
		b	4.7	8.8	13.5	14.5	14.9	17.0	15.9	10.8	13.9	8.1	2.0	1.7	125.8	(1987)	(1990)		
U.Siang (District)		a	46.2	115.6	193.8	358.5	328.3	395.1	358.8	249.7	243.4	150.9	29.4	27.1	2496.8	141	84		
		b	4.7	8.8	13.5	14.5	14.9	17.0	15.9	10.8	13.9	8.1	2.0	1.7	125.8	1987	1990		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - II
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(1977 - 1997)
UPPER SIANG

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO.OF YEARS
2001 - 2100	1	2701 - 2800	0
2101 - 2200	1	2801 - 2900	1
2201 - 2300	0	2901 - 3000	2
2301 - 2400	0	3001 - 3100	0
2401 - 2500	0	3101 - 3200	1
2501 - 2600	0	3201 - 3300	1
2601 - 2700	1	3500 - 3501	1

(Data available for 9 years)

UPPER SUBANSIRI DISTRICT

Upper Subansiri district lies in high hills and catchment of rivers and valleys in eastern Himalayas. The district has mostly mountainous terrain and high hill up to height of 5735 metres above mean sea level the northern part. The areas of extreme northern part are snowcapped, while southern part of the district is of low hills. The climatic condition of this district varies with elevation and topography; hence it can be broadly divided into tundra type in the high altitude region and temperate type in low and middle altitudinal region. In the northern part, chilly weather is generally experienced while temperate climate is in the central and southern parts of the district. The climate of the district is characterized by chilly in winter, low temperatures with long cold throughout the year in the northern part and humid and mid hot in areas of low elevation during summer and monsoon seasons. In general the year may be divided into four seasons. Cold season is from the middle of November to mid-March and this is followed by pre-monsoon season associated with thunderstorms till May. The period of June to the middle of October is of southwest monsoon season and is followed by post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at Daporijo Hydro located in southern part for a period of 11 years. Details of rainfall at this station which may be taken as representative for the district as a whole are given in Table 1 and 2. Annual rainfall of district is 1299.4 mm. The rainfall varies from place to place due to variation in elevation and topography. At very high elevations in the north of the district the rainfall is less and mostly in the form of snow. The rainfall is mostly received in the southwest monsoon season (June to September) and it is about 61% of the annual rainfall. About 25% of the annual rainfall is received in the pre-monsoon season (March to May). Heavy showers associated with thunderstorms occur in pre-monsoon and post monsoon seasons and sometimes they are accompanied with hails. Precipitation received from November to March is in the form of snow especially in the high altitudinal areas. In the period of years 1985-2000 the highest annual rainfall in the district was 133% of the annual normal recorded in year 1999 while the lowest was 69% in 1997. In the same period there was only one year, when the annual rainfall was less than 80% of the normal. It is seen from Table 2 that the annual rainfall in the district was between 1001 mm and 1600 mm in 2 years out of 4 for which full year data is available. On an average there are 105 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district annually. The heaviest rainfall in 24 hours recorded in the district was 86.8 mm at Daporijo Hydro on 16 Sept. 2000.

TEMPERATURE

There is one observatory in the district at Daporijo having an altitude of 248 m. Daporijo is the headquarters of the district. But meteorological data of this observatory is not available sufficiently for long period average, therefore, the description of meteorological conditions of the district which follows is based on available data of this observatory and data of Ziro observatory situated at altitude of 1476 m in the neighboring district Lower Subansiri. The temperatures in the district vary from place to place due to variation in elevation and orography. Cold weather begins in the district by mid-November and continues till March. Weather during the period December to February is very cold in high altitudinal areas. January is the coldest month with mean maximum temperature about 20°C and mean minimum temperature about 10°C at Daporijo in the southern part of the district. On individual days in the winter season minimum temperature may go down to about -12°C or less in the northern hilly region and about 5°C in the low lying areas of the district. The temperature gradually rises from March and continues till August. July and August are the warmest months in the year with an average maximum temperature of about 30°C and mean minimum temperature of about 22°C at Daporijo town. The temperatures are 15° - 25°C lower in northern hilly region with reference to Daporijo town. On individual days temperature may reach 38°C in low lying areas particularly in southern part. There is no summer season in this district and the weather becomes pleasant during the latter part of the summer season. The southwest monsoon season is warmer than the summer period. The weather becomes gradually cool and pleasant in southern part after the withdrawal of the southwest monsoon and chilly over high altitudinal areas during the post monsoon season.

HUMIDITY

The atmosphere is highly humid throughout the year. The relative humidity is generally about 85% throughout the year in the southern part of the district, while in the northern hilly region it is less humid particularly in the winter months.

CLOUDINESS

The district is cloudy throughout the year. In the cold season the sky is obscured on many mornings due to lifted fog, which clears with the advancement of the day. Heavily clouded to overcast skies prevail in the pre-monsoon and monsoon seasons. The hill-tops are frequently enveloped with clouds. Lightly clouded or clear skies are common during the post monsoon season.

WINDS

Winds are generally northeasterly in the mornings and southwesterly in the afternoons almost throughout the year. Winds become stronger in pre-monsoon and monsoon seasons as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Some thunderstorms particularly those in the months: March to May are violent. Some thunderstorms during pre-monsoon are accompanied with hail. Sometimes snowfall occurs during the period November to February. Dust storms occur sometimes in the latter part of the pre-monsoon season in southern part. Fog occurs frequently in the post monsoon and cold seasons especially in the high reaches of the district. It is also common over hilly areas during the monsoon season

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
UPPER SUBANSIRI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Daporijo Hydro	11	a	27.9	48.3	85.2	101.4	140.4	228.4	217.3	182.9	159.7	75.9	20.2	11.8	1299.4	133	69	86.8	16 SEP 2000
		b	4.2	5.4	8.8	9.6	12.6	16.2	14.6	13.3	10.7	5.1	2.7	1.9	105.1	(1999)	(1997)		
U.Subansiri (District)		a	27.9	48.3	85.2	101.4	140.4	228.4	217.3	182.9	159.7	75.9	20.2	11.8	1299.4	133	69		
		b	4.2	5.4	8.8	9.6	12.6	16.2	14.6	13.3	10.7	5.1	2.7	1.9	105.1	(1999)	(1997)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - II
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(DATA 1985 - 2000)
UPPER SUBANSIRI

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
801 - 900	1	1301 - 1400	0
901 - 1000	0	1401 - 1500	0
1001 - 1100	1	1501 - 1600	1
1101 - 1200	0	1601 - 1700	0
1201 - 1300	0	1701 - 1800	1

(Data available for 4 years)

WEST KAMENG DISTRICT

West Kameng district lies in western part of Arunachal Pradesh in eastern Himalaya. The district is mostly hilly terrain with elevation varying from 150 metres in south to about 7090 metres above mean sea level in north. The climate of this district is influenced by topographic variation. The highest peak in Arunachal Pradesh is Kangte with an altitude of 7090 m situated in this district. As such a large area of the district falls within higher mountainous zone, consisting of a mass of tangled peaks and valleys with the elevation decreasing towards the south as it approaches Assam plains. The highly elevated areas of the district are covered with snowcapped. There are three-principle mountain chains in the district: Sela range (high hills), Bomdila range (moderate hills) and Chaku range (low hills). Bomdila town is the headquarters of the district having an altitude of 2484 m.

In general the climate may be described as cool temperate type in all areas of the district except southern parts where it is moderate and comfortable. The northern part of the district experiences a cool temperate climate throughout the year. Cold season commences from November to late March. The high elevated areas of the district experience snowfall during this period. This is followed by pre-monsoon (summer) season of thunderstorms till May. Southwest monsoon season is from the beginning of June and lasts till the middle of October followed by post monsoon season.

RAINFALL

Records of rainfall in the district are available for three raingauge stations for period ranging from 10 to 16 years. Bomdila observatory is situated at the central part of the district while Bahlukpong and Khellong are situated towards the south and as such data of the northern regions are not available. In regions of high elevations mostly near the northern borders, the annual precipitation may be lesser and mostly in the form of snow. Bomdila observatory having an altitude of 2484 m receives an annual rainfall of 1468.8 mm which is lesser than that of Bhalukpong receiving an annual rainfall of 4439.6 mm having an altitude of 152 m. The rainfall varies from place to place due to variation in elevation and topography. In general southern part of the district receives more rainfall than other areas. It is seen from Table 1 that annual normal rainfall is about 3389.4 mm. Southwest monsoon season (June to September) is the main season of rainfall yielding nearly 74% of the annual rainfall. July is the rainiest month with an average rainfall of 742.3 mm. The rainfall in the pre-monsoon season (March-May) is mostly in the form of thundershowers yields about 16% of the annual rainfall. Sometimes precipitation occurs in the form of hails during this season. In the period 1965-2000 the highest annual rainfall in the district

was 163% of the annual normal recorded in year 1990 while the lowest annual rainfall was 27% of the annual normal recorded in 1966. In this period there were seven years, when the annual rainfall was less than 80% of the normal and there was one occasion each when such a low rainfall occurred in four and two consecutive years. It is seen from Table 2 that the annual rainfall in the district was between 2701 mm and 4100 mm in 6 out of 20 years for which full year data is available. On an average there are 120 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 72 at Bomdila observatory to 154 at Khellong. The heaviest rainfall in 24 hours recorded in the district was 570.2 mm on 11 June 1976 at Bomdila observatory.

TEMPERATURE

There is one observatory in the district at Bomdila having an altitude of 2484 m. But, the meteorological data of this observatory is not available for sufficiently long period, hence, the description of meteorological conditions of the district which follows is based on available data of the neighbouring observatory Ziro situated at an altitude of 1476 m in the Lower Subansiri district. The day and night temperatures in the district vary from place to place due to orography and altitudinal variation. Cold weather begins in the district about the middle of November and continues till March. Weather usually experienced in the elevated areas during the period December to February is very cold i.e. chilly. January is the coldest month with mean maximum temperature of about 7°C and mean minimum temperature of about 0°C at Bomdila town. On individual days in winter season minimum temperature may go down to below-7°C in the areas of middle hill range Bomdila. The temperature gradually rises from March and continues till August. July and August are the warmest months in the district with an average maximum temperature of about 20°C and an average minimum temperature of about 12°C in the middle hill range. However, the temperatures may be 10°C to 20°C lower in high elevated areas and 6°C to 12°C higher in southern parts of low elevation. In general cold weather is experienced throughout the year in all areas of the district except extreme southern part.

HUMIDITY

The atmosphere is highly humid throughout the year. The relative humidity is generally about 90% in the southwest monsoon months while in the rest of the year it is at about 85%. In general values of relative humidity are slightly higher in the afternoon than mornings.

CLOUDINESS

The district is cloudy throughout the year. In the cold season the sky is obscured on many mornings due to lifted fog which clears with the advance of the day. Heavily clouded to overcast skies prevail in the pre-monsoon and monsoon seasons. The hill-tops are frequently enveloped with clouds. Lightly clouded or clear skies are common during the post monsoon season.

WINDS

Winds are generally northeasterly in the mornings and southwesterly in the afternoons almost throughout the year. Winds become stronger in pre-monsoon, as anabatic and katabatic winds blow over hilly terrain and play a dominant role in air motion.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms occur during the period January to October. Some thunderstorms particularly those in the months of March to May are violent. Some thunderstorms during winter and pre-monsoon season are accompanied with hail. Fog occurs frequently in the post monsoon and cold seasons. It is also common over hilly areas during the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
WEST KAMENG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Bhalukpong	16	a	38.1	57.6	69.9	141.1	414.0	832.4	899.2	762.3	820.5	337.1	46.3	21.1	4439.6	124	79	397.5	24 Sep 1990
		b	2.9	5.1	5.2	9.3	15.6	20.8	23.1	19.6	19.3	9.8	2.5	1.9	135.1	(1990)	(1994)		
Bomdila	12	a	20.4	18.9	32.7	61.9	120.5	382.4	322.9	245.1	138.2	89.1	30.1	6.6	1468.8	401	63	570.2	11 Jun 1976
Obsy		b	1.1	2.2	2.7	4.5	8.8	11.0	13.9	11.7	8.9	4.3	1.9	.6	71.6	(1976)	(1971)		
Khellong	10	a	51.2	61.5	73.9	200.6	496.6	904.3	1004.7	733.7	500.2	167.9	22.7	42.5	4259.8	107	88	220.2	24 Jul 1982
		b	4.8	5.5	5.7	13.5	20.0	22.2	27.2	25.3	18.7	7.2	2.0	2.3	154.4	(1976)	(1981)		
W. Kameng		a	36.6	46.0	58.8	134.5	343.7	706.4	742.3	580.4	486.3	198.0	33.0	23.4	3389.4	163	27		
(District)		b	2.9	4.3	4.5	9.1	14.8	18.0	21.4	18.9	15.6	7.1	2.1	1.6	120.3	(1990)	(1966)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE – 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(1965 - 2000)
WEST KAMENG

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
901 - 1000	2	3301 - 3400	0
1001 - 1100	1	3401 - 3500	0
1101 - 1200	2	3501 - 3600	1
1201 - 1300	0	3601 - 3700	0
1301 - 1400	2	3701 - 3800	1
1401 - 1500	0	3801 - 3900	0
1501 - 1600	0	3901 - 4000	3
1601 - 1700	0	4001 - 4100	1
1701 - 1800	0	4101 - 4200	0
1801 - 1900	0	4201 - 4300	0
1901 - 2000	0	4301 - 4400	1
2001 - 2100	0	4401 - 4500	2
2101 - 2200	0	4501 - 4600	2
2201 - 2300	0	4601 - 4700	0
2301 - 2400	0	4701 - 4800	0
2401 - 2500	0	4801 - 4900	0
2501 - 2600	0	4901 - 5000	0
2601 - 2700	0	5001 - 5100	1
2701 - 2800	0	5101 - 5200	0
2801 - 2900	0	5201 - 5300	0
2901 - 3000	0	5301 - 5400	0
3001 - 3100	0	5401 - 5500	0
3101 - 3200	0	5501 - 5600	1
3201 - 3300	0		

(Data available for 20 years)

WEST SIANG DISTRICT

This district lies in catchment areas of rivers and hilly terrains in eastern Himalaya. Northern part of the district falls within higher mountainous zone having a mass of tangled peaks up to 4850 metres above mean sea level and valleys. The terrain in the district is mostly mountainous except for a narrow strip in the south, which is plain with elevation about 200 m. Deep narrow valleys run generally north to south in the mountain. Owing to the mountainous nature of terrain, meteorological conditions vary considerably from place to place, depending mostly on elevation and orography. The southern part of low elevation experiences a hot and humid weather in summer and monsoon seasons. The climate of the district is generally characterized by chilly in winter in the northern part, abundant rain in monsoon season and mild hot in summer in southern part of the district. Northern part of the district is generally snowcapped where climate may be described as cool temperate type. In general the year may be divided into four seasons. Winter season is from the middle of November to late March followed by pre-monsoon or summer season of thunderstorms till March. Southwest monsoon season starts from the beginning of June and lasts till mid-October which is followed by post monsoon season.

RAINFALL

Records of rainfall in the district are available for two raingauge stations Basar Hydro and Likkabali Hydro for a period of 11 years each. The details of rainfall at these stations and for the district as a whole are given in Table 1 and 2. It is seen from Table 1 that the average annual rainfall in the district is 3024.1 mm. Rainfall in the district varies from place to place depending on Topography. Likkabali Hydro station in the southern part of the district receives 3626.7 mm of rainfall annually, while Basar Hydro with an altitude of 700 m receives 2421.3 mm as average annual rainfall. In general, rainfall over the district exceeds 350 cm in the south and decreases towards the north. The northern and central parts of the district, receive rainfall of about 200 cm or less. Southwest monsoon season (June to September) is the main rainy season with an overall contribution of 73% of the annual rainfall. July is the rainiest month with an average rainfall of 745.8 mm. Pre-monsoon season (March-May) contributes about 17% of the annual rainfall. Northern mountainous part of the district receives snowfall under the influence of western disturbances in the post-monsoon and winter months. The variation in the rainfall from place to place is large. In the period 1966 to 1986 the highest annual rainfall amounting to 128% of the annual normal occurred in year 1980 while the lowest annual rainfall amounting to 74% of the normal occurred in 1982. There were two years when annual rainfall was less than 80% of the annual normal rainfall. It is seen from Table 2 that the annual rainfall in the district was between 2401 mm to 3600 mm in 5 years out of 8 for which full year data is available. On an average there are 119 rainy days (i.e days with rainfall of 2.5 mm or more) in a year in the district with 118 being at Likkabali Hydro and 120 at Basar Hydro. The heaviest rainfall in 24 hours recorded at any station in the district was 275 mm on 22nd August 1983 at Basar Hydro.

TEMPERATURE

There is no observatory in the district. The description of meteorological conditions, which follows is based on parameters recorded at Pasighat observatory (altitude 157 m) and Ziro observatory (altitude 1476 m) situated in the neighboring East Siang and Lower Subansiri districts respectively for southern part of low elevation and northern areas of the district. Aalo is the headquarters of the district having an altitude of 258 m. Day and night temperatures vary considerably from place to place, depending upon elevation. The temperatures in the district begin to decrease rapidly from mid November till January. January is the coldest month with mean maximum temperature of about 22°C and mean minimum temperature of about 12°C at Aalo town. These temperatures may be 17°-23°C and 8°-12°C respectively in southern part, having altitude upto 1000 m. On individual days in the winter season minimum temperature may go down to about 6°C over the plains and less than -10°C over hilly areas. The day and night temperatures rise rapidly from the middle of March and this trend continue till August. August is the warmest month with mean maximum temperature about 31°C and mean minimum temperature about 24°C respectively at Aalo town. But the temperatures in high hilly terrain are about 15°-25°C lower with reference to Aalo. On individual days in the summer season, the maximum temperature occasionally exceeds 35°C in southern part when oppressive weather is experienced in the plains. Weather becomes gradually cool and pleasant in the southern part after withdrawal of the monsoon till November.

HUMIDITY

The humidity is generally high throughout the year. The relative humidity is the highest in the pre-monsoon and monsoon seasons when it is about 80% or more. Winter months are slightly humid, when the relative humidity is about 70%. However, it is more bearable in the high altitudinal regions but oppressive in the valleys.

CLOUDINESS

In the cold season the sky is obscured on many mornings due to lifted fog, which clears with the advancement of the day. Heavily clouded to overcast skies prevail in the pre-monsoon and monsoon seasons. The hill-tops are frequently enveloped with clouds. Lightly clouded or clear skies are common during the post monsoon and winter seasons.

WINDS

Winds are generally light throughout the year except during southwest monsoon season when it is slightly strong. The wind sometimes becomes strong in association with thunderstorms. Due to the mountainous nature of terrain the direction of the wind is highly local as katabatic winds are experienced in the valleys and play a dominant role in air motion. Winds generally blow from northwest throughout the year. Sometimes calm conditions are also experienced.

SPECIAL WEATHER PHENOMENA

The cyclonic storms and depressions from the Bay of Bengal, which sometimes move into Assam valley, rarely affect the district. Thunderstorms activity is more during February to September, its frequency being maximum in April and minimum in December. Some of the thunderstorms particularly those in the months March to May are violent. The thunderstorms are sometimes accompanied by hail during winter and pre-monsoon season. Dust storms sometimes occur in the latter part of the pre-monsoon season in the plains i.e. southern part of the district. Snowfall generally occurs over high altitudinal area from mid-November to February. Fog occurs frequently in the post monsoon and cold seasons. It is also common over hilly areas during the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
WEST SIANG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Basar Hydro	11	a	26.3	66.7	76.8	229.2	239.2	416.9	592.5	312.4	291.4	107.0	33.6	29.3	2421.3	115	67	275.0	22 Aug1983
		b	2.9	6.4	7.6	13.9	12.5	17.0	20.2	12.9	15.0	6.4	2.6	3.0	120.4	(1984)	(1978)		
Likkabali Hydro	11	a	19.8	65.4	68.0	183.3	249.7	611.4	899.2	712.4	578.6	175.0	28.9	35.0	3626.7	137	76	230.2	19 Aug 1979
		b	2.2	5.8	6.6	12.4	11.8	18.2	20.9	15.7	13.2	6.2	2.1	2.7	117.8	(1980)	(1982)		
W. Siang (District		a	23.0	66.1	72.4	206.3	244.5	514.2	745.8	512.4	435.0	141.0	31.2	32.2	3024.1	128	74		
		b	2.6	6.1	7.1	13.1	12.1	17.6	20.5	14.3	14.1	6.3	2.3	2.8	118.9	1980	1982		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
FREQUENCY OF ANNUAL R/F IN THE DISTRICT
(1966 - 1986)

WEST SIANGRANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
2201 - 2300	2	3101 - 3200	0
2301 - 2400	0	3201 - 3300	0
2401 - 2500	0	3301 - 3400	0
2501 - 2600	1	3401 - 3500	0
2601 - 2700	0	3501 - 3600	0
2701 - 2800	2	3601 - 3700	0
2801 - 2900	1	3701 - 3800	0
2901 - 3000	0	3801 - 3900	1
3001 - 3100	1		

(Data available for 8 years)

CLIMATE OF NAGALAND

General Description

Nagaland state is situated in the extreme northeastern part of India. The state lies between $25^0$06'N and $27^0$04'N latitudes, and between $93^0$20'E and $95^0$15'E longitudes having an area of 16,579 sq.km. Nagaland is bounded by Arunachal Pradesh and part of Assam on the north, Manipur on the south, Assam on the west and Myanmar country on the east.

The state is mostly mountainous except those plain areas bordering Assam valley. The plain area of low elevation in the state is limited to Dimapur and some part of Paren, Wokha, Mokokchung, Longleng and Mon districts adjoining areas with Assam state. The capital of Nagaland is Kohima situated at an elevation of about 1400 metres above mean sea level. The topography of the state is much dissected, full of hill ranges, which break into a wide chaos of spurs and ridges. The Naga Hills rise from Assam border in to about 600 m and further rise to the southeast, where Mount Saramati in Kiphire and Tuensang districts has high elevation. The highest peak in the state is about 3840 m at Mount Saramati in Kiphire district. The Naga Hills merge with the Patkai range of Myanmar. The other hill's peaks in Nagaland are Japfu (3014 m) in Kohima district, Mol Len (3104 m) and Kupamedzu (2620 m) both in Phek district. The hilly terrain is mostly covered with dense trees and plants.

Nagaland state is drained by a number of seasonal and perennial rivers. The major rivers of Nagaland are Doyang, Dikhu, Dhansiri, Tizu, Jhanji, Nanung, Tsurong or Disai, Tsumok, Menung, Dzu, Langlong, Zunki, Likimro, Lanye, Dzuza, Milak Manglu etc. The state is mostly covered by the first four major rivers. Dhansiri, Doyang and Dikhu flow northward in the state and merge into the Brahmaputra. While Tizu river flows towards east and joins the Chindwin river in Myanmar.

Rivers

Doyang: It is the longest river in the state originating from the Japfu hills near the southern slope of Mao in Manipur. It first flows almost due north through Kohima district. The river then enters Zunheboto district still flowing northwestwardly. It makes westward bent and emerges western Lotha area in Wokha district and proceeds to the southern border of the district. It suddenly turns westward and finally falls in Dhansiri river in Assam. The main tributaries of Doyang are Chubi and Nzhu rivers which flow from Mokokchung and Kohima district respectively and finally pour itself to Doyang.

Dikhu: Dikhu river originates from Nuroto hill area in Zunheboto district. The river flows towards north along the border of Mokokchung and Tuensang districts. The main tributaries of Dikhu are Yangyu river of Tuensang district and Nanung river in the Langpangkong range in Mokokchung district. The river flows further northward and leaves the hills near Naginimora and finally merges with Brahmaputra river.

Dhansiri: Dhansiri river flows in the southwestern part of the state through Rangapahar - plains of Dimapur District. This river receives almost all the western and southern drainages of Nagaland. Its main tributaries are Dzuza and Diphu rivers. At the extreme southwest of the state, it assumes a northwardly course forming a natural boundary with Assam which finally drains into the Brahmaputra.

Tizu: Tizu river forms an important drainage system in the eastern part of the state. It originates from the central part of the state and runs through a northeast direction flows through Zunheboto and Phek districts and meets in the Chindwin river of Myanmar. The main tributaries of Tizu are Zunki, Lanye and Likimro rivers.

Nagaland state is a smaller part of one meteorological sub-division- Nagaland Manipur Mizoram Tripura (NMMT). The state comes under forecasting centre- Regional Meteorological Centre Guwahati. There are the following eleven districts in the state.

1. Dimapur 2. Kiphire 3. Kohima 4. Longleng 5. Mokokchung 6. Mon 7. Peren 8. Phek 9. Tuensang 10. Wokha 11. Zunheboto.

Climate

The state has mostly hilly terrains with peaks up to 3840 m and some plain areas of low elevation with rivers and valleys. The climate of the state is largely influenced by topography of the hilly regions and it varies from place to place according to its topography. The presence of the mountain ranges not only prevents the winds from the north but also acts as a barrier to the cyclonic storms originating from the Bay of Bengal. The climate of Nagaland is generally very cool in winter, moderate warm and pleasant in summer especially in the hilly regions and humid in the monsoon months. January is the coldest month of the year.

The year may be divided into four seasons. Winter season from December to first week of March is followed by pre-monsoon or summer season of thunderstorms till May. The period of June to mid-October is of southwest monsoon season which is followed by post monsoon season till November.

Areas in the state under each climate pattern based on Koppen's classification are shown in Fig. 2. This broad classification is based on mean annual and monthly values of precipitation in centimeters and temperature in degree centigrade. Districts along the western border of the state namely Dimapur, Paren, Mokokchung and most part of the districts viz. Mon, Kohima, Wokha and Longleng come under the climate type:- Subtropical monsoon with mild and dry winter, hot summer (Cwa). Districts in the eastern and central part of the state viz. Phek, Kiphire, Zunheboto, Tuensang and some eastern part of the district viz. Mon, Longlend, Wokha and Kohima come under the climate type:- Tropical upland, mild and dry winter, short warm summer (Cwb).

Sea level Pressure and Winds

The seasonal variation in atmospheric pressure over the state occurs in a systematic way with maximum in the winter and minimum in the southwest monsoon season. The pressure gradient over the state shows that pressure is slightly low over the western parts of the state while slightly high pressure is noticed towards the east. The trend remains the same almost throughout the year being slightly less pronounced during the monsoon season.

Table I gives the monthly mean wind speed in kilometer per hour and predominant wind direction for Kohima observatory in the state. Winds are generally light and blow from the northwest direction almost throughout the year in the mornings; however, easterly or southeasterly component is seen during the winter months. Pressure gradient increases during the pre-monsoon season and convective activity over hilly terrains plays a dominant role in air motion so that winds become stronger. October onwards, there is change in the pressure and wind pattern till December.

Temperature

Table II gives the mean maximum and mean minimum temperatures at Kohima observatory of the state. The spatial distribution of the mean maximum temperature for the representative months of the four seasons of the year is depicted in Fig. 2(a,b,c,d).

In general, pre-monsoon season and southwest monsoon season constitute the warmest part of the year. The temperatures begin to rise from the end of February. The rise in temperatures is more till April thereafter it slightly increases from April till August. It is slightly more in July and August months. The temperatures vary according to topography of the state. During May to August the mean maximum temperature is about 25^0 - 33^0C in extreme southwestern and northwestern plain part of the state. While in the remaining hilly part of the state, it is about 24^0C and in the elevated areas mostly in eastern and southern parts it is even 4^0C to 8^0C lower. In May, the maximum temperature ranges from 16^0C to 33^0C as shown in Fig. 2(a). In July, the temperature pattern (Fig. 2(b)) is quite similar to that of May with slightly high temperature. From Fig. 2(c) and 2(d) it is observed that mean maximum temperature of October ranges between 12^0C and 31^0C, while in January it ranges between 8^0C and 24^0C. The temperatures are generally higher in western part of the state than central and eastern regions of the state.

The spatial distribution of the mean minimum temperature for representative months of the four seasons of a year is depicted in Fig. 3(a,b,c,d).

In the month of January the minima of the minimum temperature is observed over eastern and hilly parts of the state. The values range between -4^0C and 8^0C (Fig. 3(a)). From Fig. 3(b), 3(c) and 3(d), it is observed that mean minimum temperature of April ranges between 4^0C and 18^0C, in July it ranges between 10^0C and 24^0C, while in October it ranges from 6^0C to 21^0C. The minimum temperature is generally higher in western and northwestern parts and low in the elevated places of the central, southern and eastern parts of the state.

The highest maximum temperature and the lowest minimum temperature ever recorded over the state are depicted in Fig. 4 and 5. The highest maximum temperature ranges between 35^0C and 40^0C in extreme western part and less than 35^0C in the hilly areas of the remaining parts of the state. The lowest minimum temperature is about - 6^0C in eastern region and about 3^0C in western region of the state.

Humidity

Table III gives the mean relative humidity at 0830 and 1730 Hrs. IST for Kohima observatory in the state.

The air is humid throughout the year. However, relative humidity in the mornings is slightly less than that in the afternoons. In the southwest monsoon season the humidity is the highest about 90%. During February to April months, the humidity is less about 65% in the mornings.

Cloudiness

Table IV and IV(a) give the monthly mean of cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 HRS IST respectively based on the data of Kohima observatory in the state.

During the period of June to September skies are heavily clouded to overcast. The hill-tops in the state are frequently enveloped with clouds. On an average the skies are overcast for 15 to 23 days in a month during this period. By October the cloudiness decreases and the skies are clear at an average around 12 to 20 days during November to March. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. Cloudiness increases from April month.

Rainfall

Table V gives the district wise and state wise mean monthly and annual rainfall and number of rainy days (i.e. days with rainfall of 2.5 mm or more). Fig. 6 and Fig. 6 (a to d) depict the spatial distribution of the annual and seasonal rainfall for the four seasons, viz. winter, pre-monsoon, southwest monsoon and post monsoon over the state respectively.

The rainfall varies from place to place in the state due to variation in elevation and topography. It is seen that there is good rainfall all over the state. In general, the annual rainfall varies in the state; it is less in the southernmost part and more in northwestern part of the state Fig. (6). The total annual rainfall for the state as a whole is 228.6 cm and total annual number of rainy days are 131. Mon district receives the maximum amount of rainfall (311.9 cm) in a year while Dimapur district receives the minimum amount of rainfall (153.9 cm). The pattern of spatial distribution of rainfall over the state during southwest monsoon season (Fig. 6(c)) and pre-monsoon season (Fig. 6(b)) generally resembles to that of the spatial distribution of the annual rainfall (Fig.6). It is observed that during the post monsoon season (Fig. 6(d)) the rainfall is more in the southeastern and southwestern parts of the state. During winter season (Fig. 6(a)) the rainfall is more in the northwestern part of the state.

The southwest monsoon season is the principal rainy season over the state. Of the total annual rainfall, about 66% is received in the southwest monsoon season (June to September), whereas 22% rainfall is received during the pre-monsoon season (March to May) and about 8% rainfall is received in post monsoon season (October to November) and about 4% rainfall is received during the winter season (December to February).

The percentage of seasonal number of rainy days with respect to the annual number of rainy days is 59% for the southwest monsoon season, 26% for the pre-monsoon season, 9% for the post monsoon season and 6% for the winter season.

The southwest monsoon sets in the beginning of June and covers the entire state by the first week of June. July and August are the rainiest months accounting for 37% of the annual rainfall with July accounting for 19% and August accounting for 18% of the annual rainfall. The mean number of rainy days in a month during the southwest monsoon season ranges from 17 to 21 with a maximum of 21 in July.

The withdrawal of the southwest monsoon begins by the first week of October and the monsoon completely withdraws from the state by the middle of this month.

The common rain giving systems over the state are depressions and cyclones originating in the Bay of Bengal and low pressure with thunderstorms during pre-monsoon and post monsoon seasons.

The occasional winter rains accounting for around 4% of the annual rainfall and which is very vital for agriculture occurs in association with the induced lows arising due to the passage of western disturbances moving east over the region. The rainfall about 22% of the annual rainfall received in the pre-monsoon months with occurrence of thunderstorms.

The features of rainfall described above are also evident from Fig. 7(d), which shows the annual and seasonal rainfall for the individual district as well as for the state and provides a measure for comparison of seasonal rainfall with the annual for both districtwise and statewise rainfall.

Table VI gives the monthly and annual rainfall for various river catchments (No. 326 and 504) in the state. The annual rainfall of these river catchments is shown in Fig. 8. Table VI and Fig. 8 show that

catchment No. 326 formed by the river Tizu which covers Kiphire district and parts of the districts of Peren, Phek, Tuensang and Zunheboto receives an annual rainfall of 2091.1 mm with about 138 rainy days and catchment No. 504 formed by the rivers Dhansiri, Doyang and Dikhu which covers parts of all the districts except Kiphire of Nagaland receives an annual rainfall of 2318.5 mm with about 129 rainy days.

Rainfall Variability

The spatial distribution of variation of annual rainfall over Nagaland is depicted in Fig. 9. Coefficient of Variation (CV), which is expressed as percentage is defined as:

$$C.V. = \frac{\text{Standard deviation } (\sigma)}{\text{Normal } (N)} \times 100$$

The spatial distribution of CV of seasonal rainfall over Nagaland is shown in Fig. 9(a), 9(b), 9(c) and 9(d) for the seasons: pre-monsoon season (March to May), southwest monsoon season (June to September), post monsoon season (October and November) and winter season (December to February) respectively.

It is observed that the values of CV range between 11.5% and 59.0% (Fig. 9(a)) in the pre-monsoon season. The areas in the extreme northern and western parts of Nagaland exhibit the highest variability with values of CV exceeding 40% while the central and remaining regions of the state exhibit the least CV of about 30%.

During the southwest monsoon season the rainfall variability is low with CV ranging between 11.2% and 53.8% (Fig. 9(b)). The rainfall variability in the extreme northern, western and southwestern regions of the state during this season is seen high with CV at an average of about 50% while the remaining regions exhibit the CV at an average less than 30%.

During the post monsoon season the values of CV range between 15.0% and 128.8% (Fig. 9(c)). The extreme southwestern and northeastern regions exhibit higher CV of about 60% to 125% while the remaining parts of the state exhibit low variability i.e. less than 60%.

During the winter season the values of CV show a steep gradient with range between 42.3% and 82.4% (Fig. 9(d)). The western part of Kohima district and eastern part of Dimapur district exhibit low variability of about 45% to 60% while the rest of the state exhibit high variability of about 60% to 80%.

It is seen from Fig. 9 that the variability of annual rainfall over Nagaland state ranges between 6.9% and 35.6% (Fig. 9). As the variability of annual rainfall, pre-monsoon rainfall and southwest monsoon rainfall over Nagaland is relatively low and as the variability of seasonal rainfall for the other seasons is high, it is observed that the contribution of pre-monsoon and southwest monsoon season's rainfall to the annual rainfall is more over the state.

Droughts:

Meteorological drought over an area or a place may be defined as a situation when the annual rainfall over the area or place is less than 75% of the normal. It is classified as "Moderate drought" if the rainfall deficit is between 25% and 50% and "Severe drought" when it is more than 50%. Areas where frequency of drought as defined above is more than 20% of the years examined, such areas 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 1901-2000, which satisfies the criteria for "drought areas" and "chronically drought affected areas".

The occurrences of drought over the districts during the 100 year period of 1901-2000 are given below. The rainfall data is not available for Kiphire, Longleng, Phek and Zunheboto districts. The figures within the brackets against each district indicate the year of drought occurrence when these districts were affected by drought.

Wokha(1951,1998 & 2000), Kohima(1997), Dimapur(1906 & 1908) and Mon(1956) .

There is no successive drought year in any district of the state. There is no year when state experiences widespread and fairly widespread drought. There were no drought conditions in the state in the following years: 1901 to 1905, 1907, 1909 to 1950, 1952 to 1955, 1957 to 1996 and 1999.

Excessive Rainfall:

Rainfall sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall regions. An annual rainfall of 125% or more of the normal is considered as excessive rainfall.

Fig. 11 shows the percentage frequency of excessive rainfall years and successive years of excessive rainfall during the period 1901-2000. It is seen from the figure that frequency of excessive rainfall is generally higher in the western region of the state.

The following table (i) gives the district wise excessive rainfall years and the highest annual rainfall (expressed as percentage of normal) with the years of occurrence.

Table (i)

S.No.	District	Years of excessive rainfall	Highest Amount of Rainfall (cm)	Rainfall in % to Normal	Year
1	Dimapur	1905, 1915, 1918	210.9	137	1915
2	Kohima	1971 ,1992, 1993	269.3	147	1993
3	Mokokchung	1918, 1920, 1921,1944,1945	529.3	194	1944
4	Mon	1931	418.0	134	1931
5	Peren	1934	230.2	126	1934
6	Tuensang	-	240.5	115	1974
7	Wokha	1915, 1941, 1944, 1945, 1946	504.2	176	1945

From the above table, it is seen that during the 100-year period 1901-2000, there were 14 years in which some districts or the other in the state recorded excessive rainfall. Mokokchung district received highest excessive rainfall, 194% of the annual normal rainfall in the year 1944. Wokha and Mokokchung districts experienced maximum number of excessive rainfall years (5). The successive years of excessive rainfall against each district are listed below:

Successive years of Excessive Rainfall (Districtwise)

Sr. No.	District	Successive years of Excessive Rainfall
1.	Mokokchung	1920 - 1921, 1944 - 1945
2.	Wokha	1944 – 1945 - 1946
3.	Kohima	1992-1993

The heaviest one-day rainfall on record at any station in the state was 322.0 mm on 6 June 1985 at Kohima observatory in Kohima district.

Cyclonic storms and depressions

Table VII depicts the total number of storms/depressions which affected the state during the period 1891-2012. The cyclonic storms and depressions, which affect India, mostly originate and/or intensify over the Bay of Bengal, mainly during the months of May to November. They generally travel northwestwards or westwards and cross the east coast of India. In general, storms and depressions become weak when they enter on the land. Nagaland is an inland state which is about 300 km away from the coast. The state therefore does not experience the full fury of severe storms/depressions like the coastal regions especially in the post monsoon months. There are few storms and depressions passing on or near Nagaland. However, in association with these systems, heavy to very heavy rainfall occurs over the affected districts.

During the months from January to April, the state was not affected by Bay storms/depressions even on a single occasion during this period 1891 to 2012, but during the remaining months, it was affected 5 times. The maximum number of storms/depressions that affected the state in May was 2, while there was single occasion each in the month of June, September and November.

Other Weather Phenomena

(a) Thunderstorms and Dust storms

Convective activity is essential for the occurrence of thunderstorms and dust storms in this state. With the advance of the summer, thunder activity becomes pronounced due to heating of the

land. When the moisture in the atmosphere is insufficient, dust storms occur in the plain areas during pre-monsoon season. As sufficient moisture in the atmosphere the thunderstorms mostly occur during the southwest monsoon and pre-monsoon seasons. Hailstorms occasionally occur in the state during the months of March and April, and they do not occur in other months. The maximum frequency of days of thunderstorms reported at Kohima observatory in the state is 2.5 in August. Thunderstorm activity attains its maximum during the southwest monsoon season. During the winter season, the state may experience thunderstorm activity resulting from low pressure areas induced due to eastward moving "Western Disturbances". Thunderstorm activity is the least and minimum in the winter season.

(b) Fog

Fog is experienced almost throughout the year especially in the valley and hilly regions, when the air is still moist and is easily cooled below the dew point while rising over high elevations. Fog mostly occurs in the morning and late evening. The maximum frequency of fog is observed during the months of June to October.

(c) Earthquakes

Nagaland state is prone to seismic activity and comes under seismic zone V. Details of earthquake of intensity 5.0 or more at Richter scale having epicenter in the state are give in Table VIII. The state has experienced 9 earthquakes during the period of 1862 - 2012. Moderate to heavy damage in property and human life occurred due to these events of the earthquakes in the state and its neighbouring regions. Nagaland state has experienced an earthquake of maximum intensity of 7.0 at Richter scale in August 1950 at 26º48'N and 95ºE.

TABLE - I
NAGALAND
MEAN WIND SPEED (Kmph) AND PREDOMINANT WIND DIRECTION

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
Kohima	a	3.6	5.1	5.9	6.4	4.0	3.5	2.6	2.6	3.0	2.9	2.6	3.1	3.8
	m	SE /E / N/NW	NW /N/ E/ SE	NW	NW	NW	NW	NW	NW	NW	NW /N / SE / E	SE /NW / N	SE / NW / E	
	e	DATA NOT AVAILABLE												

a Mean wind speed
m Predominant wind direction in the mornings
e Predominant wind direction in the evenings
C Calm
Var Variable

TABLE - II

MEAN DAILY MAXIMUM AND MEAN DAILY MINIMUM TEMPERATURE (°C)
NAGALAND

STATION	TEMP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Kohima	Max	14.5	16.8	21.3	23.6	23.8	23.9	24.0	24.4	23.9	22.1	19.2	16.3	21.2
	Min	7.8	9.4	12.7	15.5	16.8	18.4	18.9	18.7	17.8	16.3	12.9	9.3	14.5

TABLE III
MEAN RELATIVE HUMIDITY
NAGALAND

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Kohima	M	72	65	60	66	76	85	89	89	86	79	76	72	76
	E	84	77	69	67	79	88	91	92	91	90	86	86	83

M – MORNING E- EVENING

TABLE IV

MEAN CLOUD AMOUNT **(OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR

AND OVERCAST SKIES AT 0830 HRS IST

NAGALAND

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Kohima	a	20	15	16	11	7	3	3	1	5	9	14	19	123
	b	3	4	5	8	13	20	22	21	15	10	5	3	129
	c	2.1	2.7	2.7	3.8	5.9	6.9	7.4	7.2	6.1	4.6	2.3	1.8	4.5

TABLE IV (A)

MEAN CLOUD AMOUNT **(OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR

AND OVERCAST SKIES AT 1730 HRS IST

NAGALAND

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Kohima	a	18	14	12	9	6	4	3	3	3	5	12	16	105
	b	5	4	6	10	13	19	22	23	19	12	8	6	147
	c	3.0	3.7	3.6	4.2	5.4	6.7	7.2	7.3	6.7	5.2	3.7	3.0	5.0

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE V

MEAN RAINFALL AND NUMBER OF RAINY DAYS

NAGALAND

DISTRICT		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mokokchung	a	35.1	54.1	97.9	195.7	311.8	462.3	550.1	490.9	321.5	152.6	40.8	15.5	2728.3
	b	2.7	5.2	7.0	12.2	17.7	21.5	23.7	21.9	17.8	10.4	3.1	1.7	144.9
Tuensang	a	22.7	21.1	66.3	172.3	239.6	348.5	441.9	352.2	250.0	121.4	44.1	11.0	2091.1
	b	2.5	2.1	5.9	12.1	18.0	21.7	22.3	20.7	18.5	9.5	3.6	1.2	138.1
Kohima	a	11.4	29.6	56.1	87.8	170.0	294.0	373.3	380.9	258.0	129.9	35.2	6.1	1832.3
	b	1.4	3.1	5.0	7.8	14.3	18.9	22.1	20.3	16.5	8.6	2.5	0.8	121.3
Peren	a	14.1	42.2	73.3	122.7	253.2	351.2	272.9	266.6	224.4	140.4	58.8	7.4	1827.2
	b	1.1	3.9	6.5	10.2	16.1	19.0	18.7	17.8	14.7	8.1	2.5	0.8	119.4
Dimapur	a	14.5	32.6	61.7	106.8	178.8	240.4	265.9	274.2	199.6	121.6	35.1	8.0	1539.2
	b	1.4	2.9	5.3	8.2	11.0	13.0	13.2	13.4	11.1	6.9	2.2	0.9	89.5
Mon	a	31.8	72.6	118.2	269.7	409.4	508.7	597.0	492.4	379.1	174.7	46.2	19.6	3119.4
	b	3.1	6.7	8.4	14.8	21.1	23.6	25.1	23.6	19.6	12.3	3.3	1.7	163.3
Wokha	a	26.8	55.1	94.5	181.7	311.2	504.6	575.6	551.8	351.1	154.0	44.4	13.9	2864.7
	b	2.2	4.4	6.9	11.1	15.4	21.1	22.9	22.4	17.9	9.9	3.1	1.5	138.8
State Mean	**a**	**22.3**	**43.9**	**81.1**	**162.4**	**267.7**	**387.1**	**439.5**	**401.3**	**283.4**	**142.1**	**43.5**	**11.6**	**2286.0**
	b	**2.1**	**4.0**	**6.4**	**10.9**	**16.2**	**19.8**	**21.1**	**20.0**	**16.6**	**9.4**	**2.9**	**1.2**	**130.8**

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE-VI

MEAN RAINFALL(mm) OVER DIFFERENT RIVER CATCHMENTS OF NAGALAND STATE

Sr.No	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1	**Streams of Assam, Tripura , Manipur,Mizoram, Meghalaya and Nagaland flowing in to the Bay of Bengal. (catchment No.326)**												
	Districts/Parts of districts of Nagaland within this catchment:- **TUENSANG, KIPHIRE, PAREN, PHEK, ZUNHEBOTO.**												
a	22.7	21.1	66.3	172.3	239.6	348.5	441.9	352.2	250.0	121.4	44.1	11.0	2091.1
b	2.5	2.1	5.9	12.1	18.0	21.7	22.3	20.7	18.5	9.5	3.6	1.2	138.1
2	**River Brahmaputra upto Bangladesh border ,including River Dihang,River Lohit,River kameng,streams betweenRiver SubansIri and Manas and between Manas and Tista,excluding Tista and its tributaries. (catchment No.504)**												
	Districts/Parts of districts of Nagaland within this catchment:-												
	KOHIMA, MON, LONGLENG, TUENSANG, MOKOKCHUNG, WOKHA, ZUNHEBOTO, DIMAPUR, PEREN, PHEK.												
a	**22.3**	**47.7**	**83.6**	**160.7**	**272.4**	**393.5**	**439.1**	**409.5**	**289.0**	**145.5**	**43.4**	**11.8**	**2318.5**
b	**2.0**	**4.4**	**6.5**	**10.7**	**15.9**	**19.5**	**21.0**	**19.9**	**16.3**	**9.4**	**2.8**	**1.2**	**129.5**

(a) Normal Rainfall in mm

(b) Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE – VII

STORMS AND DEPRESSIONS AFFECTING NAGALAND STATE

DURING 1891 – 2012

MONTH	NO. OF STORMS/ DEPRESSIONS	MONTH	NO. OF STORMS/ DEPRESSIONS	MONTH	NO. OF STORMS/ DEPRESSIONS
January	NIL	May	2	September	1
February	NIL	June	1	October	NIL
March	NIL	July	NIL	November	1
April	NIL	August	NIL	December	NIL
				TOTAL	**05**

TABLE VIII

DETAILS OF EARTHQUAKES OF INTENSITY OF 5.0 OR MORE AT RICHTER SCALE HAVING EPICENTRE WITHIN NAGALAND STATE DURING YEARS 1862-2012

MONTHS	YEARS	FREQU-ENCY	EARTHQUAKE OF HIGHEST INTENSITY			EPICENTRE			
						LAT- N		LONG - E	
			INTENSITY AT RICHTER SCALE	DEPTH IN km	YEAR	DEG	MIN	DEG	MIN
JANUARY									
FEBRUARY									
MARCH	1991	1	5.0	33.0	1991	25	48	94	42
APRIL	1959	1	5.2		1959	25	42	94	46
MAY									
JUNE									
JULY	2012	3	5.8	50.0	2012	25	42	94	36
AUGUST	1950	1	7.0		1950	26	48	95	0
SEPTEMBER	2[1950]	2	6.0		1950	26	48	95	0
OCTOBER									
NOVEMBER	1950	1	6.4		1950	26	48	95	0
DECEMBER									
TOTAL		**9**							

DIMAPUR DISTRICT

Dimapur district has mostly plain areas with an average elevation about 250 metres above mean sea level lying in the foot of hills in the southwestern part of Nagaland. The climate of this district is characterized by a humid hot in summer and monsoon period and cold in winter. The year may be divided into four seasons. Winter season from December to February is followed by summer (pre-monsoon) season till May. Southwest monsoon season is from the beginning of June to the middle of October followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station viz. Dimapur Town for a period of 57 years. The details of rainfall at this station are given in Table 1 and 2 which may be taken as representative for the whole district. The average annual rainfall in the district is 1539.2 mm. The district receives rainfall about 64% of the annual rainfall during southwest monsoon (June to September), while pre-monsoon months (March to May) associated with thunderstorms receive rainfall of about 23% of the annual rainfall. July and August are the rainiest months with an average rainfall of 270.2 mm. In 57 years period 1901 to 1957, the annual rainfall was the highest in year 1915, when it amounted to 137% of the normal. The lowest annual rainfall which amounted to 70% of the normal occurred in 1906. There is little variation in the annual rainfall from year to year. During this period the annual rainfall in the district was less than 80% of the annual normal occurred in 6 years and there was one occasion when such a low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall in the district was between 1201 mm and 1900 mm in 39 years out of 46. On an average there are 89 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Dimapur district was 197.1 mm at Dimapur Town on 14 October 1934.

TEMPERATURE

There is no meteorological observatory in Dimapur district. Therefore, meteorological records of neighbouring observatory Lumding of Nagaon district of Assam are taken to describe the climatology of the district. Temperatures begin to rise by the end of February and continue to rise till August. The temperatures during southwest monsoon, is as high as that in the summer months and therefore the onset of the southwest monsoon does not bring the fall in temperatures. January is the coldest month with mean maximum temperature of about 24ºC and mean minimum temperature of about 8ºC. In winter, in association with western disturbances, the minimum temperatures may fall upto 3ºC on individual days. There is a gradual decrease in temperature after withdrawal of the

monsoon and weather becomes gradually cool and pleasant during post monsoon season. July and August are the hottest months with the mean maximum temperature of about 33ºC and mean minimum temperature of about 24ºC. Sometimes weather becomes oppressive due to damp heat especially in between two spells of rain during the monsoon season. On individual days in the summer and southwest monsoon seasons, maximum temperature reaches up to 38ºC. The temperatures may be about 2ºC lower at the elevated areas.

HUMIDITY

The district is generally humid throughout the year. It is more so during the southwest monsoon and post monsoon seasons and it is about 80% to 90%. During February to April, there is a fall in relative humidity which can be around 70% especially in the evening.

CLOUDINESS

During the monsoon season the skies are generally heavily clouded to overcast. Cloudiness reduces in the post monsoon season and in the period November to March the skies are clear or lightly clouded. Cloudiness increases from April month and the skies are frequently clouded.

WINDS

Winds are generally light or calm throughout the year. Sometimes they become moderate to strong. Winds generally blow from the east or south direction in the district.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur in the latter part of summer and monsoon seasons. Thunderstorms during the summer months are sometimes severe. Fog occasionally occurs in the post monsoon and winter seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
DIMAPUR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Dimapur	57	a	14.5	32.6	61.7	106.8	178.8	240.4	265.9	274.2	199.6	121.6	35.1	8.0	1539.2	137	70	197.1	14 Oct 1934
		b	1.4	2.9	5.3	8.2	11.0	13.0	13.2	13.4	11.1	6.9	2.2	0.9	89.5	(1915)	(1906)		
Dimapur (District)		a	14.5	32.6	61.7	106.8	178.8	240.4	265.9	274.2	199.6	121.6	35.1	8.0	1539.2	137	70		
		b	1.4	2.9	5.3	8.2	11.0	13.0	13.2	13.4	11.1	6.9	2.2	0.9	89.5	(1915)	(1906)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010
** Years of occurrence given in brackets

TABLE - 2
Frequency of Annual Rainfall in the District
DIMAPUR
(Data 1901-1957)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1001 – 1100	1	1401 – 1500	9	1801 – 1900	5
1101 – 1200	3	1501 – 1600	8	1901 – 2000	1
1201 – 1300	4	1601 – 1700	3	2001 – 2100	1
1301 – 1400	6	1701 – 1800	4	2101 – 2200	1

(Data available for 46 years)

KIPHIRE DISTRICT

Kiphire district has mostly hilly terrain and some valleys. Kiphire town is a headquarter of the district at an altitude of 1078 metres above mean sea level which stands in the middle of two lofty mountains of Saramati and Jingkhu. The hills in the district are generally spread from north to south. The highest peak in Nagaland is 3840 metres situated at Mount Saramati in this district.

In general the climate of the district is characterized by mild hot and pleasant in summer, very cold in winter and humid throughout the year. The year may be divided into four seasons. Winter season is from the end of November to the first week of March. The period of March to May is of summer (pre-monsoon) season of thunderstorms and is followed by southwest monsoon season till mid-October. This monsoon season is followed by post monsoon season.

RAINFALL

Records of rainfall in the district are not available. The description of rainfall which follows is based on the average values of the records of neighbouring raingauge stations in the adjacent districts viz. Tuensang, Kohima Observatory and Wokha. The rainfall in the district varies from place to place due to its topography. The average annual rainfall in the district is around 2250 mm. About 70% of the annual rainfall in the district is received during the southwest monsoon season (June to September) and about 20% rainfall is received during pre-monsoon season March to May. On an average there may be 100-125 rainy days in the district when the rainfall is 2.5 mm or more.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of neighbouring observatory Kohima situated at an altitude of 1406 metres. Though the climatic condition in the district varies from place to place due to variation in elevation and topography, the records of this observatory may be taken as a representation of the climatic conditions prevailing in the district. As Kiphire town is situated at an altitude of 1078 metres where day and night temperatures begin to increase from the end of February and this rise in temperatures continues till August. In April and May months, the weather is generally pleasant with moderate temperature in the presence of thundershowers. July and August are the hottest months of the year with mean maximum temperature about 26ºC and mean minimum temperature about 20ºC at Kiphire town . The onset of southwest monsoon in the beginning of June does not bring down the temperatures. Day temperatures

in the southwest monsoon season are almost same or even a little higher than that of the summer season but night temperatures are slightly high from the summer season. On individual days in summer and early part of southwest monsoon season the maximum temperature may reach about 33ºC. There is a gradual fall in temperatures with the withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon season. The decrease in temperature after October is remarkable till January. January is the coldest month with mean maximum temperature at about 16ºC and mean minimum temperature at about 8ºC. On individual days in the winter season, the minimum temperature may go down to below 3ºC and weather is chilly over hilly terrain during winter. The temperatures may be 8ºC to 12ºC lower over high altitudinal areas and some high in plain areas of low elevation with reference to Kiphire town. The highest maximum temperature may be about 25 ºC to 35 ºC and the lowest minimum temperature may be 3 ºC to -6 ºC in the district.

HUMIDITY

The air is humid throughout the year. The relative humidity in the mornings is slightly less than that in the afternoons. In the southwest monsoon season the humidity is about 85% to 90%. During February to April months the relative humidity is about 60% to 65% in the mornings.

CLOUDINESS

In the monsoon season the skies are mostly heavily clouded to overcast. The hill-tops are frequently enveloped with clouds. Cloudiness decreases rapidly in the post monsoon season. In the period November to March the skies are lightly clouded. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. Cloudiness increases from April month and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become moderate to strong. It is because of dominant convective motion over hilly terrain. Northwesterly winds generally blow in the mornings throughout the year. Easterly or southeasterly component also appears on a few days in the district during post monsoon and winter seasons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year, but the frequency is more in August and September. Thunderstorms occurring in summer months are sometimes associated with hail. There is no occurrence of dust storm in this hilly district. Fog occurs throughout the year, especially in the valleys but it also occurs frequently during the monsoon and post monsoon seasons. Its frequency is a maximum in September.

KOHIMA DISTRICT

Kohima district has hilly terrain with an average elevation of 1260 metres above mean sea level and valley areas. Japfu hill in this district is the second highest peak of Nagaland state and stands at 3014 metres above mean sea level. The climatic condition of this district varies from place to place due to variation in elevation and topography. The climate of the district is generally characterized by moderate temperature in summer, very cold in winter and humid air throughout the year. Winter season is from the end of November to the first week of March. The period of March to May is of summer (pre-monsoon) season of thunderstorms and is followed by southwest monsoon season till mid-October. This monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at Kohima observatory for 47 years. The details of rainfall at this station are given in Table 1 and 2. The average annual rainfall in the district is about 1832.3 mm. The rainfall varies from place to place in the district due to topographic variation. About 71% of the annual rainfall in the district is received during southwest monsoon months (June to September). July and August are the rainiest months with an average rainfall of 377 mm. The variation in the annual rainfall from year to year is not large. In the 53 years period 1948 to 2000, the highest annual rainfall was 147% of the normal occurred in year 1993 and the lowest annual rainfall was 70% of the normal occurred in 1997. In this period there were two years, when the annual rainfall was less than 80% of the normal and these were consecutive. It is seen from Table 2 that annual rainfall in the district was between 1401 mm and 2200 mm in 18 years out of 23 for which full year data is available. On an average there are about 121 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Kohima observatory was 322.0 mm on 06 June 1985.

TEMPERATURE

There is a meteorological observatory in the district at Kohima (altitude of 1406 metres). Though the climatic condition in the district varies from place to place due to orographic variation, the records of this observatory may be taken as a representation of the climatic conditions prevailing in the district. Both day and night temperatures begin to increase from the end of February and continue to rise till August. In April and May months weather is generally pleasant with moderate temperature and thundershowers. The onset of the southwest monsoon in the beginning of June does not bring down the temperatures. July and August are the hottest months of the year with mean maximum temperature of about 24.2ºC and mean minimum temperature of about 18.8 ºC. Day temperatures in the southwest

monsoon season are almost same or even a little higher than that of the summer season, but night temperatures are slightly high than in the summer season. On individual days in summer and southwest monsoon season maximum temperature reaches about 32ºC. There is a gradual fall in temperatures after withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon. The decrease in temperature after October is remarkable till January. January is the coldest month with mean minimum temperature of 7.8ºC and mean maximum temperature of 14.5ºC and on individual days in the winter season, minimum temperature may go down to about 3ºC. The temperatures may be low by 6ºC - 8ºC over high altitudinal areas and 3 º to 5 ºC high in plain areas of low elevation particularly in northern part with reference to Kohima town.

The highest maximum temperature ever recorded at Kohima was 33.9ºC on 03 May 1959 and the lowest minimum temperature ever recorded was 1.0ºC on 03 January 1981.

HUMIDITY

The air is much humid throughout the year. The relative humidity in the mornings is slightly less than those in the afternoons. In the southwest monsoon season the humidity is between 85% and 90%. During February to April months the relative humidity is less about 60% to 65% in the morning.

CLOUDINESS

In the southwest monsoon season the skies are mostly heavily clouded to overcast. The hill-tops are frequently enveloped with clouds. Skies are generally heavily clouded to overcast for 15 to 23 days in a month during southwest monsoon season. Cloudiness decreases rapidly from October. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March. Cloudiness increases from April and the skies are frequently clouded and overcast till October.

WINDS

Winds are generally light throughout the year. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become moderate to strong. Northwesterly winds blow in the district in the mornings throughout the year. Easterly or southeasterly winds also observe on a few days in the district during the post monsoon and winter seasons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year, but the frequency is more in August and September. Thunderstorms occurring in summer months are sometimes associated with hail. Sometimes dust-storms occasionally occur in the district during pre-monsoon season. Fog occurs throughout the year, especially in the valleys and its frequency is a maximum in September about 6 days.

Tables 3, 4, 5 and 6 give the temperatures and relative humidity, cloudiness, mean wind speed and special weather phenomena respectively for Kohima observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KOHIMA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Kohima (Obsy)	47	a	11.4	29.6	56.1	87.8	170.0	294.0	373.3	380.9	258.0	129.9	35.2	6.1	1832.3	147	70	322.0	06 Jun 1985
		b	1.4	3.1	5.0	7.8	14.3	18.9	22.1	20.3	16.5	8.6	2.5	0.8	121.3	(1993)	(1997)		
Kohima (District)		a	11.4	29.6	56.1	87.8	170.0	294.0	373.3	380.9	258.0	129.9	35.2	6.1	1832.3	147	70		
		b	1.4	3.1	5.0	7.8	14.3	18.9	22.1	20.3	16.5	8.6	2.5	0.8	121.3	(1993)	(1997)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
KOHIMA
(Data 1948-2000)

Range in mm	No. of years	Range in mm	No. of years
1201 – 1300	1	2001 – 2100	1
1301 – 1400	0	2101 – 2200	2
1401 – 1500	2	2201 – 2300	1
1501 – 1600	2	2301 – 2400	1
1601 – 1700	0	2401 – 2500	1
1701 – 1800	5	2501 – 2600	0
1801 – 1900	1	2601 – 2700	1
1901 – 2000	5		

(Data available for 23 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(KOHIMA)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	14.5	7.8	23.5	22-01-1984	1.0	03-01-1981	72	84
February	16.8	9.4	25.0	29-02-1984	2.3	22-02-1972	65	77
March	21.3	12.7	29.1	20-03-1959	4.0	10-03-1987	60	69
April	23.6	15.5	32.2	19-04-1956	5.0	29-04-1986	66	67
May	23.8	16.8	33.9	03-05-1959	10.0	16-05-1981	76	79
June	23.9	18.4	30.5	27-06-1984	9.4	24-06-1986	85	88
July	24.0	18.9	33.1	07-07-1965	7.8	26-07-1985	89	91
August	24.4	18.7	31.1	12-08-2006	8.3	19-08-1985	89	92
September	23.9	17.8	31.0	30-09-1984	8.9	30-09-1985	86	91
October	22.1	16.3	31.5	30-10-1980	5.0	16-10-1986	79	90
November	19.2	12.9	29.5	04-11-1982	3.1	27-11-1985	76	86
December	16.3	9.3	26.0	04-12-1982	2.8	14-12-1985	72	86
Annual	21.2	14.5	33.9	03-05-1959	1.0	03-01-1981	76	83

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(KOHIMA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	20	15	16	11	7	3	3	1	5	9	14	19	123
b	3	4	5	8	13	20	22	21	15	10	5	3	129
c	2.1	2.7	2.7	3.8	5.9	6.9	7.4	7.2	6.1	4.6	2.3	1.8	4.5
1730 HOURS IST													
a	18	14	12	9	6	4	3	3	3	5	12	16	105
b	5	4	6	10	13	19	22	23	19	12	8	6	147
c	3.0	3.7	3.6	4.2	5.4	6.7	7.2	7.3	6.7	5.2	3.7	3.0	5.0

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(KOHIMA)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind Speed in Km/hr	3.6	5.1	5.9	6.4	4.0	3.5	2.6	2.6	3.0	2.9	2.6	3.1	3.8
Direction in morning	SE/E/N/NW	NW/N/E/SE	NW	NW	NW	NW	NW	NW	NW	NW/N/SE/E	SE/NW/N	SE/NW/E	
Direction in evening													

TABLE - 6
Special Weather Phenomena
(KOHIMA)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0	0.3	1.4	1.5	0.6	0.4	1.6	2.5	2	0.6	0.2	0.1	11.2
Hail	0	0	0.3	0.1	0	0	0	0	0	0	0	0	0.4
Dust storm	0	0.1	0.1	0.2	0.2	0	0	0	0	0	0.1	0	0.7
Fog	0.5	0.5	0.3	0.5	1.4	3.8	3.9	5.5	5.9	4.3	1.2	0.4	28.2

LONGLENG DISTRICT

Longleng district has a strip of mountain and some plain areas. Altitude of the district varies from 150 to 2000 metres above mean sea level. The climate of this district is generally characterized by mild hot in summer, cold in winter and humid throughout the year. The year may be divided into four seasons. The period of June to mid-October is of southwest monsoon season followed by post monsoon season till November. Winter season is from December to February and is followed by summer season associated with thunderstorms till May.

RAINFALL

Records of rainfall in the district are not available. The description of rainfall follows is based on the average values of the records of neighbouring raingauge stations in the adjacent districts viz. Mokokchung, Tuensang observatory, Wakchong Hydro (Mon district) and Nazira (Sibsagar district). The average annual rainfall in the district may be considered as 2000 mm. About 65% of the annual rainfall in the district is received during southwest monsoon season (June to September) and about 25% during the pre-monsoon season. July is the rainiest month with an average rainfall of about 400 mm. On an average there would be around 100-125 rainy days in a year in the district when it rains 2.5 mm or more.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of neighbouring observatory Kohima (Alt 1406 m). Temperature varies from place to place due to topographic variation. The winter season commences in the district from the beginning of December when both day and night temperatures begin to rapidly decrease. January is the coldest month with mean minimum temperature of about 9°C and mean maximum temperature of about 17°C at district headquarter of Longleng which is situated at an altitude about 1066 metres. On individual days in winter season minimum temperature may go down to about 2°C. Temperatures begin to rise steadily from March and reach its maximum in July and August. Average maximum temperature in these months is of about 27°C and average minimum temperature is of about 21°C. On individual days in the monsoon and summer months the maximum temperature may go up to above 34°C. The weather is mild hot in summer season associated with thunderstorms. The monsoon season is the period of the highest temperatures and sometimes the weather becomes oppressive due to damp heat especially in between two spells of rain. The weather becomes gradually cool after withdrawal of southwest monsoon and pleasant during post

monsoon season. The temperatures may be lower by 4°C at high altitudinal areas and about 3°C higher in plain areas of low elevation with reference to district headquarter (Longleng town).

HUMIDITY

The atmosphere over the district is much humid throughout the year. The average relative humidity in the southwest monsoon season is about 80% to 85% and during February to April month relative humidity is less about 60% to 65% in the mornings.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon and pre-monsoon seasons. Cloudiness decreases rapidly from the middle of October. Sometimes skies are lightly or moderately clouded in post monsoon and winter seasons. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. Cloudiness increases from April month and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms during the period of March to August when they are stronger. It is because of dominant convective motion over hilly terrain. Winds are generally northerly to northwesterly in the morning. Easterly and southeasterly winds also observe on few days during winter and post monsoon months.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are common throughout the year but they are more frequent during the months of March to September. Thunderstorms are sometimes accompanied with hail in the early part of pre-monsoon season. Fog occurs in post monsoon, winter and early part of pre-monsoon season.

MOKOKCHUNG DISTRICT

Mokokchung district has six distinct hill ranges up to 1560 metres above mean sea level and plain areas of low elevation. The ranges are more or less parallel to each other and run in southwest or northeast direction. The climate of the ranges adjoining the Assam plains is warm while it is cool towards Tuensang district. The climate of the district is characterized by cold in winter, mild hot in summer and abundant rainfall in the monsoon months. Winter season is from December to the first week of March and is followed by the summer (pre-monsoon) season till May. Southwest monsoon season starts from the beginning of June and lasts till mid-October. The monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station (Mokokchung town) in the district for a period of 58 years. The details of rainfall at this station are given in Tables 1 and 2 which may be taken as representative for the whole district. The average annual rainfall in the district is 2728.3 mm. The district receives about 67% of the annual rainfall during southwest monsoon season (June to September), while the pre-monsoon months of March to May contribute rainfall of about 22% of the annual rainfall. July is the rainiest month with an average rainfall of 550.1 mm. In the 75 year period 1901-1975, the annual rainfall was the highest in the year 1944, when it amounted to 194% of the annual rainfall. The lowest annual rainfall which amounted to 76% of the normal occurred in 1917. There is no much variation in annual rainfall from year to year. During the same period the annual rainfall in the district was less than 80% of the normal occurred in only one year. It is seen from Table 2 that the annual rainfall in the district was between 2201 mm to 3300 mm in 35 years out of 41.

On an average there are 145 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Mokokchung was 251.2 mm on 7 July 1957.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on Kohima observatory (Altitude 1406), the records of which may be taken as representative of the general climatic conditions prevailing in the district. The district is a hilly terrain with some plain areas, hence the temperatures vary from place to place. As district headquarters of Mokokchung is situated at an altitude of 1325 metres. The winter season commences from the beginning of December when both day and night temperatures begin to drop rapidly. January is the coldest month with the mean maximum temperature of about 15°C and mean minimum temperature of about 8°C at the district headquarters. On individual days in winter season minimum temperature may go down to 3°C. Temperatures begin to rise steadily from the beginning of March and reach its maximum in August. July and August are the hottest months of the year. An average of

maximum temperature is of about 25°C and minimum temperature is of about 20°C. The southwest monsoon season is the period of high temperatures. Sometimes the weather becomes oppressive due to damp heat especially in between two spells of rain in the monsoon season. Maximum temperature may reach 33°C on individual days during summer and southwest monsoon season. The temperatures may be as high as 3°C to 5°C in the plain areas of low elevation with reference to the district headquarters. The highest maximum temperature may be 38°C in western and northern parts and about 33°C in extreme eastern part of the district. The lowest minimum temperature may be 1°C to 3°C in the district.

HUMIDITY

The atmosphere over the district is much humid throughout the year. The average relative humidity in the morning is about 85% and in the afternoons is about 80% to 90% in the southwest monsoon season. The relative humidity is less about 60% in the early part of summer season.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon and pre-monsoon seasons. Skies are lightly or moderately clouded in post monsoon and winter seasons. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. Cloudiness increases from April month and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms when they are strong. It is because of dominant convective motion over hilly terrain. Winds are generally northwesterly throughout the year except for some period when they are calm.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are common throughout the year but they are more frequent during March to September. Thunderstorms are sometimes accompanied with hail in the early part of pre-monsoon season. Dust-storms are also sometimes observed during this period. Fog occurs in post monsoon, winter and early part of pre-monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
MOKOKCHUNG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Mokokchung	58	a	35.1	54.1	97.9	195.7	311.8	462.3	550.1	490.9	321.5	152.6	40.8	15.5	2728.3	194	76	251.2	07 Jul 1957
		b	2.7	5.2	7.0	12.2	17.7	21.5	23.7	21.9	17.8	10.4	3.1	1.7	144.9	(1944)	(1917)		
Mokokchung (District)		a	35.1	54.1	97.9	195.7	311.8	462.3	550.1	490.9	321.5	152.6	40.8	15.5	2728.3	194	76		
		b	2.7	5.2	7.0	12.2	17.7	21.5	23.7	21.9	17.8	10.4	3.1	1.7	144.9	(1944)	(1917)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
MOKOKCHUNG
(Data 1928-1957)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
2001 – 2100	1	2901 – 3000	0	3801 – 3900	0
2100 – 2200	0	3001 – 3100	2	3901 – 4000	0
2201 - 2300	2	3101 – 3200	1	4001 - 4100	1
2301 - 2400	3	3201 – 3300	0	4101 - 4200	0
2401 - 2500	10	3301 – 3400	0	4201 – 4300	0
2501 - 2600	6	3401 – 3500	0	4301 - 4400	0
2601 - 2700	3	3501 – 3600	0	4401 – 4500	1
2701 - 2800	4	3601 - 3700	0	5201 – 5300	1
2801 - 2900	4	3701 – 3800	2		

(Data available for 41 years)

MON DISTRICT

This northern most district of Nagaland has hilly terrain and low lying areas with undulating hills towards Assam boundary. Topographically the district can be divided into two regions, viz. upper region comprising Longching, Chen, Mopong and Tobu areas and lower region comprises Mon, Tizit & Nagnimora areas. Shawot, the highest peak in the district has an altitude of 2414 metres above mean sea level. The climate of the district is characterized by mild hot in summer, cold in winter and abundant rainfall in the monsoon months. Climatic condition in the district varies from place to place due to topographic variation. The year may be divided into four seasons. Southwest monsoon season starts from June and lasts till mid-October, followed by post monsoon season till November. Winter season sets in by the end of November and lasts till the first week of March. The winter season is followed by summer season till May.

RAINFALL

Records of rainfall in the district are available for one raingauge station at Wakchong for the period of 30 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 3119.4 mm. Rainfall in the district varies from place to place due to variation in elevation and topography. During the monsoon season (June to September), the district receives rainfall about 63% of the annual rainfall. July is the rainiest month with an average rainfall of 597.0 mm. In the summer season (March to May), the district receives rainfall about 26% of the annual rainfall. The variation in the annual rainfall from year to year is not large. In the 30 year period from 1928 to 1957, the highest annual rainfall amounting to 134% of the normal occurred in year 1931, while the lowest annual rainfall which was 73% of the normal occurred in 1956. In the same period, there were 2 years in which the annual rainfall in the district was less than 80% of the normal, however they were not consecutive. It is seen from Table 2 that the annual rainfall was between 2501 mm and 3800 mm in 21 years out of 24 in which full year data is available. On an average there are 163 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year at Wakchong. The heaviest rainfall recorded in 24 hours at Wakchong was 228.6 mm on 01 May 1931.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of neighbouring observatory of Sibsagar district of Assam state and Kohima. Though the climatic conditions in the district vary from place to place due to topographic variation, the records of meteorological parameters of these observatories may be taken as representative of the climatic conditions prevailing in the district. Headquarters of Mon district is situated at an altitude 656 metres. The winter season commences in the district from the end of November when both day and night temperatures begin to decrease rapidly till January. January is the coldest month with the mean minimum temperature about 9°C and

the mean maximum temperature about 18°C at the district headquarters. On individual days during winter season, minimum temperature may go down upto 3°C and weather is chilly over high altitudinal areas during winter. Temperatures begin to rise steadily from middle of February and reach its maximum in July and August. The mean maximum temperature in these months is about 28°C and mean minimum temperature is about 22°C. The weather is mild hot in summer generally associated with thunderstorms. The monsoon season is the period of high temperatures. In the monsoon and summer seasons, maximum temperature may reach up to 35°C on individual days. Sometimes weather becomes oppressive due to damp heat especially in between two spells of rain in the monsoon season. The weather becomes gradually cool after withdrawal of southwest monsoon and pleasant during post monsoon season. The temperatures may be 6° to 8°C lower in hilly terrain and some high in plain areas of low elevation with reference to district headquarters.

HUMIDITY

The atmosphere over the district is humid throughout the year. The average relative humidity is about 80% and it is about 80% to 90% in the southwest monsoon season. The relative humidity is less in early part of summer season.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon and pre-monsoon seasons. The hill-tops are frequently enveloped with clouds. Skies are lightly or moderately clouded in post monsoon and winter seasons. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. Cloudiness increases from April and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year except for short spells during thunderstorms in the period of March to August when they are strong. . It is because of dominant convective motion over hilly terrain. Winds generally blow northerly to northeasterly throughout the year.

SPECIAL WEATHER PHENOMENA

Cyclonic storms and depressions which originate in the Bay of Bengal and move into Assam seldom reach the district to affect its weather. Thunderstorms are common throughout the year but they are more frequent during March to September. Thunderstorms are sometimes accompanied with hail in the early part of pre-monsoon season. Fog occurs in post monsoon, winter and early part of pre-monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
MON

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Wakchong	30	a	31..8	72.6	118.2	269.7	409.4	508.7	597.0	492.4	379.1	174.7	46.2	19.6	3119.4	134	73	228.6	01 May 1931
		b	3.1	6.7	8.4	14.8	21.1	23.6	25.1	23.6	19.6	12.3	3.3	1.7	163.3	(1931)	(1956)		
Mon (District)		a	31..8	72.6	118.2	269.7	409.4	508.7	597.0	492.4	379.1	174.7	46.2	19.6	3119.4	134	73		
		b	3.1	6.7	8.4	14.8	21.1	23.6	25.1	23.6	19.6	12.3	3.3	1.7	163.3	(1931)	(1956)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
MON
(Data 1928-1957)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
2201 - 2300	1	2901 – 3000	4	3601 - 3700	0
2301 - 2400	0	3001 – 3100	2	3701 – 3800	0
2401 - 2500	1	3101 – 3200	2	3801 – 3900	0
2501 - 2600	0	3201 – 3300	2	3901 – 4000	0
2601 - 2700	1	3301 – 3400	4	4001 - 4100	0
2701 - 2800	2	3401 – 3500	2	4101 - 4200	1
2801 - 2900	1	3501 – 3600	1		

(Data available for 24 years)

PEREN DISTRICT

This district is a strip of mountainous areas, plains and valleys in the foot hills in the north. Mount Paona, the highest peak in the district is about 2500 metres above the sea level. The climate of the district is characterized by cold in winter, mild hot and pleasant in summer and humid throughout the year. The year may be divided into four seasons. Southwest monsoon season is from the beginning of June to mid-October, followed by post monsoon season till November. Winter season is from the end of November till the first week of March and is followed by summer season of thunderstorms till May.

RAINFALL

Records of rainfall in the district are available for one raingauge station at Hemina for the period of 26 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The annual rainfall in the district is about 1827.2 mm. The variation in the annual rainfall from year to year in the district is not large. Rainfall in the district varies from place to place due to variation in elevation and topography. During the monsoon season (June to September), the district receives rainfall about 61% of the annual rainfall. June is the rainiest month with an average rainfall of 351.2 mm. In the summer season (March to May), the district receives rainfall about 25% of the annual rainfall. In the 70 years period of 1930 to 1999, the highest annual rainfall amounting to 126% of the normal occurred in year 1934, while the lowest annual rainfall was 79% of the normal occurred in 1933. In this period, there were 2 years in which the annual rainfall in the district was less than 80% of the normal and they were not consecutive. It is seen from Table 2 that the annual rainfall was between 1401 mm and 2200 mm in 17 years out of 19, for which full year data is available. On an average there are 119 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year at Hemina. The heaviest rainfall recorded in 24 hours at Hemina was 197.4 mm on 09 July 1946.

TEMPERATURE

There is no meteorological observatory in the district. The description of the climate of the district which follows is based on meteorological data of neighbouring observatory Kohima at an altitude of 1406 metres above mean sea level. Though the climatic conditions in the district vary from place to place due to topographic variation, the records of this observatory may be taken as a representative of the climatic conditions prevailing in the district. The headquarters of Peren district is situated at height of 1445 metres. Both day and night temperatures begin to increase from the end of February and continue to rise till August. In April and May weather is generally pleasant with a moderate temperature and the district experiences thundershowers. July and August are the hottest months with mean maximum temperature of about 24ºC and mean minimum temperature of about 18ºC at district headquarter. The onset of the southwest monsoon in the beginning of June does not bring down the temperatures. Day

temperatures in the southwest monsoon season are almost same or even a little higher than that of the summer season but night temperatures are slightly higher than the summer season. On individual days in summer and early part of southwest monsoon season the maximum temperature may reach about 33ºC. There is a gradual decrease in temperatures with the withdrawal of the monsoon. The decrease in temperature after October is remarkable till January and weather becomes gradually cool and pleasant during post monsoon season. January is the coldest month with mean minimum temperature of 7ºC and mean maximum temperature of 14ºC. On individual days in the winter season, minimum temperature may go down to about 2ºC and weather is also chilly over high altitudinal areas during winter. The temperatures may be low over high altitudinal areas and high in plain areas of low elevation with reference to district headquarters. They may be less or more by 3ºC to 5ºC in the district. The highest maximum temperature may be about 35ºC and the lowest temperature may be about 0ºC in the district.

HUMIDITY

The air is humid throughout the year. However, relative humidity in the mornings is slightly less than those in the afternoons. In the southwest monsoon season the humidity ranges between 85% and 90%. During February to April months the relative humidity is about 65% in the mornings.

CLOUDINESS

In the monsoon season the skies are mostly heavily clouded to overcast. The hill- tops are frequently enveloped with cloud. Cloudiness decreases rapidly in the post monsoon season. In the period November to March the skies are clear or lightly clouded. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. Cloudiness increases from April and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year. Sometimes they are moderate to strong. It is because of dominant convective motion over hilly terrain. They blow in the northwesterly direction in the mornings. Easterly or southeasterly winds can also appear on a few days in the district during post monsoon and winter season.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year, but the frequency is more in August and September. Thunderstorms occurring in summer months are sometimes associated with hail. Sometimes dust storms occur in the plain areas during the pre-monsoon season. Fog occurs in post monsoon, winter and early part of pre-monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
PEREN

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Hemina	26	a	14.1	42.2	73.3	122.7	253.2	351.2	272.9	266.6	224.4	140.4	58.8	7..4	1827.2	126	79	197.4	09 Jul 1946
		b	1.1	3.9	6.5	10.2	16.1	19.0	18.7	17.8	14.7	8.1	2.5	0.8	119.4	(1934)	(1933)		
Peren (District)		a	14.1	42.2	73.3	122.7	253.2	351.2	272.9	266.6	224.4	140.4	58.8	7..4	1827.2	126	79		
		b	1.1	3.9	6.5	10.2	16.1	19.0	18.7	17.8	14.7	8.1	2.5	0.8	119.4	(1934)	(1933)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
PEREN
(Data 1930-1999)

Range in mm	No. of years	Range in mm	No. of years
1401 - 1500	2	1901 – 2000	3
1501 - 1600	4	2001 – 2100	0
1601 - 1700	4	2101 – 2200	3
1701 - 1800	0	2201 – 2300	1
1801 - 1900	1	2301 - 2400	1

(Data available for 19 years)

PHEK DISTRICT

Phek district is located in the southeastern part of Nagaland bounded by Myanmar in the east, Manipur state in the south, Zunheboto and Tuensang districts in the north and Kohima in the west. The district has mostly mountainous region and valleys. Zanibu is the highest peak in the district with an elevation of 3104 metres above mean sea level. The climate of this district is characterized by mild hot and pleasant in summer, very cold in winter, and humid throughout the year. Winter season is from the end of November to the first week of March. The period of March to May is of summer (pre-monsoon) season of thunderstorms and is followed by southwest monsoon season till mid-October. This monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are not available for any station. The description of rainfall which follows is based on the average values of the records of neighbouring raingauge stations in the adjacent districts viz. Ukhrul farm (Ukhrul district of Manipur state), Maram farm (Senapati district), Kohima Observatory and Wokha. The rainfall in the district varies from place to place due to its topographic variation. The average annual rainfall in the district may be considered as 2000 mm. About 70% of the annual rainfall in the district is received during southwest monsoon season (June to September). About 20% of the annual rainfall is received in the pre-monsoon months; March to May. July and August are the rainiest months with an average rainfall of about 300 mm. On an average the number of rainy days may be about 100-125 in the district when the rainfall is 2.5 mm or more.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of Kohima observatory at an altitude of 1406 m. Though the climatic conditions in the district vary from place to place due to its mountainous terrain, the records of Kohima observatory may be taken as a representative of the climatic conditions prevailing in the district. As headquarters of Phek district is situated at an altitude about 1450 m. Both day and night temperatures begin to increase from the end of February and this rise in temperatures continues till August. In April and May months, the weather is generally pleasant with moderate temperatures in the presence of thundershowers. July and August are the hottest months of the year with mean maximum temperature about 24ºC and mean minimum temperature about 18ºC at the district headquarters. The onset of southwest monsoon in the beginning of June does not bring down the temperatures. Day temperatures in the southwest monsoon season are almost same or even a little higher than those of the summer season but night

temperatures are slightly higher than summer season. There is a gradual decrease in temperatures with the withdrawal of the monsoon. The decrease in temperature after October is remarkable, and weather becomes gradually cool and pleasant during post monsoon season. January is the coldest month with mean minimum temperature about 7ºC and mean maximum temperature about 14ºC. On individual days the in the winter season, the minimum temperature may go down to about 2ºC and weather is also chilly over hilly terrains during winter. The temperatures may be low over high altitudinal areas and high in the plain areas of low elevation with reference to district headquarters. They may be less or more by 6º- 8ºC in the district with reference to district headquarters. The highest maximum temperature may be in the range of 30 ºC to 35 ºC and the lowest minimum temperature may be 0ºC to -6ºC in the district.

HUMIDITY

The air is humid throughout the year. However, relative humidity in the mornings is slightly less than that in the afternoons. In the southwest monsoon season the humidity is at about 85%. During February to April months the relative humidity is about 60% in the mornings.

CLOUDINESS

In the monsoon season the skies are mostly heavily clouded to overcast. The hill-tops are frequently enveloped with clouds. Cloudiness decreases rapidly in the post monsoon season. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March. Cloudiness increases from April and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year. Sometimes they are moderate to strong. It is because of dominant convective motion over hilly terrain. They generally blow from northwest direction in the mornings. Easterly or southeasterly wind also blows on a few days in the district during the post monsoon and winter seasons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year, but the frequency is more in August and September. Thunderstorms occurring in summer months are sometimes associated with hail. Fog occasionally occurs throughout the year, especially in the valleys.

TUENSANG DISTRICT

Tuensang, the largest district of Nagaland has hilly terrains, high ridges and narrow valleys. The climatic condition in this district varies from place to place due to variation in elevation and orography. The hilly area has elevation up to 2700 metres above mean sea level. The climate of the district is characterized by a humid atmosphere, very cold in winter, mild hot and pleasant in summer and heavy rainfall in the monsoon months. Winter season begins by the end of November and lasts till the first week of March. The period of March to May is of summer (pre-monsoon) season of thunderstorms and is followed by southwest monsoon season till mid-October. This monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at Tuensang town for 12 years. The details of rainfall at this station is given in Table 1 and the same may be taken as representative for the district as a whole. The average annual rainfall in the district is about 2091.1 mm. The rainfall varies from place to place in the district due to variation in elevation and topography. About 67% of the annual rainfall in the district is received during the southwest monsoon season (June to September). The district receives about 23% of the annual rainfall during the pre-monsoon months; March to May associated with thunderstorms. July is the rainiest month with an average rainfall of about 441.9 mm. On an average there are about 138 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Tuensang town was 128.6 mm on 15 August 1976.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of Kohima observatory at an altitude of 1406 metres above mean sea level. Though the climatic conditions in the Tuensang district vary from place to place due to mountainous terrain, the records of Kohima observatory may be taken as a representation of the climatic conditions prevailing in the district. The altitude of Tuensang town, the district headquarter is 1372 metres above mean sea level. Both day and night temperatures begin to increase from the end of February and continue to rise till August. In April and May months weather is generally pleasant with a moderate temperature however, the district experiences thundershowers. July and August are the hottest months of the year with mean maximum temperature of about 25ºC and mean minimum temperature of about 19ºC at Tuensang town. Day temperatures in the southwest monsoon season are almost same or even a

little higher than that of the summer season, but night temperatures are slightly high from the summer season. The onset of the southwest monsoon does not bring down the temperatures. On individual days in summer and early part of southwest monsoon season the maximum temperature may even reach about 33ºC. There is a gradual decrease in temperatures after withdrawal of the monsoon by the second week of October. The decrease in temperatures after October is remarkable, especially during night and weather becomes gradually cool and pleasant during post monsoon season. January is the coldest month with mean minimum temperature of 8ºC and mean maximum temperature of 15ºC. On individual days in the winter season, the minimum temperature drops to about 3ºC and weather is chilly over high altitudinal areas during winter. The temperatures may be low over high altitudinal areas and high in the plain areas of low elevation with reference to district headquarters. They may be less or more by 4ºC to 6ºC in the district with reference to Tuensang town. The highest maximum temperature may be 30ºC to 35ºC and the lowest minimum temperature may be 0ºC to -6ºC in the district.

HUMIDITY

The air is much humid throughout the year. However, relative humidity in the mornings is slightly less than those in the afternoons. In the southwest monsoon season the humidity is about 85%. During February to April months the relative humidity is about 65% in the morning.

CLOUDINESS

In the monsoon season the skies are mostly heavily clouded to overcast. The hill-tops are frequently enveloped with clouds. Cloudiness decreases rapidly in the post monsoon season. During the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March. Cloudiness increases from April and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year. Sometimes winds are moderate to strong. It is because of dominant convective motion over hilly terrain. They blow from northwest direction in the mornings. Easterly or southeasterly winds also blow on a few days in the district during the post monsoon and winter seasons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year, but the frequency is more in August and September. Thunderstorms occurring in summer months are sometimes associated with hail. Fog occasionally occurs throughout the year, especially in the valleys.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
TUENSANG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Tuensang Town	12	a	22.7	21.1	66.3	172.3	239.6	348.5	441.9	352.2	250.0	121.4	44.1	11.0	2091.1	115 (1974)	-	128.6	15 Aug 1976
		b	2.5	2.1	5.9	12.1	18.0	21.7	22.3	20.7	18.5	9.5	3.6	1.2	138.1				
Tuensang (District)		a	22.7	21.1	66.3	172.3	239.6	348.5	441.9	352.2	250.0	121.4	44.1	11.0	2091.1	115 (1974)	-		
		b	2.5	2.1	5.9	12.1	18.0	21.7	22.3	20.7	18.5	9.5	3.6	1.2	138.1				

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

WOKHA DISTRICT

Wokha district has hilly terrain and some plain areas with valleys. The district has hills of the elevation up to 1970 metres above mean sea level. It is divided into three ranges viz. Wokha range or upper range, Samir range or middle range and Bhandani range or lower range. The climate is warm in the plains and mild warm in high altitudinal areas in summer, cold in winter and good rainfall in the monsoon season. The year may be divided into four seasons. Winter season is from the end of November to the first week of March. The period of March to May is of summer (pre-monsoon) season of thunderstorms and is followed by southwest monsoon season till mid-October. This monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at Wokha for 61 years. The details of rainfall at this station and for the district as a whole are given in Table 1 and 2. The average annual rainfall in the district is about 2864.7 mm. About 69% of the annual rainfall in the district is received during the southwest monsoon season (June to September). July is the rainiest month with an average rainfall of about 575.6 mm. In the pre-monsoon season (March to May) the district receives about 21% rainfall of the annual rainfall. The variation in the annual rainfall from year to year is not large. In the 100 years period 1901 to 2000, the highest annual rainfall which was 176% of the normal occurred in year 1945 and the lowest annual rainfall was 58% of the normal occurred in year 2000. In this period there were four years, when the annual rainfall was less than 80% of the normal and they were not consecutive. It is seen from Table 2 that the annual rainfall in the district was between 2201 mm and 3500 mm in 40 out of 49 years. On an average there are about 139 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at Wokha town was 224.5 mm on 21 August 1955.

TEMPERATURE

There is no meteorological observatory in the district. So the description of climate for the district which follows is based on the meteorological data neighbouring observatory of Kohima. The temperatures vary from place to place due to variation in elevation and topography. As the headquarters of Wokha district is situated at an altitude 1350 metres. Both day and night temperatures begin to increase from the end of February and continue to rise till August. In April and May the weather is generally pleasant with moderate temperature and thundershowers. July and August are the hottest months of the year with mean maximum temperature of about 25ºC and mean minimum temperature of about 19ºC at the district headquarters. The onset of the southwest monsoon does not bring down the

temperatures in June. Day temperatures in the southwest monsoon season are almost same or even a little higher than those of the summer season. On individual days in summer and early part of southwest monsoon season the maximum temperature reaches up to 34ºC. There is a gradual decrease in temperatures after withdrawal of the monsoon. The decrease in temperature after October is remarkable, and weather becomes gradually cool till January. January is the coldest month with a mean minimum temperature of about 8ºC and a mean maximum temperature of about 15ºC. On individual days the in the winter season, the minimum temperature may go down to about 2ºC and weather is chilly over high altitudinal areas during winter. The temperatures may be 2- 4ºC less over high altitudinal areas and 4-6ºC high in the plain areas of low elevation with reference to the district headquarters. The highest maximum temperature may be 30ºC and 37ºC in eastern part and western part (plain areas) of the district respectively. The lowest minimum temperature may be 0ºC to 3ºC in the district.

HUMIDITY

The air is humid throughout the year. However, relative humidity in the mornings is slightly less than that in the afternoons. In the southwest monsoon season the humidity is much high about 85%. From February to April months the relative humidity is at about 65% in the mornings.

CLOUDINESS

In the monsoon season the skies are mostly heavily clouded to overcast. The hill-tops are enveloped with clouds. Cloudiness decreases rapidly in the post monsoon season. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March. Cloudiness increases from April and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year. Sometimes they are moderate to strong. It is because of dominant convective motion over hilly terrain. They blow in the northwesterly direction in the mornings. Easterly or southeasterly component also appears on a few days in the district during the post monsoon and winter seasons.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year, but its frequency is more in August and September. Thunderstorms occurring in summer months are sometimes associated with hail. Sometimes dust-storms occur in the northwestern part of district during the pre-monsoon season. Fog occasionally occurs in post monsoon season, winter and early part of pre-monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
WOKHA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Wokha Town	61	a	26.8	55.1	94.5	181.7	311.2	504.6	575.6	551.8	351.1	154.0	44.4	13.9	2864.7	176	58	224.5	21 Aug 1955
		b	2.2	4.4	6.9	11.1	15.4	21.1	22.9	22.4	17.9	9.9	3.1	1.5	138.8	(1945)	(2000)		
Wokha (District)		a	26.8	55.1	94.5	181.7	311.2	504.6	575.6	551.8	351.1	154.0	44.4	13.9	2864.7	176	58		
		b	2.2	4.4	6.9	11.1	15.4	21.1	22.9	22.4	17.9	9.9	3.1	1.5	138.8	(1945)	(2000)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
WOKHA
(Data 1901-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1601 – 1700	1	2501 – 2600	6	3401 – 3500	0	4301 – 4400	1
1701 – 1800	0	2601 – 2700	3	3501 – 3600	0	4401 – 4500	1
1801 – 1900	0	2701 – 2800	6	3601 – 3700	0	4501 – 4600	0
1901 – 2000	0	2801 – 2900	4	3701 – 3800	0	4601 – 4700	1
2001 – 2100	2	2901 – 3000	5	3801 – 3900	0	4701 – 4800	0
2101 – 2200	1	3001 – 3100	2	3901 – 4000	0	4801 – 4900	0
2201 – 2300	0	3101 – 3200	5	4001 – 4100	0	4901 – 5000	0
2301 – 2400	4	3201 – 3300	1	4101 – 4200	1	5001 – 5100	1
2401 – 2500	3	3301 – 3400	1	4201 – 4300	0		

(Data available for 49 years)

ZUNHEBOTO DISTRICT

Zunheboto district has hilly terrain with elevation varying from 1000 to 2500 metres above mean sea level and valleys. There are several hill ranges running northeast and southwest. The hills are more or less parallel to each other. The climatic condition of this district varies from place to place due to variation in elevation and orography. The climate of the district is characterized by moderately warm and pleasant in summer, very cold in winter and humid air throughout the year. Winter season is from the end of November to the first week of March. The period of March to May is of summer (pre-monsoon) season of thunderstorms and is followed by southwest monsoon season till mid-October. This monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are not available for any station for sufficiently long period. It rains almost throughout the year. The description of rainfall that follows is based on the data of neighbouring raingauge stations viz. Tuensang, Mokokchung and Wokha. The data of these stations are used to find out the average values for this district. The average annual rainfall in the district is about 2500 mm. The rainfall varies from place to place in the district due to topographic variation. About 65% to 70% of the annual rainfall in the district is generally received during the southwest monsoon season (June to September). July and August are the rainiest months with an average rainfall of about 500 mm. The average rainfall in the pre-monsoon season (March to May) would be about 20% of the annual rainfall. On an average there are about 125-150 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of neighbouring observatory at Kohima situated at an altitude of 1406 metres. Though the climatic condition in the district varies from place to place due to mountainous terrain, the records of Kohima observatory may be taken as a representation of the general climatic conditions prevailing in the district. An altitude of Zunheboto town, the district headquarters is 1874 metres. Both day and night temperatures begin to increase from the end of February and this rise in temperatures continues till August. In April and May, the weather is generally pleasant with moderate temperature and thundershowers. July and August are the hottest months of the year with mean maximum temperature about 22ºC and mean minimum temperature about 17ºC at Zunheboto town. The onset of the southwest monsoon in the beginning of June does not bring down the temperatures. Day

temperatures in the southwest monsoon season are almost same or even a little higher than that of the summer season, but night temperatures are somewhat higher than the summer season. On individual days in summer and early part of southwest monsoon season the maximum temperature may reach upto about 31ºC. There is a gradual decrease in temperatures after withdrawal of the monsoon. The decrease in temperature after October is remarkable till January, and weather becomes gradually cool and pleasant during post monsoon season. January is the coldest month with mean minimum temperature about 4ºC and mean maximum temperature about 12ºC. On individual days during the winter season, the minimum temperature may go down to 0ºC and weather is chilly over high elevated areas during winter. The temperatures may be less over high altitudinal areas and high in the areas of low elevation. They may be less or more by 3ºC to 5ºC with reference to Zunheboto town. The highest maximum temperature may be about 30ºC to 35ºC and the lowest minimum temperature may be less than 0ºC in the district.

HUMIDITY

The air is much humid throughout the year. However, relative humidity in the mornings is slightly less than that in the afternoons. In the southwest monsoon season the humidity may be between 85% and 90%. During February to April months the humidity is about 65% in the mornings.

CLOUDINESS

In the monsoon season the skies are mostly heavily clouded to overcast. The hill-tops are frequently enveloped with clouds. Cloudiness decreases rapidly in the post monsoon season. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March. Cloudiness increases from April and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year. Sometimes they are moderate to strong. It is because of dominant convective motion over hilly terrain. They generally blow in the northwesterly direction in the mornings. Easterly or south-easterly wind also blows on a few days in the district during the post monsoon and winter season.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year, but the frequency is more in August and September. Thunderstorms occurring in summer season are sometimes associated with hail. Fog occasionally occurs throughout the year, especially in the valleys. Its frequency is more in the monsoon and post monsoon seasons.

CLIMATE OF MANIPUR

General Description

Manipur is one of the seven sister states (Northeastern states) of India. The state is bounded by Nagaland on the north, Mizoram on the south, Assam on the west, and international borders of Myanmar on the east as well as on the south. The state lies at latitude of 23°50' N to 25°41' N and longitude of 93°02'E to 94°47'E. The total area covered by the state is 22,327 km². 90% of the total area of the state i.e. around 20,089 km^2 is covered by hills, whereas the remaining area is of valleys, rivers and plains of low elevation. In the state the hills are spread into ranges with irregular serrated ridges. There are several hill ranges of elevation up to 3114 metres above mean sea level and some of them are generally spread from north to south. Khayang is the highest peak in the state about 3114 m in Ukhrul district. The state capital of Manipur is Imphal at an elevation of 790 m in oval shaped valley.

Topographically, Manipur state has two distinct physical regions – an outlying mountainous area dotted with rugged several hills and narrow valleys, and inner area of flat plain or valleys. The valley region known as Imphal Valley is also dotted with a number of hills and mounds rising above the flat surface. Slope of the valley is generally from north to south. There are many lakes in the state. Loktak in the state is the largest lake in northeastern states which has important feature of the central region.

Rivers

There are so many rivers flowing in the state. Mostly rivers are in western and central regions which flow from north and south directions. There are four major river basins in Manipur state; Barak river basin in the west, Manipur river basin in the central region, Yu river basin in the east, and a part of Lanye river basin in the north.

Barak river originates in the hills near Mao at border of Nagaland and Manipur and a part of Surma–Meghna river system. It flows westward for some distance forming the boundary of the state with Nagaland and turns southward and reaches at the southwestern corner of the state. The state is drained by Barak river and its important tributaties are Makru, Jiri, Irang and Tuivai (Tipai) flowing in the state.

Imphal river and its tributaries mainly drain the Imphal Valley i.e. Central Plains. Imphal river flows to the eastern part of Loktak lake. Khordak river drains the water of Loktak lake into Imphal river. Imphal river rises in the highlands to the west of Kangpokpi and flows towards the south. Sekmai, Kongba, Iril and Thoubal are the principle tributaries of Imphal river. Imphal river in the south of the Loktak, is known as Manipur river and it is joined by its tributaries Khuga and Chakpi. Manipur river and its tributaries – Nambul and other smaller streams

with Loktak and other associated lakes form the water resources for the state. Manipur river enters into Chin Hills of Myanmar through narrow gorges at the southern boundary.

Yu river drains the eastern part of the state. The Yu river basin includes the Chamu, Khunou and other small streams.

Lanye river flows in the northern part of Manipur state.

Lakes of Manipur:

There are many lakes in the southern part of the Imphal valley. Loktak lake in Bishnupur district is the largest fresh water lake in the northeastern region of India. The surface area is about 180.4 sq. km in the rainy season. Other lakes including Waithou, Ikop, Pumlen and Kharungpat are located in the state. The lakes and rivers form important fishing ground into this hilly state.

Manipur state comes under forecasting centre- Regional Meteorological Centre, Guwahati. The state is a smaller part of the one meteorological subdivision- Nagaland, Manipur, Mizoram & Tripura (NMMT) and consists of the following 9 districts.

S.No.	Name	S.No.	Name	S.No.	Name
1.	Bishnupur	4.	Imphal East	7.	Tamenglong
2.	Chandel	5.	Imphal West	8.	Thoubal
3.	Churachandpur	6.	Senapati	9.	Ukhrul

Climate

The state has mostly hilly terrains with peaks ranges from 900 m to 3114 m and small area of rivers, valleys and lakes with low elevation. The climate of the state is largely influenced by topography of the hilly regions and it varies from place to place according to its topography. The presence of the mountain ranges not only prevents the winds but also acts as a barrier to the cyclonic storms originating from the Bay of Bengal. The climate of the state is generally characterized by mild hot in summer, humid in monsoon season and very cold in winter months. The state receives a good amount of rainfall in the monsoon months. Broadly the year may be divided into four seasons. Winter season sets in by the end of November and lasts till February. The coldest month is January, as cold winds freeze the atmosphere. The period of March to May is of pre-monsoon or summer season. The summer season is generally associated with rain and thunderstorms due to convective motion. The period of June to mid-October constitutes southwest monsoon season. This season is followed by post-monsoon season till November.

The state is located entirely to the north of the Tropic of Cancer, hence it comes under sub-tropical monsoon type of climate.

Areas in the state under each climate pattern based on Koppen's classification are shown in Fig. 2. This broad classification is based on mean annual and monthly values of rainfall in centimeter and temperature in ^{0}C. Most of the districts in the western part of the state viz: Churachandpur, Bishnupur, Imphal West, Imphal East, Thoubal, plain part of Tamenglong and western part of the district Chandel and Senapati come under the climate type: Subtropical monsoon with mild and dry winter, hot summer (Cwa). Districts in high altitudinal eastern part of the state viz. Ukhrul, eastern part of districts Chandel and Senapati, hilly parts of Tamenglong come under the climate type: Tropical upland, mild and dry winter, short warm summer (Cwb).

Sea level Pressure and Winds

The seasonal variation in atmospheric pressure over the state occurs in a systematic way with maximum in winter and minimum in the southwest monsoon season. The pressure gradient over the state is generally weak. Pressure is slightly low over the western and central parts of the state while slightly high pressure is noticed towards the east. The trend remains the same almost throughout the year being slightly less pronounced during the monsoon season.

Winds are generally light throughout the year. Sometimes wind becomes moderate to strong as anabatic and katabatic winds prevail over hilly terrain due to convective motion. During pre-monsoon and monsoon seasons winds blow from south and southeast direction in the morning and winds from northwest and west direction blow in the afternoon throughout the year. Calm and variable winds are also observed.

Pressure begins to change from October to January and wind pattern also changes. Table I gives the monthly mean wind speed in kilometer per hour and predominant wind direction in the morning and evening for Imphal observatory in the state.

Temperature

Table II gives the mean maximum and minimum temperatures at the Imphal observatory of the state. The spatial distribution of mean maximum temperature for the representative months of the four seasons of a year is depicted in Fig. 2(a,b,c,d).

In general, pre-monsoon and southwest monsoon seasons constitute the warmest part of the year. The maximum temperature begins to rise from the middle of February till August. April onwards, throughout the remaining summer season till August, the temperatures remain equal or it is slightly more in June, July and

August. The temperatures vary according to the topography of the state. In May month, mean maximum temperature is about 30^{0}C in western and central parts of the state, while in the remaining hilly part of the state it ranges between 18^{0}C and 28^{0}C (Fig. 2(a)). In July the temperature pattern is quite similar to that of May with slightly high temperature as shown in Fig. 2(b). From Fig. 2(c) it is observed that mean maximum temperature in October ranges between 15^{0}C and 28^{0}C while in January it ranges between 8^{0}C and 24^{0}C as shown in Fig 2(d).

The spatial distribution of mean minimum temperature for representative months of the four seasons of the year is depicted in Fig. 3(a.b.c.d). The minima of the mean minimum temperature are observed in the month of January over the state. From Fig. 3(a) the mean minimum temperature is about 5^{0}C in the western and central parts of the state and in places with higher elevation mean minimum temperature may be about 0^{0}C or less. The temperature value ranges between -4^{0}C and 8^{0}C. From Fig. 3(b) it is observed that mean minimum temperature of April ranges between 8^{0}C and 17^{0}C while in October it ranges between 8^{0}C and18^{0}C as shown in Fig.3 (d). In July it ranges 12^{0}C to 23^{0}C as shown in Fig. 3(c).

Both, the maximum and minimum temperatures rise rapidly from the middle of February to April. Thereafter maximum temperature remains more or less equal throughout pre-monsoon season and southwest monsoon season. The rise in maximum temperature from April to August is about 1^0 to 2^{0}C, while rise in minimum temperature is about 4^0 to 5^{0}C. As such, there is no distinct summer in the state. The night temperatures start falling rapidly after September, while day temperatures follow the trend after October. Both temperatures attain the lowest values by January. June, July and August have the lowest diurnal range of temperature about 7^0 to 8^{0}C. After withdrawal of southwest monsoon diurnal range increases rapidly and it is the highest of the order of 16^0 to 18^{0}C in the month of January.

The highest maximum temperature and the lowest minimum temperature ever recorded are depicted in Fig. 4 and 5. The highest maximum temperature ever recorded in the state is 35.7^{0}C on 13 July 2009 and the lowest minimum temperature ever recorded is -2.7^{0}C on 10 January 1970 at Imphal observatory. The highest maximum temperature is about 38^{0}C in western part and about 30^{0}C in eastern part of the state. However, the lowest temperature ranges between -3^{0}C and -6^{0}C in hilly terrains of eastern and central regions and is about 5^{0}C in western part of the state.

Humidity

Table III gives mean relative humidity at 0830 and 1730 HRS IST for Imphal observatory in the state. The state is generally highly humid throughout the year especially in the mornings except February to April when relative humidity is the least at about 50% to 60% in the afternoons. Relative humidity is the highest during the period June to December when it is about 80% in mornings, being slightly less about 75% in the afternoons. As

such there is no much diurnal variation between the mornings and afternoons especially in monsoon and post monsoon months.

Cloudiness

Table IV and IV(a) *give* the mean monthly and total cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 HRS IST respectively for Imphal observatory.

During the period April to September the skies are heavily clouded to overcast. The hill tops are frequently enveloped with clouds. On an average the skies are overcast for 3 to 8 days during this period. The cloudiness is more in the mornings than in afternoons. By October the cloudiness decreases and on an average around 1 to 9 days, the skies are clear during October to March. In winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. The cloudiness increases from April and the skies are frequently clouded.

Rainfall

Table V gives the districtwise and statewise mean for month and annual rainfall and number of rainy days (i.e. days with rainfall of 2.5 mm or more). Fig. 6 and Fig. 6(a to d) depict the spatial distribution of annual and seasonal rainfall over the state respectively.

The rainfall varies with space in the state due to altitudinal variation from place to place and topography of the state. There is good rainfall throughout the state. From table V total annual rainfall for the state as a whole is 220.9 cm and the total number of rainy days are 109. The rainfall is more about 250 cm to 400 cm in the southern and northwestern part i.e. Tamenglong and less in some part of central region as shown in (Fig. 6). It is observed that during winter season the rainfall is more in the northwestern sector and less in the central part of the state (Fig. 6(a)). The pattern of spatial distribution of rainfall over the state during the southwest monsoon season Fig. 6(c) and pre-monsoon season Fig. 6(b) generally resembles to that of the spatial distribution of the annual rainfall (Fig. 6). It is observed that during post monsoon season the rainfall is more in northwestern and southwestern sector of the state (Fig. 6(d)).

The southwest monsoon season is the principal rainy season over the state. Of the total annual rainfall 67% is received in the southwest monsoon season, whereas 20% is received during pre-monsoon season (March-May) and about 10% is received in post monsoon season (October-November) and 3% is received during winter season (December-February).

The percentage of seasonal number of rainy days with respect to the annual indicate that 62% occurs during the southwest monsoon season, whereas, 23% occurs during the pre-monsoon season, 10% occurs during the post monsoon season and 5% during the winter season.

The southwest monsoon sets in by the beginning of June and covers the entire state by the first week of this month. June and July are the rainiest months accounting for 39% of the annual rainfall with June accounting for 21% and July accounting for 18% of the annual rainfall. The number of rainy days during the southwest monsoon season ranges from 13 to 19 with a maximum of 19 in July.

The withdrawal of the southwest monsoon begins by the first week of October and completely withdraws from the state by the middle of this month.

The most common rain giving systems over the state are depressions and cyclones originating in the Bay of Bengal and low pressure associated with thunderstorms during pre-monsoon and post monsoon seasons.

The occasional winter rains accounting for around 3% of the annual and which is very vital for agriculture, occurs in association with the induced lows arising due to the passage of western disturbances moving east over the region. The rainfall of about 20% of the annual received in the pre-monsoon months is basically due to occurrence of thunderstorms.

The features of rainfall described above are also evident from Fig. 7(e), which shows the annual and seasonal rainfall for the individual districts as well as for the state and provides a measure for comparison of seasonal rainfall with the annual for both districtwise and statewise rainfall.

Table VI gives the monthly and annual rainfall for river catchment (No. 326) in the state. The annual rainfall of this river catchment is shown in Fig. 8. Table VI shows that catchment No. 326 formed by the river basins viz. the Barak river basin in the west, Manipur river basin in the central part, Yu river basin in the east, and a part of Lanye river basin in the north covering Manipur state receives an annual rainfall of 2209.4 mm with 109 rainy days.

Rainfall Variability

The spatial distribution of variation of annual rainfall over Manipur state is depicted in Fig. 9. Coefficient of Variation (CV) which is expressed as percentage is defined as:

$$C.V. = \frac{\text{Standard deviation } (\sigma)}{\text{Normal } (N)} \times 100$$

It is observed from Fig. 9 that the values of CV of annual rainfall range between 7.7% and 70.1% over the entire state.

The spatial distribution of CV of seasonal rainfall over Manipur is shown in Fig. 9(a), 9(b), 9(c) and 9(d) for the seasons: pre-monsoon season (March to May), southwest monsoon season (June to September), post monsoon season (October and November) and winter season (December to February) respectively.

It is observed that the values of CV range between 29.0% and 90.9% (Fig. 9(a)) in the pre-monsoon season. Area in southeastern and northwestern parts of the state exhibits the highest variability with values of CV exceeding 60% while the remaining regions of the state exhibit the least CV of about 60% or less.

During the southwest monsoon season the rainfall variability is low with CV ranging between 5.5% and 59% (Fig. 9(b)). The rainfall variability in the northwest, southeast and central regions of the state is of high value of CV at an average of about 30% to 59%, while the remaining regions have CV value less than 30%.

During the post monsoon season the values of CV range between 11% and 128% (Fig. 9(c)). Northeastern and southwestern sectors of the state exhibit lower variability of 30% to 60%, while central, northwestern and southeastern regions exhibit higher CV of about 60% to 128%.

During the winter season the values of CV show a steep gradient with range between 65% and 199.6% (Fig. 9(d)). Northeastern and southwestern sectors of the state exhibit low variability of about 60% to 90% while the remaining regions of the state exhibit high value of CV about 90% or more.

The variability of annual rainfall over Manipur state ranges between 7.7% and 70.1% (Fig. 9). As the variability of annual rainfall and rainfall during southwest monsoon and pre-monsoon seasons over Manipur is relatively low and variability of seasonal rainfall for winter and post monsoon seasons is high, it is seen that contribution of southwest monsoon and pre-monsoon seasonal rainfall to the annual rainfall is more over the state.

Droughts

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

Churachandpur and Senapati districts in the state experienced 8 and 14 years of drought respectively out of the 18 and 31 years under consideration during the period 1901-2000, satisfying the criteria for "chronically drought affected areas" whereas Imphal East district experienced 16 years of drought out of 46 years under consideration satisfying the criteria for "drought areas".

Following districts of the state were affected by drought during some year or the other during the period 1901-2000. The details of year wise occurrence of drought over each district during the 100-year period of 1901-2000 are given below. The figures within the brackets against each district indicate the number of occasions during the 100 year period when these districts were affected by drought.

Bishnupur (1), Chandel(2), Churachandpur(8), Imphal East(16), Imphal West(1), Senapati(14), Thoubal(2) and Ukhrul(2).

Occurrence of drought conditions in successive years is not frequent in the state. However, individual district have had successive years of drought. Severity of drought not only depends upon the order of the 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 year may not be as high as in a single year.

The following table (i) depicts districtwise years of successive drought during the 100 year period 1901-2000.

Table (i)

Sr. No.	Name of Affected districts	Years of Successive Drought
1.	Bishnupur	-
2	Chandel	-
3	Churachandpur	1959 - 1960 - 1961 - 1962.
4	Imphal East	1952- 1953- 1954, 1957- 1958- 1959- 1960, 1971- 1972, 1992- 1993.
5	Imphal West	-
6	Senapati	1959 - 1960 -1961- 1962, 1967 - 1968, 1970 - 1971 - 1972, 1999 - 2000.
7	Tamenglong	-
8	Thoubal	-
9	Ukhrul	-

Fig. 10 shows the percentage frequency of drought and years of successive drought in the districts during the period 1901-2000. The following table (ii) 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 (ii)

S.No.	Names of District Affected	Years of Severe Drought
1.	Bishnupur	-
2.	Chandel	1972 (21%)
3.	Chunradhandpur	1962, 1972, 1994 (22%)
4.	Imphal East	1992 (49%)
5.	Imphal West	-
6.	Senapati	1960, 1962, 1967, 1999, 2000 (38%)
7.	Tamenglong	-
8.	Thoubal	-
9.	Ukhrul	-

It is observed that the lowest annual rainfall percentage was in Chandel district (21% of the annual normal rainfall) in the year 1972.

Incidence of widespread and fairly widespread drought over the state in any particular year was not very common.

There were no drought conditions in the state in the following years: 1901 to 1951, 1955-1956, 1963, 1973-74, 1977-1978, 1980 to 1991 & 1995-1997. The districts of Senapati and Imphal East experienced the maximum number of drought conditions namely 14 and 16 years respectively during the 100 year period under consideration.

Excessive Rainfall:

Rainfall sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall regions. An annual rainfall of 125% or more of the normal is considered as excessive rainfall.

Fig. 11 shows the percentage frequency of excessive rainfall years and successive years of excessive rainfall during the period 1901 - 2000. It is seen from the figure that the frequency of excessive rainfall is generally higher in the northern, central and southeastern regions of the state.

The following table (iii) gives the district wise excessive rainfall years and the highest annual rainfall (expressed as percentage of normal) with the years of occurrence.

Table (iii)

Sr. No.	District	Years of excessive rainfall	Highest amount of Rainfall in (cm)	Rainfall in % to normal	Year
1.	Bishnupur	1967	765.1	359%	1967
2.	Chandel	1966, 1974	391.1	146%	1974
3.	Churachandpur	-	275.7	118%	2000
4.	Imphal East	1966, 1975, 1977, 1980, 1982, 1995	357.4	173%	1980
5.	Imphal West	1977	177.5	126%	1977
6.	Senapati	1933, 1934, 1935, 1936, 1937, 1938, 1966	515.8	226%	1938
7.	Tamenglong	-	488.4	121%	1934
8.	Thoubal	1976	396.3	305%	1976
9.	Ukhrul	1934, 1939	233.6	142%	1934

From the above table, it is seen that during the 100 year period 1901-2000, there were 16 years in which some districts or the other in the state recorded excessive rainfall. In the year 1967, Bishnupur district received the highest excessive rainfall 359% of the annual normal rainfall, amounting 765.1 cm. Senapati and Imphal East districts experienced maximum number of excessive rainfall 7 and 6 years respectively, while the remaining districts except Churchandpur and Tamenglong experienced excessive rainfall at least in one year. The successive years of excessive rainfall against each district are listed below:

Successive years of Excessive Rainfall (Districtwise)

Sr. No.	Districts	Successive years of Excessive Rainfall
1.	Bishnupur	-
2.	Chandel	-
3.	Churchandpur	-

Sr. No.	Districts	Successive years of Excessive Rainfall
4.	Imphal East	-
5	Imphal West	-
6	Senapati	1933 -1934 -1935 - 1936 -1937 - 1938.
7	Tamenglong	-
8	Thoubal	-
9	Ukhrul	-

The heaviest one day rainfall on record at any station in the state was 678.5 mm on 2 June 1963 at Thanlon in Churachandpur district.

Cyclonic storms and depressions

Table VII depicts the total number of storms/depressions which affected the state during the period 1891 - 2012. The cyclonic storms and depressions which affect India mostly originate and/or intensify over the Bay of Bengal mainly during the months of May to November. They usually travel northwestwards or westwards and cross the east coast of India. During the course of their movement, they sometimes turn or recurve towards north or northeast. This point of turning or recurving progressively shifts westwards till September. In general storms and depressions become weak when they enter on the land. Manipur though an inland state, the coast is only about 150 km away. The state therefore does not experience the full fury of severe storms/depressions like the coastal regions especially in the post monsoon months. However, in association with these systems, heavy to very heavy rainfall occurs over the affected districts. Some of these disturbances recurve, while still out in the Bay of Bengal and a few of them cross the coast and travel inland, affecting the weather of the state.

During the months from January to April, July and August the state was not affected by storms/depressions even on a single occasion but during the remaining months, it was affected 15 times. The number of storms and depressions that affected the state in May and June were 4 and 2 respectively. The storms/ depressions during September to December form over the Bay of Bengal which recurve while still out in the Bay and affect the weather of the state. Their frequency is maximum in May and October.

Other Weather Phenomena

(a) Thunderstorms and Dust storms

Convective activity is essential for the occurrence of thunderstorms and dust storms. With the advance of the summer, thunder activity becomes pronounced due to heating of the land. Imphal is the only observatory in

the state and records of the frequency of days of squalls and thunderstorms and other parameters are recorded at this observatory and this may be taken as representative of the whole state. Thunderstorms occur throughout the year. Thunderstorm activity occurs more in summer season. Thunderstorm activity attains its maximum in April. During the winter season, the state experiences thunderstorm activity resulting from low-pressure areas induced due to eastward moving upper air disturbances known as "Western Disturbances". Thunderstorm activity is the least and minimum in December.

When the moisture in the atmosphere is insufficient, dry thunderstorms or dust storms occur in presence of convective motion. The dust storms occasionally occur in extreme western part of the state but not occurred in other areas. They are mainly confined to the summer months April and May. Hailstorms occur rather rarely in the state, during the months of March to May. Squalls occasionally occur in the state, mainly during the pre-monsoon months.

(b) Fog

Fog is experienced during the post monsoon and winter months, when the air is still moist and is easily cooled below the dew point while rising over high elevations or hilly areas. Favourable conditions for formation of radiation fog such as light to calm wind, clear skies, low temperatures etc., do exist after withdrawal of the monsoon till March, their frequency of occurrence being maximum during the month of December. Sometimes it is also observed in hilly areas along valleys during southwest monsoon and post monsoon seasons.

(c) Earthquakes

Manipur state is prone to seismic activity and comes under seismic zone V. Details of earthquake of intensity 5.0 or more at Richter scale having epicenter in the state are given in table - VIII. The state has experienced 33 earthquakes of moderate and high intensity during the period of 1862 - 2012. Moderate to heavy damage in property and human life occurred due to these events of the earthquakes in the state as well as its neighouring regions. It is seen from the table - VIII that state has experienced maximum number of earthquakes (10) in the month of May. Manipur state has experienced an earthquake of maximum intensity of 6.5 Richter scale in May 1939 at 24º 18'N latitude and 94º 06' E longitude and in June 1934 at 25º 06'N latitude and 94º 42' E longitude.

TABLE – I
MEAN WIND SPEED IN (Kmph) AND PREDOMINANT WIND DIRECTON
MANIPUR

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Imphal/ Tulihal(A)	a	2.8	4.5	5.4	5.4	4.7	4.3	4.2	3.9	3.3	2.6	2.3	2.3	3.8
	m	C	C	C	C/S/ SE	C/S/ SE	C/S/ SE	C/S/ SE	C/S/ SE	C/SE /S	C	C	C	
	e	C/NW	W/ NW/C	W/ NW/C	C/ NW/W	NW/C	C/ NW/ SE/S	C/ NW/ SE/S	C/NW/ SE/S	C/NW	C/NW	C/NW	C/ NW/ W	

a: Mean Wind Speed in Kmph.
m: Predominant wind direction in the morning.
e: Predominant wind direction in the evening.
C: Calm.
Var: Variable.

TABLE – II
MEAN MAXIMUM AND MEAN MINIMUM TEMPERATURE (◦C)
MANIPUR

STATION	TEMP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Imphal/ Tulihal(A)	Max	21.7	23.4	26.9	28.4	28.9	29.4	29.0	29.2	29.0	28.4	25.4	22.4	26.8
	Min	4.3	7.2	11.6	15.7	18.4	21.1	21.5	21.3	20.1	16.6	11.1	5.3	14.5

TABLE III
MEAN RELATIVE HUMIDITY (%)
MANIPUR

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Imphal/ Tulihal (A)	M	77	68	64	70	75	80	82	82	82	82	81	82	68
	E	59	51	50	61	68	77	78	78	79	78	74	68	69

M : MORNING E : EVENING

TABLE IV

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

MANIPUR

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Imphal/ Tulihal(A)	a	9	8	8	2	0	0	0	0	0	0	1	4	32
	b	1	1	2	4	5	7	8	7	5	4	3	1	48
	c	2.4	2.5	3.1	4.5	5.3	6.6	6.9	6.6	6.4	5.3	4.3	3.3	4.8

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE IV (A)

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

MANIPUR

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Imphal/ Tulihal(A)	a	8	6	4	1	0	0	0	0	0	1	4	9	33
	b	1	1	2	3	3	6	4	3	3	3	2	1	32
	c	2.2	2.8	3.5	4.7	5.1	6.3	6.5	6.3	5.8	3.8	2.7	1.8	4.3

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE V
MEAN RAINFALL AND NUMBER OF RAINY DAYS
MANIPUR

DISTRICT		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Chandel	a	9.3	29.4	37.3	68.6	180.7	654.5	551.6	486.5	351.9	251.7	49.0	8.5	2679.0
	b	0.7	2.0	2.8	5.1	8.7	19.2	20.6	19.7	15.1	8.5	2.7	0.5	105.6
Churachandpur	a	13.2	31.1	72.7	187.1	237.9	424.9	403.0	382.6	349.0	173.3	50.2	11.2	2336.2
	b	1.2	2.5	4.7	9.4	12.4	18.0	18.5	17.1	14.4	8.8	3.1	0.6	110.7
Imphal East	a	13.1	35.7	104.5	164.1	240.9	391.3	368.7	320.9	237.1	143.9	35.9	9.7	2065.8
	b	1.3	2.6	5.9	9.3	12.8	17.7	19.2	16.4	12.0	7.0	2.3	0.7	107.2
Senapati	a	15.4	41.7	69.7	141.4	242.4	435.8	413.8	374.1	268.1	189.8	73.9	16.3	2282.4
	b	1.3	3.1	5.0	9.0	13.4	20.6	21.0	18.7	14.9	9.3	3.6	0.9	120.8
Tamenglong	a	26.0	69.8	149.0	299.1	460.6	801.9	818.7	640.3	445.7	234.2	80.6	10.6	4036.5
	b	1.9	4.9	8.5	12.8	17.9	22.7	24.1	21.8	17.5	10.2	2.9	0.8	146.0
Imphal West	a	25.1	29.8	60.5	106.0	123.0	289.8	223.0	213.3	157.4	117.6	41.7	21.3	1408.5
	b	1.6	2.4	4.5	8.1	10.2	16.4	16.0	14.6	9.3	7.7	3.2	0.8	94.8
Bishnupur	a	54.5	50.2	114.3	108.2	159.5	435.4	310.5	369.1	219.4	237.0	57.0	16.0	2131.1
	b	1.5	2.6	5.1	7.7	11.6	18.4	18.8	16.4	9.9	7.8	2.5	0.6	102.9
Ukhrul	a	16.1	41.8	55.0	81.2	150.3	346.0	317.1	264.4	181.2	119.3	60.8	12.0	1645.2
	b	1.6	3.3	4.4	6.7	10.9	18.9	21.4	17.9	13.1	7.9	3.6	0.8	110.5
Thoubal	a	15.2	27.8	42.9	96.4	140.0	338.7	181.7	219.8	109.1	90.8	27.7	9.4	1299.5
	b	0.9	2.5	4.2	6.8	9.1	13.9	12.7	14.1	7.8	5.9	2.2	0.5	80.6
State	**a**	**20.9**	**39.7**	**78.4**	**139.1**	**215.0**	**457.6**	**398.7**	**363.4**	**257.7**	**173.1**	**53.0**	**12.8**	**2209.4**
Mean	**b**	**1.3**	**2.9**	**5.0**	**8.3**	**11.9**	**18.5**	**19.1**	**17.4**	**12.7**	**8.1**	**2.9**	**0.7**	**108.8**

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE-VI

MEAN RAINFALL(mm) OVER DIFFERENT RIVER CATCHMENTS OF MANIPUR STATE

Sr.No	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1	Streams of Assam, Tripura , Manipur,Mizoram, Meghalaya and Nagaland flowing in to the Bay of Bengal. (catchment No.326)												
	Districts/Parts of districts of Manipur within this catchment:- SENAPTI,I MPHAL EAST, IMPHAL WEST, CHURACHANDAPUR, BISHNUPUR, TAMENGLONG, UKHRUL, THOUBAL, CHANDEL.												
a	21.4	45.8	80.2	142.4	217.1	466.1	429.7	397.5	268.8	177.8	55.1	12.7	2314.7
b	1.3	2.9	5.0	8.3	11.9	18.5	19.1	17.4	12.7	8.1	2.9	0.7	108.8

a: Normal Rainfall in mm

b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE – VII

STORMS AND DEPRESSIONS AFFECTING MANIPUR STATE

DURING 1891 – 2012

MONTH	*NO. OF STORMS/ DEPRESSIONS*	*MONTH*	*NO. OF STORMS/ DEPRESSIONS*	*MONTH*	*NO. OF STORMS/ DEPRESSIONS*
January	NIL	May	4	September	2
February	NIL	June	2	October	4
March	NIL	July	NIL	November	2
April	NIL	August	NIL	December	1
				TOTAL	**15**

TABLE VIII

DETAILS OF EARTHQUAKE OF INTENSITY OF 5.0 OR MORE AT RICHTER SCALE HAVING EPICENTRE WITHIN MANIPUR STATE DURING YEARS 1862-2012

MONTHS	YEARS	FREQUE-NCY	EARTHQUAKE OF HIGHEST INTENSITY			EPICENTRE			
			INTENSITY AT RICHTER SCALE	DEPTH IN km	YEAR	LAT - N		LONG -E	
						DEG	MIN	DEG	MIN
JANUARY									
FEBRUARY	1965	1	5.4	45.0	1965	24	58	94	13
MARCH	1937, 1947	2	5.9		1937	25	30	94	0
APRIL	1935, 1952, 1989	3	6.0		1935	25	6	94	42
			6.0		1952	25	30	94	30
MAY	1927, 1938, 1939, 1940, 1970, 1973, 1984, 1987, 1994, 1991	10	6.5	70.0	1939	24	18	94	6
JUNE	1880, 1934, 1959, 1965	4	6.5		1934	25	6	94	42
JULY	1828, 1930	2	5.5		1930	25	0	93	30
AUGUST	1926, 1983, 1989	3	5.7	60.0	1983	25	2	94	40
SEPTEMBER	1930, 1937, 1950, 2009	4	6.0		1930	25	18	93	48
OCTOBER									
NOVEMBER	1952	1	6.0		1952	25	30	94	0
DECEMBER	1971, 2[1991]	3	5.6	46.0	1971	25	10	94	43
TOTAL		**33**							

BISHNUPUR DISTRICT

Bishnupur district is mostly plain lying in the foot of hills. The district has some small hills of elevation up to 900 metres above mean sea level. The climate of this district is generally influenced by Loktak Lake, which is the largest fresh water lake in the northeastern region of India. The lands surrounding Loktak Lake are foggy in the winter mornings although it is not very cold. The climate of this district is characterized by mild cold in winter, mild hot in summer and humid throughout the year. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of pre-monsoon season associated with thunderstorms and is followed by southwest monsoon season till mid-October. This monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station, at Kangchupkhul for 19 years. The details of rainfall at this station which is representative of the district as a whole are given in Table 1 and 2. The average annual rainfall in the district is 2131.1 mm. The variation in the annual rainfall from year to year is much large. About 63% of the annual rainfall occurs during the southwest monsoon season (June to September). June is the rainiest month with an average rainfall of 435.4 mm. In the pre-monsoon season (March to May) the district receives about 18% of the annual rainfall. In the 100 year period 1901 to 2000, the highest annual rainfall amounting to 359% of the annual normal occurred in year 1967, while the lowest annual rainfall was 50% of the normal occurred in 1972. There are four years when annual rainfall was less than 80% of the normal and they were not consecutive. It is seen from Table 2 that the annual rainfall was between 1701 mm and 2600 mm in 9 years out of 14. On an average there are 103 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at Kangchupkhul was 212.0 mm on 2 June 1974.

TEMPERATURE

There is no meteorological observatory in the district and hence, the description of the climate which is based on the records of meteorological parameters of neighbouring observatory Imphal at an elevation of about 780 metres above mean sea level. As the district has hills of height up to 900 m and

Bishnupur town is located at height 788 m. The winter sets in by the end of November and lasts till February. Day and night temperatures begin to decrease from the middle of November till January which is the coldest month. The mean maximum temperature of January month is about 21°C and mean minimum temperature is about 4°C. In association with cold waves, the minimum temperature reaches to below 0°C on individual days. The temperatures begin to rise from March and continue till August, while the day temperature reaches its highest in June when mean maximum temperature is about 29°C and mean minimum temperature is about 21°C. During the monsoon season, day temperatures continue to be nearly equal or a little higher than that in April and May, the nights being slightly warmer. During the period April to July maximum temperature may reach up to 35°C on individual days. During the monsoon season weather sometimes becomes oppressive due to damp heat in between two spells of rain. There is a gradual fall in temperatures after withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon season. The temperatures may be 2° - 4°C higher in plain areas of low elevation with reference to district headquarters.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April especially in the afternoons when relative humidity can be about 60% but in other months the humidity is above 70%. Particularly, it is high around 80% in the monsoon season.

CLOUDINESS

The skies are heavily clouded to overcast during the southwest monsoon season and latter part of summer. The hill-tops are frequently enveloped with clouds. Skies are also heavily clouded on many days in the post monsoon season. Cloudiness decreases from October. During winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March.

WINDS

Winds are generally light or calm throughout the year. Sometimes winds become moderate or strong as convective motion over hilly terrain plays a dominant role. During pre-monsoon and monsoon

seasons winds blow from south and southeast direction in the mornings and blow from northwest and west direction in the afternoons throughout the year.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail occurs rarely and is confined in the summer season. Thunderstorms in summer season are sometimes accompanied by squalls. Fog is common in post monsoon and winter months. Its frequency is the highest in the month of December.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
BISHNUPUR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Kangchupkhul	19	a	54.5	50.2	114.3	108.2	159.5	435.4	310.5	369.1	219.4	237.0	57.0	16.0	2131.1	359	50	212.0	02 Jun 1974
		b	1.5	2.6	5.1	7.7	11.6	18.4	18.8	16.4	9.9	7.8	2.5	0.6	102.9	(1967)	(1972)		
Bishnupur District		a	54.5	50.2	114.3	108.2	159.5	435.4	310.5	369.1	219.4	237.0	57.0	16.0	2131.1	359	50		
		b	1.5	2.6	5.1	7.7	11.6	18.4	18.8	16.4	9.9	7.8	2.5	0.6	102.9	(1967)	(1972)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
BISHNUPUR
(Data 1957-1977)

Range in mm	No. of years	Range in mm	No. of years
1001 – 1100	1	4401 – 4500	0
1101 – 1200	0	4501 – 4600	0
1201 – 1300	0	4601 – 4700	0
1301 – 1400	0	4701 – 4800	0
1401 – 1500	0	4801 – 4900	0
1501 – 1600	0	4901 – 5000	0
1601 – 1700	3	5001 – 5100	0
1701 – 1800	4	5101 – 5200	0
1801 – 1900	2	5201 – 5300	0
1901 – 2000	0	5301 – 5400	0
2001 – 2100	1	5401 – 5500	0
2101 – 2200	1	5501 – 5600	0
2201 – 2300	0	5601 – 5700	0
2301 – 2400	1	5701 – 5800	0
2401 – 2500	0	5801 – 5900	0
2501 – 2600	0	5901 – 6000	0
2601 – 2700	0	6001 – 6100	0
2701 – 2800	0	6101 – 6200	0
2801 – 2900	0	6201 – 6300	0
2901 – 3000	0	6301 – 6400	0
3001 - 3100	0	6401 – 6500	0
3101 – 3200	0	6501 - 6600	0
3201 – 3300	0	6601 - 6700	0
3301 – 3400	0	6701 - 6800	0
3401 – 3500	0	6801 - 6900	0
3501 – 3600	0	6901 - 7000	0
3601 – 3700	0	7001 - 7101	0
3701 – 3800	0	7101 - 7200	0
3801 – 3900	0	7201 - 7300	0
3901 – 4000	0	7301 - 7400	0
4001 – 4100	0	7401 - 7500	0
4101 – 4200	0	7501 - 7600	0
4201 – 4300	0	7601 - 7700	1
4301 - 4400	0		

(Data available for 14 years)

CHANDEL DISTRICT

Chandel district (formerly known as Tengonpal district) lies in the southeastern part of Manipur. This district is mostly hilly which is having elevation ranging from 790 metres to 2350 metres above mean sea level and some valleys. The climate of the district is characterized by mild hot and pleasant in summer, cold in winter, abundant rainfall and humid in the monsoon months. The year may be divided into four seasons. Summer or pre-monsoon season associated with thunderstorms starts from March and lasts till May which is followed by southwest monsoon season till mid-October. The period of mid-October to November is of post monsoon season and is followed by winter season till February.

RAINFALL

Records of rainfall in the district are available for only one raingauge station, at Tengonpal Farm for 19 years. The details of rainfall at this station which may be taken as representative for the district as a whole are given in Table 1 and 2. The average annual rainfall in the district is 2679.0 mm. The variation in the annual rainfall from year to year is large and rainfall also varies from place to place due to topographic variation. About 76% of the annual rainfall occurs during the southwest monsoon season (June to September). June is the rainiest month with an average rainfall of 654.5 mm. In the pre-monsoon season (March to May) the district receives about 11% of the annual rainfall. In the 100 year period 1901 to 2000, the highest annual rainfall amounting to 146% of the annual normal occurred in year 1974, while the lowest annual rainfall was 21% of the normal occurred in 1972. In this period there were 3 years in which the annual rainfall was less than 80% of the normal and out of which 2 years were consecutive. It is seen from Table 2 that the annual rainfall was between 2101 mm and 3300 mm in 9 years out of 14. On an average there are 106 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at Tengonpal farm was 380.4 mm on 12 June 1974.

TEMPERATURE

There is no meteorological observatory in the district and as such, the conditions prevailing at Imphal observatory at an elevation of about 780 metres in neighbouring district of Imphal East may be taken as representative of the climatic conditions prevailing in the district. As the district is hilly and its headquarter is situated at an elevation of 910 m, so that temperature and other meteorological conditions in the district vary according to the topography. The winter sets in by the end of November and lasts till February. Temperatures begin to decrease from the middle of November till January which is the coldest month. The mean minimum temperature in January is about 4°C and mean maximum temperature is about 21°C at the district headquarters. In association with cold waves, the minimum temperature reaches below to 0°C on individual days

and weather becomes chilly over hilly terrains during winter. The temperatures begin to rise from the middle of February and continue till August. July and August are the warmest months when mean maximum temperature is about 29°C and mean minimum temperature is about 20°C. During the monsoon season, day temperatures continue to be nearly equal to those in April and May, nights however may be slightly warmer. During the period April to July maximum temperature may reach 35°C on individual days. During the southwest monsoon season weather sometimes becomes oppressive due to damp heat in between two spells of rain. There is a gradual fall in the temperatures after withdrawal of the monsoon, and weather becomes cool and pleasant during post monsoon season. The day and night temperatures may be 5- 8°C lower in high altitudinal areas and 2- 3°C high in plain and valleys areas with reference to district headquarter.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April especially in the afternoons when relative humidity is about 60% but in other months the humidity is above 70%. Particularly it is high around 80% in the monsoon season.

CLOUDINESS

The skies are heavily clouded to overcast during the southwest monsoon season and latter part of pre-monsoon season. Sometimes the hill-tops are enveloped with clouds. Skies are also clouded on many days in the post monsoon season. Cloudiness decreases from October. In the winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March.

WINDS

Winds are generally light or calm throughout the year. Anabatic and Katabatic winds prevail over hilly terrain due to convective motion so that winds sometimes become moderate or strong. During the pre-monsoon and monsoon seasons winds blow from the south and southeast direction in the mornings and winds blow from northwest and west direction in the afternoons throughout the year.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail occurs rarely and is confined in the summer season. Thunderstorms in summer season are sometimes accompanied by squalls. Fog is common in post monsoon and winter months. Sometimes it is also observed in monsoon months in hilly areas along valley. Its frequency is the highest in December.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
CHANDEL

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Tengonpal Farm	19	a	9.3	29.4	37.3	68.6	180.7	654.5	551.6	486.5	351.9	251.7	49.0	8.5	2679.0	146	21	380.4	12 Jun 1974
		b	0.7	2.0	2.8	5.1	8.7	19.2	20.6	19.7	15.1	8.5	2.7	0.5	105.6	(1974)	(1972)		
Chandel (District)		a	9.3	29.4	37.3	68.6	180.7	654.5	551.6	486.5	351.9	251.7	49.0	8.5	2679.0	146	21		
		b	0.7	2.0	2.8	5.1	8.7	19.2	20.6	19.7	15.1	8.5	2.7	0.5	105.6	(1974)	(1972)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall
CHANDEL
(Data 1959-1979)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
501 – 600	1	1401 – 1500	0	2301 – 2400	2	3201 – 3300	0
601 – 700	0	1501 – 1600	0	2401 – 2500	0	3301 – 3400	0
701 – 800	0	1601 – 1700	0	2501 – 2600	1	3401 – 3500	0
801 – 900	0	1701 – 1800	0	2601 – 2700	0	3501 – 3600	1
901 – 1000	0	1801 – 1900	0	2701 – 2800	4	3601 – 3700	0
1001 – 1100	0	1901 – 2000	0	2801 – 2900	1	3701 – 3800	0
1101 – 1200	0	2001 – 2100	1	2901 – 3000	0	3801 – 3900	0
1201 – 1300	0	2101 – 2200	0	3001 - 3100	1	3901 – 4000	1
1301 – 1400	1	2201 – 2300	0	3101 – 3200	0		

(Data available for 14 years)

CHURACHANDPUR DISTRICT

Churachandpur is a hilly district in southern part of Manipur. The district has hills of elevation upto 2100 metres above mean sea level and plains of low elevation with valleys. The climate of the district is characterized by cold in winter and mild warm in summer and humid atmosphere throughout the year. However, the summer and post monsoon seasons are experienced as mild warm and pleasant. The year may be divided into four seasons. Winter season starts from the end of November and lasts till February. The period of March to May is of summer season associated with thunderstorms and is followed by southwest monsoon season till mid-October. The southwest monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for three raingauge stations, for period ranging from 14 to 18 years. The details of 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 2336.2 mm. The variation in the annual rainfall from year to year is large. The rainfall also varies from place to place due to topographic variation. About 67% of the annual rainfall occurs during the southwest monsoon season (June to September). June is the rainiest month with an average rainfall of 424.9 mm. In the pre-monsoon season (March to May) the district receives about 21% of the annual rainfall. The western part of the district receives more rainfall (about 3000 mm as annual normal) than eastern part. In the 100 year period 1901 to 2000, the highest annual rainfall amounting to 118% of the annual normal occurred in 2000, while the lowest annual rainfall which was 22% of the normal occurred in 1994. In this period (1901-2000), there were 11 years in which the annual rainfall was less than 80% of the normal and there were one occasion each of 4, 3 and 2 consecutive years respectively. It is seen from Table 2 that the annual rainfall was between 1801 mm and 2800 mm in 9 years out of 18. On an average there are 111 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 86 at Churachandpur to 125 at Thanlon. The heaviest rainfall recorded in 24 hours at any station in the district was 678.5 mm at Thanlon on 2 June 1963.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate which follows is based on the records of meteorological parameters of Imphal observatory which is at an elevation of 780 m in the neighbouring Imphal East district. As the district is hilly and its headquarters is situated at an elevation of 921 m. Temperature and other meteorological conditions in the district vary according to the topography of the place. The winter season starts from the end of November and lasts till February. Temperatures begin to decrease from the middle of November till January, which is the coldest month. In January month the mean maximum temperature is about 20°C and mean minimum temperature is about 4°C at Churachandpur town. In association

with cold waves, the minimum temperature drops to below 0°C on individual days and weather becomes chilly over hilly terrain. The temperatures begin to rise from the middle of February and continue till August, while the day temperature reaches its highest in June when the mean maximum temperature is about 28°C and mean minimum temperature is about 21°C. During the monsoon season, day temperatures continue to be nearly equal or slightly higher than those in April and May, nights however are slightly warmer. During the period April to July maximum temperature may reach up to 33°C on individual days. In the monsoon season weather sometimes becomes oppressive due to damp heat in between two spells of rain. There is a gradual fall in temperatures after withdrawal of the monsoon and weather becomes gradually cool and pleasant in the post monsoon season. The day and night temperatures are 6° - 8°C lower in the high elevated areas and 2° – 4°C higher in plain and valley areas of low elevation with reference to district headquarter.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April especially in the afternoon when relative humidity can be about 60% but in other months the humidity can be about 70%. Particularly, it is high around 80% in the monsoon season.

CLOUDINESS

The skies are heavily clouded to overcast during the pre-monsoon and southwest monsoon seasons. The hill-tops are frequently enveloped with clouds. Skies are also heavily clouded on many days in the post monsoon season. Cloudiness decreases from October. During winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March.

WINDS

Winds are generally light throughout the year. As anabatic and katabatic winds prevail over hilly terrain due to convective motion so that winds sometimes become moderate or strong. During pre-monsoon and monsoon seasons winds blow from south and southeast direction in the mornings and blow from northwest and west directions in the afternoons throughout the year . It is sometimes calm or variable.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail occurs rarely and is confined in the summer season. Thunderstorms in summer season are sometimes accompanied by squalls. Fog is common in post monsoon and winter months. Sometimes it is also observed in monsoon months in hilly areas along valley. Its frequency is the highest in December.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
CHURACHANDPUR

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Churachandpur	18	a	8.1	23.7	33.5	107.8	107.4	267.9	204.4	236.9	137.9	112.0	50.1	10.8	1300.5	138	72	160.0	01 May 1977
		b	0.9	1.9	3.3	7.5	8.7	13.6	14.4	15.4	9.6	7.5	2.8	0.6	86.2	(1977)	(1972)		
Thanlon	14	a	15.3	31.7	61.4	270.0	302.7	582.2	600.0	538.7	538.8	272.0	64.4	11.1	3288.3	384	55	678.5	02 Jun 1963
		b	1.3	2.2	4.2	10.3	14.4	20.8	21.8	17.7	17.2	10.4	3.9	0.5	124.7	(1963)	(1967)		
Thanlon(Hydro)	18	a	16.2	37.8	123.1	183.4	303.7	424.5	404.5	372.2	370.4	136.0	36.2	11.6	2419.6	114	21	157.3	10 Sep 1980
		b	1.4	3.3	6.7	10.3	14.1	19.7	19.4	18.2	16.4	8.5	2.5	0.8	121.3	(2000)	(1994)		
Churachandpur (District)		a	13.2	31.1	72.7	187.1	237.9	424.9	403.0	382.6	349.0	173.3	50.2	11.2	2336.2	118	22		
		b	1.2	2.5	4.7	9.4	12.4	18.0	18.5	17.1	14.4	8.8	3.1	0.6	110.7	(2000)	(1994)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
CHURACHANDPUR
(Data 1959-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
501 – 600	1	1301 – 1400	1	2101 – 2200	1
601 – 700	0	1401 – 1500	1	2201 – 2300	1
701 – 800	0	1501 – 1600	0	2301 – 2400	0
801 – 900	0	1601 – 1700	1	2401 – 2500	1
901 – 1000	1	1701 – 1800	1	2501 – 2600	0
1001 – 1100	1	1801 – 1900	3	2601 – 2700	0
1101 – 1200	1	1901 – 2000	0	2701 – 2800	1
1201 – 1300	1	2001 – 2100	2		

(Data available for 18 years)

IMPHAL EAST DISTRICT

Imphal East district lies in hills and valleys. The district has two parts which are located separately in central and extreme western regions of Manipur. The western part of the district has mostly plains with valley of low elevation however, eastern part is mostly hilly with elevation up to 1560 metres above mean sea level. The climate of this district is characterized by cold in winter, mild hot in summer and humid air throughout the year. The year may be divided into four seasons. Summer (pre-monsoon) season of thunderstorms is from March to May and is followed by southwest monsoon season till mid-October. Post monsoon season is from mid-October to November. The period of December to February is of winter season.

RAINFALL

Records of rainfall in the district are available for 4 raingauge stations for the period ranging from 12 to 47 years. The details of rainfall at these stations and for the district as a whole are given in Tables 1 and 2. On account of the hilly nature of the terrain, rainfall varies from place to place depending on elevation and orography iin the district. The annual normal rainfall in the district is 2065.8 mm. The variation in annual rainfall from year to year is large. About 64% of the annual rainfall occurs during the southwest monsoon season (June to September), while rainfall in pre-monsoon season (March to May) associated with thunderstorms contributes about 25% of the annual rainfall. June is the rainiest month with an average rainfall of 391.3 mm. Southwestern part of the district receives more rainfall than northwestern part. Annual normal rainfall in eastern part of the district is less, about 1390 mm whereas it is about 2740 mm in western part separately. In the fifty year period from 1951 to 2000, the highest annual rainfall amounting to 173% of the annual normal occurred in year 1980, while the lowest annual rainfall which was 49% of the normal occurred in 1992. In this period 1951-2000, there were 20 years in which annual rainfall was less than 80% of the normal and such a low rainfall was occurred in one occasion of 9 consecutive years and four occasions of two consecutive years. It is seen from Table 2 that the annual rainfall was between 1601 mm and 2600 mm in 23 years out of 46. On an average there are 107 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 91 at Imphal C.Hospital to 123 at Chhota Berka (Hydro). The heaviest rainfall recorded in 24 hours at any station in the district was 240.0 mm at Jiriham Farm on 08 October 1963.

TEMPERATURE

There is one meteorological observatory in the district at Imphal at an elevation of about 780 m above mean sea level in the eastern part of the district. Temperature and other meteorological conditions depend very much on elevation of the place in the district. The description of climate which follows is based on the records of meteorological parameters of Imphal observatory. The winter season is from December to February. Temperatures begin to decrease from the middle of November till January, which is the coldest month. The mean

maximum temperature in January is 21.7°C and the mean minimum temperature is 4.3°C. In association of cold waves, the minimum temperature reaches to below the freezing point of water on individual days. The temperatures begin to rise from the middle of February and continue till August, while the day temperature reaches its highest in June when mean maximum temperature is about 29.4°C and mean minimum temperature is about 21.1°C. During the monsoon season day temperatures continue to be nearly equal or a little higher than in April and May, however nights are slightly warmer. Sometimes weather becomes oppressive due to damp heat in between two spells of rain. There is a gradual fall in temperature after withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon season. On individual days during the period April to July maximum temperature may reach up to 35°C. The temperatures may be 2°- 5°C lower over high altitudinal areas in the eastern part and 2°- 4°C high in plain areas of low elevation particularly in western part of the district.

The highest maximum temperature ever recorded at Imphal observatory was 35.7°C on 13 July 2009 and the lowest minimum temperature ever recorded was -2.7°C on 10 January 1970.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April especially in the afternoon when relative humidity is about 50% to 60% but in other months the humidity is above 70%. Particularly, it is high i.e. 80% in the monsoon season.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and latter part of summer. Sometimes the hill tops are enveloped with clouds. Skies are also heavily clouded on many days in the post monsoon season. Cloudiness decreases from October. In winter season, sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March.

WINDS

Winds are generally light throughout the year. Anabatic and katabatic winds prevail over hilly terrain due to convective motion so that winds sometimes become moderate or strong. During pre-monsoon and southwest monsoon seasons winds blow from south and southeast direction in the morning and winds from northwest and west direction blow in the afternoon throughout the year. Sometimes winds are calm or variable.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail is rather rare and is confined to the summer season. Thunderstorms in summer season are sometimes accompanied by squalls. Fog is common in post monsoon and winter months. Its frequency is the highest in December.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Imphal observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
IMPHAL EAST

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Chhota Berka (Hydro)	25	a	8.2	44.4	152.8	227.2	335.8	459.0	510.1	445.4	370.3	146.3	32.0	14.1	2745.6	130	78	200.1	06 Jun 1987
		b	0.8	2.4	6.0	11.2	14.9	19.3	23.2	19.5	16.3	6.5	2.0	0.9	123.0	(1980)	(1979)		
Imphal C. Hosp	12	a	19.2	18.5	78.7	71.8	157.4	287.1	243.7	212.6	146.6	115.9	29.5	1.5	1382.5	108	90	88.9	30 Oct 1959
		b	1.7	1.8	5.6	5.9	11.9	15.3	16.1	13.8	9.3	6.8	2.1	0.3	90.6	(1955)	(1960)		
Imphal T-Aero Obsy	47	a	13.2	36.0	79.1	117.1	161.0	257.3	228.5	194.9	138.0	119.7	36.6	13.6	1395.0	157	64	158.6	30 Jul 1989
		b	1.3	3.2	6.0	9.1	11.5	15.7	16.2	13.5	9.6	7.0	2.4	0.9	96.4	(1991)	(1979)		
Jiriham Farm	16	a	11.9	44.1	107.2	240.1	309.5	561.8	492.7	430.8	293.3	193.6	45.4	9.6	2740.0	139	65	240.0	08 Oct 1963
		b	1.3	2.9	6.1	11.1	12.9	20.4	21.3	18.9	12.8	7.9	2.7	0.7	119.0	(1961)	(1972)		
Imphal E. District		a	13.1	35.7	104.5	164.1	240.9	391.3	368.7	320.9	237.1	143.9	35.9	9.7	2065.8	173	49		
		b	1.3	2.6	5.9	9.3	12..8	17.7	19.2	16.4	12.0	7.0	2.3	0.7	107.2	(1980)	(1992)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
IMPHAL EAST
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1001 - 1100	1	2301 – 2400	1
1101 – 1200	0	2401 – 2500	0
1201 – 1300	3	2501 – 2600	0
1301 – 1400	6	2601 – 2700	0
1401 – 1500	4	2701 – 2800	1
1501 – 1600	3	2801 – 2900	3
1601 – 1700	4	2901 – 3000	0
1701 – 1800	1	3001 – 3100	1
1801 – 1900	1	3101 – 3200	0
1901 – 2000	6	3201 – 3300	0
2001 – 2100	2	3301 – 3400	0
2101 – 2200	4	3401 – 3500	0
2201 – 2300	4	3501 – 3600	1

(Data available for 46 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(IMPHAL/TULIHAL(A))

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	21.7	4.3	27.8	23-01-2010	-2.7	10-01-1970	77	59
February	23.4	7.2	31.5	19-02-2009	-1.4	05-02-1968	68	51
March	26.9	11.6	35.0	25-03-2010	2.4	12-03-1966	64	50
April	28.4	15.7	34.4	27-04-1979	6.2	02-04-1968	70	61
May	28.9	18.4	35.6	22-05-2009	11.1	01-05-1992	75	68
June	29.4	21.1	35.6	06-06-1979	14.7	09-06-1987	80	77
July	29.0	21.5	35.7	13-07-2009	15.4	29-07-1985	82	78
August	29.2	21.3	34.0	10-08-2007	14.6	16-08-1979	82	78
September	29.0	20.1	34.4	02-09-2005	14.3	19-09-1990	82	79
October	28.4	16.6	33.5	05-10-2007	7.8	27-10-1987	82	78
November	25.4	11.1	30.7	01-11-2007	1.5	28-11-1969	81	74
December	22.4	5.3	28.9	03-12-1979	-1.7	29-12-1969	82	68
Annual	26.9	14.6	35.7	13-07-2009	-2.7	10-01-1970	77	69

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (IMPHAL/TULIHAL (A))

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	9	8	8	2	0	0	0	0	0	0	1	4	32
b	1	1	2	4	5	7	8	7	5	4	3	1	48
c	2.4	2.5	3.1	4.5	5.3	6.6	6.9	6.6	6.4	5.3	4.3	3.3	4.8
1730 HOURS IST													
a	8	6	4	1	0	0	0	0	0	1	4	9	33
b	1	1	2	3	3	6	4	3	3	3	2	1	32
c	2.2	2.8	3.5	4.7	5.1	6.3	6.5	6.3	5.8	3.8	2.7	1.8	4.3

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (IMPHAL/TULIHAL (A))

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	2.8	4.5	5.4	5.4	4.7	4.3	4.2	3.9	3.3	2.6	2.3	2.3	3.8
Direction in morning	C	C	C	C/S/SE	C/S/SE	C/S/SE	C/S/SE	C/S/SE	C/SE/S	C	C	C	
Direction in evening	C/NW	W/NW/C	W/NW/C	C/NW/W	NE/C	C/NW/SE/S	C/NW/SE/S	C/NW/SE/S	C/NW	C/NW	C/NW	C/NW/N	

TABLE - 6
Special Weather Phenomena (IMPHAL/TULIHAL(A))

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.3	1.7	6.1	11.4	8.6	6.8	3.0	4.6	4.4	2.3	0.4	0.2	49.8
Hail	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Dust storm	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
Fog	6.8	0.7	0.6	0.3	0.2	0.0	0.0	0.1	0.7	4.4	7.6	12.2	33.6
Squall	0.0	0.0	0.2	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2

IMPHAL WEST DISTRICT

Imphal West district lies in hilly area having an elevation up to 2500 metres above mean sea level and plain areas of low elevation. The climate of this district is characterized by cold in winter, moderate temperature and pleasant in summer and humid atmosphere. It is relatively less humid and dry during the winter season. The year may be divided into four seasons. Summer (pre-monsoon) season of thunderstorms is from March to May followed by southwest monsoon season till mid-October. The period of mid-October to November is of post monsoon season. The period of December to February is of winter season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station, i.e. Imphal (PWD) for the period of 16 years. The details of rainfall at this station which is representative for the district as a whole are given in Tables 1 and 2. The annual normal rainfall in the district is 1408.5 mm. About 63% of the annual rainfall occurs during the southwest monsoon season (June to September), while rainfall in pre-monsoon season (March to May) generally associated with thunderstorms contributes about 21% of the annual rainfall. June is the rainiest month with an average rainfall of 289.8 mm. In this district the rainfall varies from place to place due to topographic variation. Northern and Central parts of the district receive more rainfall of about 2000 mm in a year. In the period 1957 to 1977, the highest annual rainfall amounting to 126% of the annual normal occurred in year 1977, while the lowest annual rainfall was 69% of the normal occurred in 1972. During this period the rainfall was less than 80% of the normal during two years, but they were not consecutive. It is seen from Table 2 that the annual rainfall was between 1101 mm and 1700 mm in 7 years out of 11 years for which whole year data is available. On an average there are 95 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at Imphal (PWD) was 175.0 mm on 01 July 1975.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of Imphal observatory situated at an elevation of 780 metres in neighbouring Imphal East district. The district headquarter is situated at an elevation of 790 m. Temperature and other meteorological conditions depend very much on elevation of the place in the district. Winter sets in by the end of November. Temperatures begin to decrease remarkably from the end of November till January, which is the coldest month. The mean minimum temperature of January month is about 4°C and mean maximum temperature is about 21°C at the district headquarter. In winter season, minimum temperature reaches to below the freezing point of water on individual days and weather becomes chilly over hilly terrains. The temperatures begin to rise from the middle of February and continue till August. July and August are the warmest months when

mean maximum temperature is about 29°C and mean minimum temperature is about 21°C. During the monsoon season, day temperatures continue to be nearly equal or even higher than that in April and May, however nights are slightly warmer. In the monsoon season weather sometimes becomes oppressive due to damp heat in between two spells of rain. There is a gradual fall in temperatures after withdrawal of the monsoon and weather become gradually cool and pleasant during post monsoon season. During the period April to July maximum temperature may reach about 34°C on individual days. The temperatures may be 8°-10°C lower over high altitudinal areas and 2°- 3°C high in plain areas of low elevation with reference to district headquarters.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April especially in the afternoon when relative humidity is about 60% but in other months the humidity is 70%. Particularly, it is high around 80% or more in the monsoon season.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and latter part of summer. The hill-tops are frequently enveloped with clouds. Skies are also heavily clouded on many days in the post monsoon season. In winter season, the sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March.

WINDS

Winds are generally light or calm throughout the year. As anabatic and katabatic winds prevail over hilly terrain due to convective motion so that winds sometimes become moderate or strong. During pre-monsoon and monsoon seasons winds blow from the south and southeast direction in the mornings and it blows from northwest and west directions in the afternoons throughout the year.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail is rather rare and confined to the summer season. Thunderstorms in summer season are sometimes accompanied by squalls. Fog is common in post monsoon and winter months. Sometimes it is also observed in monsoon months in hilly areas along valley. Its frequency is the highest in December month.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
IMPHAL WEST

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Imphal PWD	16	a	25.1	29.8	60.5	106.0	123.0	289.8	223.0	213.3	157.4	117.6	41.7	21.3	1408.5	126	69	175.0	01 July 1975
		b	1.6	2.4	4.5	8.1	10.2	16.4	16.0	14.6	9.3	7.7	3.2	0.8	94.8	(1977)	(1972)		
Imphal West. District		a	25.1	29.8	60.5	106.0	123.0	289.8	223.0	213.3	157.4	117.6	41.7	21.3	1408.5	126	69		
		b	1.6	2.4	4.5	8.1	10.2	16.4	16.0	14.6	9.3	7.7	3.2	0.8	94.8	(1977)	(1972)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
IMPHAL WEST
(Data 1957-1977)

Range in mm	No. of years	Range in mm	No. of years
901 - 1000	1	1401 – 1500	2
1001 – 1100	1	1501 – 1600	3
1101 – 1200	0	1601 – 1700	0
1201 – 1300	0	1701 – 1800	2
1301 – 1400	2		

(Data available for 11 years)

SENAPATI DISTRICT

Senapati district has land of hills, green valley and rivers. This district has hill ranges varying from 1060 metres to 2900 metres above mean sea level. The hills run along the north- south direction and gradually slope down towards south and meet the Imphal valley. The climate of this district is characterized by mild hot and pleasant in summer, very cold in winter, abundant rainfall in monsoon months and humid atmosphere. The climatic conditions in the district vary with orography of a place. The year may be divided into four seasons. Winter season begins by the end of November and lasts till February. The period of March to May is of pre-monsoon season of thunderstorms till May and is followed by southwest monsoon season till mid-October. This is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for three raingauge stations, for period ranging from 12 to 29 years. The details of 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 2282.4 mm. About 65% of the annual rainfall occurs during the southwest monsoon season (June to September). June is the rainiest month with an average rainfall of 435.8 mm. In the pre-monsoon season (March to May) the district receives about 20% of the annual rainfall. The variation in the annual rainfall from year to year is much large. On account of the hilly nature of the terrain, rainfall varies from place to place due to topographic variations. In the 73 year period 1928 to 2000, the highest annual rainfall amounting to 226% of the annual normal occurred in year 1938, while the lowest annual rainfall was 38% of the normal occurred in 2000. During this period, there were 14 years in which the annual rainfall was less than 80% of the normal and there were two occasions of two consecutive years and one occasion each of 3 and 4 consecutive years. It is seen from Table 2 that the annual rainfall was between 1801 mm and 2800 mm in 10 years out of 31. On an average there are 121 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 92 at Maram Farm to 145 at Kongpakpi. The heaviest rainfall recorded in 24 hours at any station in the district was 251.0 mm at Kongpakpi on 26 August 1936.

TEMPERATURE

There is no meteorological observatory in the district and as such the records of meteorological parameters of neighbouring observatory Imphal observatory situated at an elevation of 780 metres and Kohima observatory situated at an elevation of 1406 metres may be taken as a representative of the general climatic conditions prevailing in the district. As district headquarter is situated at an elevation of 1065 metres. Temperature and other meteorological conditions vary according to the topography of the place. The winter season starts from the end of November. Temperatures begin to decrease from the middle of November till January which is the coldest month. The mean maximum temperature of January month is about 19°C and mean

minimum temperature is about 6°C at the district headquarters. In association with cold waves, the minimum temperature drops to below 0°C on individual days and weather becomes chilly over hilly terrain. The temperatures begin to rise from the middle of February and continue till August. July and August are the warmest months when mean maximum temperature is about 27°C and mean minimum temperature is about 19°C. During the monsoon season, day temperatures continue to be nearly equal or a little higher than those in April and May, nights however are slightly warmer. During the period April to July maximum temperature may reach 33°C on individual days. In the monsoon season weather sometimes becomes oppressive due to damp heat in between two spells of rain. There is a gradual fall in temperatures after withdrawal of the monsoon and weather becomes gradually cool and pleasant in the post monsoon season. The temperatures may be 6° -10°C lower in the high elevated areas and 3° –5°C higher in plain areas of low elevation with reference to district headquarters.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April especially in the afternoon when relative humidity is about 50% to 60% but in other months the humidity is above 70%. Particularly, it is high i.e. 80% in the monsoon season.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and latter part of summer. The hill-tops are frequently enveloped with clouds. Skies are also heavily clouded on many days in the post monsoon season. Cloudiness decreases from October. In winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March.

WINDS

Winds are generally light throughout the year. As anabatic and katabatic winds prevail over hilly terrain due to convective motion so that winds sometimes become moderate or strong. During pre-monsoon and monsoon seasons winds blow from south and southeast direction in the morning and winds from northwest and west direction blow in the afternoon throughout the year. Sometimes winds are calm or variable.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail is rather rare and is confined to the summer season. Thunderstorms in summer season are sometimes accompanied by squalls. Fog is common in post monsoon and winter months. Sometimes it is also observed in monsoon months in hilly areas along valley. Its frequency is the highest in December month.

TABLE - 1

NORMALS AND EXTREMES OF RAINFALL
SENAPATI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Kongpakpi	18	a	21.3	68.9	114.9	167.8	331.5	563.9	512.6	469.3	358.6	253.8	108.0	20.0	2990.6	172	57	251.0	26 Aug 1936
		b	1.4	5.0	7.3	10.1	17.1	24.1	24.7	21.5	18.4	10.6	3.8	1.4	145.4	(1938)	(1953)		
Maram Farm	29	a	14.9	19.8	51.7	68.0	146.3	255.3	228.7	203.8	128.7	111.0	33.0	9.5	1270.7	132	69	120.4	14 Oct 1975
		b	1.5	1.9	4.2	5.9	10.3	15.8	10.7	15.3	10.7	6.8	2.3	0.6	92.0	(1973)	(2000)		
Tinsong	12	a	10.0	36.5	42.5	188.5	249.5	488.2	500.0	449.2	317.1	204.5	80.6	19.4	2586.0	121	77	145.6	18 Jul 1968
		b	1.0	2.3	3.4	10.9	12.8	21.9	21.5	19.2	15.7	10.6	4.6	0.8	124.7	(1966)	(1972)		
Senapati (District)		a	15.4	41.7	69.7	141.4	242.4	435.8	413.8	374.1	268.1	189.8	73.9	16.3	2282.4	226	38		
		b	1.3	3.1	5.0	9.0	13.4	20.6	21.0	18.7	14.9	9.3	3.6	0.9	120.8	(1938)	(2000)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
SENAPATI
(Data 1928-2000)

Range in mm	No. of years	Range in mm	No. of years
801 – 900	1	3001 - 3100	0
901 – 1000	1	3101 – 3200	2
1001 – 1100	2	3201 – 3300	0
1101 – 1200	1	3301 – 3400	1
1201 – 1300	2	3401 – 3500	0
1301 – 1400	4	3501 – 3600	0
1401 – 1500	1	3601 – 3700	0
1501 – 1600	1	3701 – 3800	0
1601 – 1700	1	3801 – 3900	1
1701 – 1800	0	3901 – 4000	0
1801 – 1900	0	4001 – 4100	0
1901 – 2000	2	4101 – 4200	1
2001 – 2100	1	4201 – 4300	1
2101 – 2200	2	4301 - 4400	0
2201 – 2300	2	4401 – 4500	0
2301 – 2400	2	4501 – 4600	0
2401 – 2500	1	4601 – 4700	0
2501 – 2600	0	4701 – 4800	0
2601 – 2700	0	4801 – 4900	0
2701 – 2800	0	4901 – 5000	0
2801 – 2900	0	5001 – 5100	0
2901 – 3000	0	5101 – 5200	1

(Data available for 31 years)

TAMENGLONG DISTRICT

Tamenglong district is located in the western part of the state of Manipur. Tamenglong is entirely composed of hills, ranges, narrow valleys and rivers. This hilly district has elevation up to 2800 metres above mean sea level. The climate of this district is characterized by mild hot in summer, cold in winter, abundant rainfall in the pre-monsoon and southwest monsoon seasons and humid atmosphere. The year may be divided into four seasons. Summer (pre-monsoon) season associated with thunderstorms is from March to May followed by southwest monsoon season till mid-October. The period of mid-October to November constitute post monsoon season followed by winter season from December till February.

RAINFALL

Records of rainfall in the district are available for only one raingauge station, i.e. Tamenglong which is a hill station having an altitude of 1260 m for the period of 42 years. The details of rainfall at this station which is a representative for the district as a whole are given in Tables 1 and 2. The annual normal rainfall in the district is 4035.5 mm. The rainfall in the district varies from place to place due to topographic variation. About 67% of the annual rainfall occurs during the southwest monsoon season (June to September), while rainfall in pre-monsoon season (March to May) in association with thunderstorms contributes about 23% of the annual rainfall. July is the rainiest month with an average rainfall of 818.7 mm. The annual rainfall variation from year to year is very large. The rainfall also varies from place to place due to topographic variation. In the period 1922 to 1976, the highest annual rainfall amounting to 121% of the annual normal occurred in year 1934, while the lowest annual rainfall which was 78% of the normal occurred in 1942. During this period, there was 1 year when the annual rainfall was less than 80% of the normal. It is seen from Table 2 that the annual rainfall was between 3201 mm and 4800 mm in 28 years out of 30 years for which whole year data is available. On an average there are 146 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at Tamenglong was 602.8 mm on 18 June 1976.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of Imphal observatory situated at an elevation of about 780 m above mean sea level. The district headquarters is situated at an elevation of 1260 m a.m.s.l. As the district is hilly, temperature and other meteorological conditions vary from place to place according to the topography. The winter season starts from December and lasts till February. Temperatures begin to decrease from the end of November till January, which is the coldest month. The mean maximum temperature in January is about 19°C and mean minimum temperature is about 3°C at the district headquarter. In association with cold waves, the minimum temperature drops to below 0°C on individual days and weather becomes chilly over hilly terrains in

winter season. The temperatures begin to rise from the middle of February and continue till August. July and August are the warmest months when mean maximum temperature is about 27°C and mean minimum temperature is about 20°C. During the monsoon season, day temperatures continue to be nearly equal or a little higher than those in April and May, nights however are slightly warmer. During the period April to August, maximum temperature reaches up to 33°C on individual days. In the monsoon season weather sometimes becomes oppressive due to damp heat in between two spells of rain. There is a gradual fall in temperatures after withdrawal of the monsoon and weather becomes gradually cool and pleasant in the post monsoon season. The temperatures may be 6°- 8°C lower over high altitudinal areas and 3°- 5°C higher in valley and plain areas of low elevation with reference to district headquarters.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April particularly, in the afternoon when relative humidity is about 60% but in other months humidity is above 70%. Particularly, it is high about 80% in the monsoon season.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and latter part of summer. The hill-tops are frequently enveloped with clouds. Skies are also heavily clouded on many days in the post monsoon season especially in the mornings. Cloudiness decreases from October. In winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March.

WINDS

Winds are generally light throughout the year. As anabatic and katabatic winds prevail over hilly terrain due to convective motion so that winds sometimes become moderate or strong. During pre-monsoon and monsoon seasons winds blow from south and southeast direction in the mornings and blow from northwest and west directions in the afternoons throughout the year. Winds are also calm or variable.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail is rather rare and confined in the summer season. Thunderstorms in summer season are sometimes accompanies by squalls. Fog is common in post monsoon and winter months. Sometimes it is also observed in monsoon months in hilly areas along valley. Its frequency is high in the month of December.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
TAMENGLONG

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Tamenglong	42	a	26.0	69.8	149..0	299.1	460..6	801..9	818.7	640..3	445..7	234..2	80.6	10.6	4036.5	121	78	602.8	18 June 1976
		b	1.9	4.9	8.5	12.8	17.9	22.7	24.1	21.8	17.5	10.2	2.9	0.8	146.0	(1934)	(1942)		
Tamenglong District		a	26.0	69.8	149.0	299.1	460..6	801..9	818.7	640..3	445..7	234..2	80.6	10.6	4036.5	121	78		
		b	1.9	4.9	8.5	12.8	17.9	22.7	24.1	21.8	17.5	10.2	2.9	0.8	146.0	(1934)	(1942)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
TAMENGLONG
(Data 1922-1976)

Range in mm	No. of years	Range in mm	No. of years
3101 - 3200	1	4101 – 4200	4
3201 – 3300	1	4201 – 4300	3
3301 – 3400	0	4301 – 4400	1
3401 – 3500	1	4401 – 4500	0
3501 – 3600	3	4501 – 4600	1
3601 – 3700	3	4601 – 4700	1
3701 – 3800	1	4701 – 4800	1
3801 – 3900	3	4801 – 4900	1
3901 – 4000	2		
4001 – 4100	3		

(Data available for 30 years)

THOUBAL DISTRICT

Thoubal district lies in plain and valleys surrounded by hills. Punam which is the highest hill in this district has an elevation about 1008 metres above sea level. Its average elevation of the district is about 790 metres. The climate of this district is characterized by cold in winter, moderate temperature in summer and humid air throughout the year. The year may be divided into four seasons. Summer (pre-monsoon) season associated with thunderstorms is from March to May. Southwest monsoon season starts from the beginning of June and lasts till mid-October. The period of mid-October to November constitutes post monsoon season. The period of December to February is of winter season.

RAINFALL

Records of rainfall in the district are available for only one rain gauge station- Wangbal Farm for a period of 19 years. The details of rainfall at this station which may be taken as representative for the district as a whole are given in Tables 1 and 2. The annual normal rainfall in the district is 1299.5 mm. About 65% of the annual rainfall occurs during the southwest monsoon season (June to September), while the rainfall in pre-monsoon season (March to May) associated with thunderstorms contributes about 21% of the annual rainfall. June is the rainiest month with an average rainfall of 338.7 mm. The variation in the annual rainfall from year to year is much large. In the period 1959 to 1977, the highest annual rainfall amounting to 305% of the annual normal occurred in year 1976, while the lowest annual rainfall which was 52% of the normal occurred in 1972. During this period, there were 4 years when annual rainfall was less than 80% of the normal and only one occasion of such a low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall was between 1001 mm and 1600 mm in 11 years out of 14 years for which whole year data is available. On an average there are 81 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at Wangbal Farm was 530.0 mm on 14 June 1976.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of neighbouring observatory Imphal situated at an elevation of about 780 metres a.s.l. in Imphal East district. The district headquarter is Thoubal town situated at an elevation of 790 m. Winter sets in by the end of November. Temperatures begin to decrease from mid- November till January, which is the coldest month. The mean minimum temperature in January is about 4°C and mean maximum temperature is about 22°C. In association with cold waves, during the winter season, the minimum temperature may drop below 0°C on individual days. The temperatures begin to rise from the middle of February and continue till August, while the day temperature reaches its highest in June, when mean maximum temperature is about 29°C

and mean minimum temperature is about 21°C. During the monsoon season day temperatures continue to be nearly equal or even higher than those in April and May, nights however are slightly warmer. During the period April to July maximum temperature reaches up to 35°C on individual days. There is a gradual fall in temperatures after withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon season. The temperatures may be about 2°C higher in valley or plain areas of low elevation and 1°-2°C lower at high altitudinal areas with reference to district headquarters.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April especially in the afternoons when relative humidity is about 50% to 60% but in other months the humidity is above 70%. Particularly it is high around 80% in the monsoon season.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and latter part of summer. Sometimes the hill tops are enveloped with clouds. Skies are also heavily clouded on many days in the post monsoon season. Clodiness decreases from October. In winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March.

WINDS

Winds are generally light throughout the year. During pre-monsoon and monsoon seasons winds blow from south and southeast direction in the mornings and winds blow from northwest and west direction in the afternoons throughout the year. Sometimes winds are calm or variable.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail is rather rare and is confined to the summer season. Thunderstorms in summer season are sometimes accompanied by squalls. Fog is common in post monsoon and winter months. Sometimes it is also observed in monsoon months in hilly areas along valley. Its frequency is the highest in the month of December.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
THOUBAL

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Wangbal Farm	19	a	15.2	27.8	42.9	96.4	140.0	338.7	181.7	219.8	109.1	90.8	27.7	9.4	1299.5	305	52	530.0	14 June 1976
		b	0.9	2.5	4.2	6.8	9.1	13.9	12.7	14.1	7.8	5.9	2.2	0.5	80.6	(1976)	(1972)		
Thoubal (District)		a	15.2	27.8	42.9	96.4	140.0	338.7	181.7	219.8	109.1	90.8	27.7	9.4	1299.5	305	52		
		b	0.9	2.5	4.2	6.8	9.1	13.9	12.7	14.1	7.8	5.9	2.2	0.5	80.6	(1976)	(1972)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
THOUBAL
(Data 1959-1977)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
601 - 700	1	1501 – 1600	0	2401 – 2500	0	3301 – 3400	0
701 – 800	0	1601 – 1700	0	2501 – 2600	0	3401 – 3500	0
801 – 900	0	1701 – 1800	0	2601 – 2700	0	3501 – 3600	0
901 - 1000	1	1801 – 1900	0	2701 – 2800	0	3601 – 3700	0
1001 – 1100	2	1901 – 2000	0	2801 – 2900	0	3701 – 3800	0
1101 – 1200	7	2001 – 2100	0	2901 – 3000	0	3801 – 3900	0
1201 – 1300	0	2101 – 2200	0	3001 – 3100	0	3901 – 4000	1
1301 – 1400	1	2201 - 2300	0	3101 – 3200	0		
1401 – 1500	1	2301 – 2400	0	3201 – 3300	0		

(Data available for 14 years)

UKHRUL DISTRICT

Ukhrul district lies in eastern part of Manipur surrounded by Myanmar. The terrain of the district is hilly with varying heights of 913 metres to 3114 metres above mean sea level is rippled with ridges and rivers. District headquarters is situated at 2020 m where climate is generally cold throughout the year except summer season when it is mild warm and pleasant. The climate of this district is characterized by very cold in winter, moderate temperature in summer and humid air throughout the year. The year may be divided into four seasons. Winter season starts from the middle of November to the first week of March. This is followed by summer (pre-monsoon) season associated with thunderstorms till May. Southwest monsoon season begins from the first week of June and lasts till mid-October. This is followed by post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station, i.e. Ukhrul Farm for the period of 42 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The annual normal rainfall in the district is 1645.2 mm. The variation in the annual rainfall from year to year is not large, but rainfall varies from place to place due to topographic variation. About 67% of the annual rainfall occurs during the southwest monsoon season (June to September), while rainfall in pre-monsoon season (March to May) contributes about 17% of the annual rainfall. June is the rainiest month with an average rainfall of 346.0 mm. In the period 1922 to 1977, the highest annual rainfall amounting to 142% of the annual normal occurred in year 1934, while the lowest annual rainfall was 55% of the normal occurred in 1972. There were two years during this period for which the annual rainfall was less than 80% of the normal and they were not consecutive years. It is seen from Table 2 that the rainfall was between 1301 mm and 2000 mm in 28 years out of 33. On an average there are 111 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at Ukhrul Farm was 163.6 mm on 5 June 1942.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on meteorological data of neighbouring Imphal observatory situated at an elevation of about 780 m and Kohima observatory at an elevation of 1406 m in Nagaland state. Consequent upon, the climatic conditions in the district vary from place to place due to variation in elevation and orography and district headquarter- Ukhrul is situated at altitude about 2020 m. Both day and night temperatures begin to increase from the end of February and continue till August. July and August are the hottest months with mean maximum temperature of about 23°C and mean minimum temperature of about 16°C at the district headquarter. Temperatures during the southwest monsoon season are almost same or sometimes even a little higher than those of the summer season (March to May). The onset of the southwest monsoon in the beginning of June does

not bring down the temperatures. On individual days in summer and early part of the southwest monsoon season the maximum temperature may reach up to 30°C. There is a gradual fall in temperatures after withdrawal of the monsoon and weather becomes gradually cool and pleasant during post monsoon season. The decrease in temperature after October is remarkable till January. January is the coldest month with the mean minimum temperature at about 2°C and the mean maximum temperature at about 12°C. On individual days during winter, minimum temperature may go down to sub-zero and weather becomes chilly over high altitudinal areas. The temperatures are 4°-6°C lower over high altitudinal areas and 5°-8°C higher in areas of low elevation with reference to district headquarter.

HUMIDITY

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during January to April especially in the afternoon when relative humidity is about 50% to 60% but in other months the humidity is above 70%. Particularly it is high i.e. 80% or more during the monsoon season.

CLOUDINESS

In the monsoon season the skies are mostly heavily clouded to overcast. The hill-tops are frequently enveloped with clouds and one can see sudden changes in the position of clouds within a few moments. Cloudiness decreases from October. In winter season sky sometimes becomes obscured in the mornings due to lifted fog which clears with the advance of the day. But the skies are sometimes clear or lightly clouded during the period from November to March. Cloudiness increases from April and the skies are frequently clouded.

WINDS

Winds are generally light throughout the year. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. During pre-monsoon and monsoon seasons winds blow from south and southeast direction in the morning and winds from northwest and west direction blow in the afternoon throughout the year. Sometimes winds are calm or variable.

SPECIAL WEATHER PHENOMENA

Thunderstorms occur throughout the year. Its frequency is more in summer and southwest monsoon months. Hail is rather rare and is confined to the summer season. Thunderstorms in summer season are sometimes accompanied by squalls. Fog is common in post monsoon and winter months. Sometimes it is also observed in monsoon months in hilly areas along valley. Its frequency is the highest in December month.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
UKHRUL

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Ukhrul Farm	42	a	16.1	41.8	55.0	81.2	150.3	346.0	317.1	264.4	181.2	119.3	60.8	12.0	1645.2	142	55	163.6	05 Jun 1942
		b	1.6	3.3	4.4	6.7	10.9	18.9	21.4	17.9	13.1	7.9	3.6	0.8	110.5	(1934)	(1972)		
Ukhrul (District)		a	16.1	41.8	55.0	81.2	150.3	346.0	317.1	264.4	181.2	119.3	60.8	12.0	1645.2	142	55		
		b	1.6	3.3	4.4	6.7	10.9	18.9	21.4	17.9	13.1	7.9	3.6	0.8	110.5	(1934)	(1972)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
UKHRUL
(Data1922-1977)

Range in mm	No. of years	Range in mm	No. of years
901 -1000	1	1701 – 1800	6
1001 – 1100	0	1801 – 1900	4
1101 – 1200	1	1901 – 2000	3
1201 – 1300	0	2001 – 2100	2
1301 – 1400	2	2101 – 2200	0
1401 – 1500	6	2201 – 2300	0
1501 – 1600	1	2301 – 2400	1
1600 – 1700	6		

(Data available for 33 years)

THE CLIMATE OF MIZORAM

General Description

Mizoram state is situated between 21° 58'N to 24°35'N latitude and 92°15' E to 93°29' E longitude. It has a geographical area of over 21,087 Sq km. The tropic of Cancer passes near the capital of the state, Aizwal town. Mizoram occupies the southeast corner of northeastern region of India. Its geographical borders with Assam and Manipur in north and Tripura in west extended over 123 km, 95 km and 277 km respectively. It shares about 404 km long international boundary on the east and south with Myanmar and 318 km on the west with Bangladesh.

Mizoram is a land of mostly rolling hills, rivers and valleys. There are 21 major hills ranges of different heights which run through the length and breadth of the state with the highest peak 'Phawngpui hill (Blue Mountain) towering 2,065 metres above mean sea level. The mountain ranges are mostly aligned in south direction in parallel series. The ranges are separated from one another by narrow deep river and valleys. The hills are extremely rugged and steep in the state. There are some small patches of flat lands. Eastern part of the state has mainly mountainous topography and overall elevation is higher and steeper slopes than in the western part of the state. The elevation in the eastern part varies from 400 to 2065 m and average elevation in the eastern region is about 1000 m. The western part of the state is characterized by ridge and valley type topography where average elevation is about 450 m.

Rivers

Mizoram state is drained by various rivers, streams, and rivulets. The area receives a considerable amount of rainfall in summer and southwest monsoon season, and most of the streams are ephemeral (temporary) in nature. The most of the rivers originated in the central part of the state and flow either towards north or south direction by north-south trending ridges. The important rivers in the northern part of the state are Tlawng (Dhaleshwari), Tuirial (Sonai) and Tuivawl which flow northwards and fall in Barak river in Cachar district of Assam. The southern part of the state is drained by rivers Chhimtuipui (Koldoyne) on the east with its tributaries Mat, Tuichang, Tlau and Tuipui. Chhimtuipui formed natural boundary with Myanmar in the east and south. The western part is drained by Khawthalangtuipui (Karnafuli) river and its tributaries Tuichawng, Phairuang, Deh etc.

Tlawng is the longest river about 185 km in Mizoram. It originates from Zopui hill at the height about 1395 m and flows towards the north. It divides region into almost two equal parts. After confluence with tributaries tut and Teirei, it enters Cachar district where it is known as Dhaleshwari and falls in to Barak river near Badarpur.

Tuirial river originates from north Chawilung hill in Aizwal district. Its span in the state is about 117 km. It flows northward to join Barak river in Assam. Tuirini is its important tributary which joins the main stream from eastern bank after flowing parallel to it about 60 km.

Tuivawl river rises near Chhawrtui village and its span in the state is about 72 km. It flows towards north where its tributary Tuivai joins at Manipur border and later confluence with Barak river.

Tlau river which spans for about 159 km in the state is a demarcating line between Mizoram and Myanmar. It flows from the northeast corner of the state near Khuangphah village it takes southward direction. After confluence with main tributary river Tuipui, it meets Chhimthuipui river in opposite direction.

Chhimtuipui or Koldoyne (Kaladan) is one of the biggest rivers in the state. It originates from western part of Myanmar near Vanum village at an altitude 2325 m and flows in south direction. It enters Mizoram near Sabawangte village from which it takes the path northward for distance 138 km in the state, marking international boundary and meets Tiau river. From this point flow direction diverted towards north- west and meets Tuichang river and eventually flows southwards where tributaries Mat and Mengpui confluence it.

Khawthlangtuipui river originates from Saithah village in Mamit district. It flows towards south forming boundary line between Mizoram and Bangladesh. After taking about 128 km courses, it turns towards southwest entering Bangladesh through Tlabung. Its important tributaries are De, Kawrpui, Tuichawng and Phairuang.

Mizoram state comes under forecasting centre- Regional Meteorological Centre Guwahati. The state is a smaller part of one meteorologically sub-division – Nagaland, Manipur, Miroram, Tripura (NMMT). There are eight districts in the state:

Sr. No.	Name	Sr. No.	Name
1.	Aizwal	5.	Lawngtlai
2.	Champhai	6.	Lunglei
3.	Chhimtuipui	7.	Mamit
4.	Kolasib	8.	Serchhip

Climate

The climate of the state is generally characterized by mild hot and humid in summer and monsoon seasons and cold in winter months. The characteristics are typically that of the hilly particularly in eastern and

central parts, rivers and valleys regions. The climate varies from place to place in the state according to the topography. The state has a good amount of rainfall in the monsoon season and it also receives significant rainfall in April and May months. During pre-monsoon and post monsoon seasons weather is associated with thundershowers and moderate temperature and it is generally experienced pleasant particularly in eastern and central regions of the state. The year may be divided in to four seasons. Winter season from December to February is followed by pre-monsoon or summer season of thunderstorms till May. Southwest monsoon season starts from the beginning of June and lasts till mid-October. The period of mid-October and November is of post monsoon season.

Areas in the state under each climatic pattern based on Koppen's classification are shown in Fig. 2. This broad classification is based on mean annual and monthly values of precipitation in centimeters and temperature in degree celsius (^{0}C). Most of the districts of the state viz. Lawangtlai, Aizwal, Mamit, Kolasib, central and western part of Lunglei and Serchhip come under the climate type: Subtropical monsoon with mild and dry winter, hot summer (Cwa). The hilly districts along the eastern border of the state viz. Champhai, Chhimtuipui and small eastern part of Serchhip and Lunglei districts come under climate type: Tropical upland, mild and dry winter, short warm summer (Cwb).

Sea level Pressure and Wind

The seasonal variation in atmospheric pressure over the state occurs in a systematic way with a maximum in the winter and a minimum in the southwest monsoon season. The pressure gradient over the state is generally weak except during post monsoon and winter months. The pressure is slightly low over the southern portion of the state in the mornings while it is even over the entire state in the evenings. The pressure increases after withdrawal of the monsoon however the trend remains the same as in monsoon months.

The winds are generally light with some slight strengthening in force during latter part of summer and southwest monsoon season. Sometimes winds become strong due to dominant convective motion over hilly terrains. Winds are mainly easterly in the mornings while they are westerly in the evenings throughout the year. Westerly and southwesterly components are seen during the pre-monsoon season and early monsoon season in the mornings, whereas, in the monsoon season a southwesterly component is also seen in the evenings. As the pressure becomes low over plain areas (mostly western part of the state) and high over hilly terrains during pre-monsoon and southwest monsoon seasons so that winds become moderate to strong.

Pressure begins to change from October to January and wind pattern also changes. Table I gives the monthly mean wind speed in kilometer per hour and predominant wind direction in the morning and evening for Aizwal observatory in the state.

Temperature

Table II gives the mean maximum and mean minimum temperatures at Aizwal observatory of the state. The spatial distribution of mean maximum temperature for the representative months of the four seasons of the year is depicted in Fig. 2(a,b,c,d).

The temperatures decrease from west to east with elevation. In general, pre-monsoon and southwest monsoon seasons constitute the warmest part of the year. The maximum temperature begins to rise from the middle of February till April or May when it reaches maximum, thereafter it remains slightly less or equal till September. The temperature varies from place to place according to topography of the state. During May to August mean maximum temperature is about 30^0C in extreme western and northwestern plain part of the state, while in the hilly part of the state, it is about 25^0C and in the high elevated places mostly in eastern part it is even 3^0 to 5^0C lower. During May, the maximum temperature ranges from 21^0 to 30^0C as shown in Fig. 2(a). In July, the temperature pattern (Fig. 2(b)) is quite similar to that of May with slightly less temperature. From Fig. 2(c) it is observed that the mean maximum temperature of October ranges between 20^0C and 28^0C, while in January it ranges between 15^0C and 25^0C as shown in Fig. 2(d). The temperatures are generally higher in western part than central and eastern regions of the state.

The spatial distribution of the mean minimum temperature for representative months of the four seasons of a year is depicted in Fig. 3(a,b,c,d).

In the month of January the minima of minimum temperature is observed over northeastern and hilly parts of the state. It is observed that mean minimum temperature of January ranges between 5^0C and 12^0C (Fig. 3(a)). From Fig. 3(b), 3(c) and 3(d), it is observed that the mean minimum temperature of April ranges between 13^0C and 21^0C, in July it ranges from 16^0 to 22^0C, while in October it ranges between 14^0C and 21^0C. The minimum temperature is generally high in western and northwestern parts and low in the hilly terrains of the remaining parts of the state.

The highest maximum temperature and the lowest minimum temperature ever recorded over the state are depicted in Fig. 4 and 5. The highest maximum temperature ranges between 35^0C to 40^0C over all the state except eastern hilly part of the state where it is less than 35^0C. The lowest minimum temperature in the northwestern part is about 3^0 -6^0C and about 0^0C in hilly terrain in the eastern region of the state.

Humidity

Table III gives the mean relative humidity at 0830 and 1730 HRS IST for Aizwal observatory in the state.

The atmosphere over the state is generally much humid throughout the year especially in the mornings except during winter and earlier part of summer season when humidity is the least. As such there is not much diurnal variation between the mornings and afternoons.

Relative humidity is the highest during the period June to October when it is about 85%. During winter and summer months the humidity is the lowest at around 55% to 75% being lower during the afternoons.

Cloudiness

Table IV and IV (a) give the mean monthly and total cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 HRS IST respectively.

There is cloudiness almost throughout the year. During the period June to September the skies are heavily clouded to overcast. On an average the skies are overcast for 12 to 21 days during this period more so in the afternoons. The cloudiness decreases from November month and the skies are clear at an average around 14 to 21 days during November to March.

Rainfall

Table V gives the district wise and state wise normals for monthly and annual rainfall and number of rainy days (i.e. days with rainfall of 2.5 mm or more). Fig. 6 and Fig. 6 (a to d) depict the spatial distribution of the annual and seasonal rainfall for the four seasons, viz. winter, pre-monsoon, southwest monsoon and post monsoon over the state respectively.

The rainfall varies place to place in the state due to variation in elevation and topography within the state. There is good rainfall all over the state. In general, the rainfall is comparatively less in northeastern part of the state Fig. (6). The total annual rainfall for the state as a whole is 2577.8 mm and total annual number of rainy days are 127. Aizwal district receives the maximum amount of rainfall (2749.1 mm) in a year while Champhai district receives the minimum amount of rainfall (2191.8 mm). The pattern of spatial distribution of rainfall over the state during the southwest monsoon (Fig. 6(c)) and pre-monsoon season (Fig. 6(b)) generally more or less resembles to that of the spatial distribution of the annual rainfall (Fig.6). It is observed that during the post monsoon season (Fig. 6(d)) the rainfall is more in the central and northeastern part of the state.

The southwest monsoon season is main rainy season over the state. Of the total annual rainfall, about 65% is received in the southwest monsoon season. State also receives significant amount of rainfall about 22% during the pre-monsoon season (March to May) and about 11% in post monsoon season (October to November), and 2% is received during the winter season (December to February).

The percentage of seasonal number of rainy days with respect to the annual number of rainy days is 65% for the southwest monsoon season, 20% for the pre-monsoon season, 12% for the post monsoon season and 3% for the winter season.

The southwest monsoon sets in by the first week of June over the entire state. June, July and August are the rainiest months accounting 51% of the annual rainfall with accounting 17% of the annual for each month. The number of rainy days during the southwest monsoon season ranges from 19 to 22 with a maximum of 22 in July and August.

The withdrawal of the southwest monsoon begins by the first week of October and completely withdraws from the state by the middle of this month.

The most common rain giving systems over the state are depressions and cyclones originating in the Bay of Bengal and low pressure with thunderstorms during pre-monsoon and post monsoon seasons.

The occasional winter rains accounting for around 2% of the annual rainfall and which is very vital for agriculture occurs in association with the induced lows arising due to the passage of western disturbances moving east over the region or nearby the region. The rainfall of about 22% of the annual received in the pre-monsoon months is basically due to thunderstorm activity.

The features of rainfall described above are also evident from Fig. 7(f), which shows the annual and seasonal rainfall for the individual districts as well as for the state and provides a measure for comparison of seasonal rainfall with the annual for both district-wise and state-wise rainfall.

Table VI gives the monthly and annual rainfall for river catchment of Mizoram state. All rivers flowing in Mizoram state viz. Tuivawl, Tuvai, Tuirini, Tlawng, Tut and Teirei flowing northwards into the Barak river and Mat, Tuichang, Khawchhaktuipui, Tlau and Chhimtuipui or Koldoyne flowing southwards of Mizoram which covers all the districts, are part of catchment No. 326. The annual rainfall of this river catchment is shown in Fig. 8. Table VI shows that part of catchment No. 326 formed by these rivers which covers the Mizoram state receives annual rainfall of 2577.8 mm with 127 rainy days.

Rainfall Variability

The spatial distribution of variation of annual rainfall over Mizoram is depicted in Fig. 9. Coefficient of Variation (CV) which is expressed as percentage is defined as:

$$C.V. = \frac{\text{Standard deviation } (\sigma)}{\text{Normal } (N)} \times 100$$

It is observed from Fig. 9 that the values of CV of annual rainfall range between 3.6% and 38.0% over Mizoram state.

The spatial distribution of CV of seasonal rainfall over Mizoram is shown in Fig. 9(a), 9(b), 9(c) and 9(d) for the seasons: pre-monsoon season (March to May), southwest monsoon season (June to September), post monsoon season (October and November) and the winter season (December to February) respectively.

It is observed that the values of CV in the pre-monsoon season range between 12.3% and 54.5% (Fig. 9(a)). The regions in the central and some western part of Mizoram exhibit the highest variability with values of CV about 50% while the rest of the state exhibit the lower CV of about 30% except the south-eastern most tip where CV is less than 20%.

During the southwest monsoon season the rainfall variability is low with CV ranging between 4.0% and 48.7% (Fig. 9(b)). The rainfall variability in the state during this season shows a less CV at an average less than 30% except the extreme northwest and southeast tip of the state where rainfall variability is slightly higher at an average about 40%.

During the post monsoon season the values of CV range between 0.9% and 109.8%. Fig. 9(c) exhibits a variability of 30% to 60% in almost areas of the state, while small portions in the northwestern and northeastern region have high CV value more than 60%. Small portion in central and eastern part has low CV value less than 30%.

During the winter season the values of CV show a steep gradient with range between 34.7% and 167.0% (Fig. 9(d)). The rainfall variability increases from the northeastern part of the state to the southwestern parts in a very systematic way during this season. It is 60% to 90% in the northeastern portion, 90% to 120% in the central, northwestern and southeastern portions of the state. However, it is more than 120% in the southwestern portion of the state.

Fig. 9 shows that state has low variability i.e. 3.6% to 38% in annual rainfall. As the variability of annual rainfall and rainfall during the pre-monsoon and southwest monsoon seasons over Mizoram is relatively low and

as the variability in the rainfall for the other seasons is very high, it is observed that the contribution of the pre-monsoon and southwest monsoon season's rainfall to the annual rainfall is more over the state.

Droughts:

Meteorological drought over an area or a place may be defined as a situation when the annual rainfall over the area or place is less than 75% of the normal. It is classified as "Moderate drought" if the rainfall deficit is between 25% and 50% and "Severe drought" when it is more than 50%. Areas where frequency of drought as defined above is more than 20% of the years examined, such areas 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 satisfies the criteria for "drought areas" or "chronically drought affected areas".

Following districts of the state were affected by drought during some year or the other during the period 1951-2000. The details of year wise occurrence of drought over the district during the 50-year period of 1951-2000 are given below. The figures within the brackets against each district indicate the drought year during the 50-year period when these districts were affected by drought.

Aizwal(1961), Champhai(1994), Lawngtlai(1994), Lunglei(1957&1994)

No district in the state experienced severe drought condition during this period. Severity of drought not only depends upon the order of the 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 year may not be as high as in a single year. However, there is no district (s) in this state with drought in successive years.

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

There were no drought conditions in the state in the following years: 1951 to 1956, 1958 to 1960, 1962 to 1993 and 1995 to 2000.

Excessive Rainfall:

Rainfall sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall regions. An annual rainfall of 125% or more of the normal is considered as excessive rainfall.

Fig. 11 shows the percentage frequency of excessive rainfall years and successive years of excessive rainfall during the period 1951-2000. It is seen from the figure that the frequency of excessive rainfall is generally higher in the central region of the state.

The following table (i) gives the district wise excessive rainfall years and the highest annual rainfall (expressed as percentage of normal) with the years of occurrence.

. **Table (i)**

S.No.	District	Years of excessive rainfall	Highest amount of Rainfall in cm	Rainfall in % to normal	Year
1.	Aizwal	1952, 1953, 1954, 1956	574.6	209%	1953
2.	Champhai	1988	287.1	131%	1988
3.	Chhimptuipui	Data Not Available			
4.	Kolasib	1952	367.6	138%	1952
5.	Lawngtlai	NIL	301.8	118%	1991
6.	Lunglei	1951 , 2000	370.8	136%	2000
7.	Mamit	Data Not Available			
8.	Serchhip	Data Not Available			

From the above table, it is seen that during the 50-year period 1951-2000, there were 7 years in which some districts or the other in the state recorded excessive rainfall. In the year 1953, Aizwal district received the highest excessive rainfall at about 209% of the annual normal rainfall with maximum number of excessive rainfall years (4) while three remaining districts experienced excessive rainfall for one or two years. There is successive years (1952- 1953- 1954) of excessive rainfall in only Aizwal district.

The heaviest one-day rainfall on record at any station in the state was 339.0 mm at Kolasib town on 17 May 1995 in Kolasib district.

Cyclonic storms and depressions

Table VII depicts the total number of storms/depressions, which affected the state during the period 1891-2012. The cyclonic storms and depressions that affect India mostly originate and/or intensify over the Bay of Bengal, mainly during the months of April to November. They usually travel northwestwards or westwards and cross the east coast of India. During the course of their movement, they sometimes turn or recurve towards north or northeast. This point of turning or recurving progressively shifts westwards till September. In general, storms and depressions weaken on entering land. Mizoram though an inland state, the coast is about 250 km away. The state therefore does not experience the full fury of severe storms/depressions like coastal regions especially in

the post monsoon months. In association with these systems, heavy to very heavy rainfall occurs over the affected districts. In May and September to November months these disturbances sometimes recurve while still out in Bay of Bengal. Hence, some of them cross the Bangladesh coast and travel inland, affecting the weather of the state.

During the months from January to March and July-August the state was not affected by Bay storms/depressions even on a single occasion during the period 1891 to 2012, but during the remaining months, it was affected 39 times. The number of storms/depressions that affected the state in May and June was 7 and 3 respectively, while their frequency is more in post monsoon season, the maximum number being 12 in the month of October.

Other Weather Phenomena

(a) Thunderstorms and Dust storms

Convective activity is essential for the occurrence of thunderstorms and dust storms. With the advance of the summer, thunder activity becomes pronounced due to non-uniform heating of the land and moisture in the state as orographic factor plays a dominant role for it. When the moisture in the atmosphere is insufficient, dry thunderstorms or dust storms occur during the pre-monsoon season. The thunderstorms generally occur throughout the year. The maximum number of thunderstorms occurs in pre-monsoon months and September to October. Thunderstorm activity is the least and minimum in December and January. During late September and winter season, the state may experience thunderstorm activity resulting from low-pressure areas induced due to eastward moving upper air disturbances known as “Western Disturbances”. Hailstorms occasionally occur in the state during March and April. Squalls occur rather rarely in the state, mainly during the pre-monsoon months. During pre-monsoon season occasional dust storm is rarely experienced in western region of the state.

(b) Fog

Fog is experienced at hilly terrains during southwest monsoon, post monsoon and winter months while in the plain region i.e. western part it occurs only in winter months. When the air is still moist and is easily cooled below the dew point while rising over high elevations. Favourable conditions for formation of radiation fog such as light to calm wind, clear skies, low temperatures etc., do exist after withdrawal of the monsoon till March, their frequency of maximum occurrence being during the month of September and October.

(c) Earthquakes

Mizoram state is prone to seismic activity and comes under seismic zone V. Details of earthquakes of intensity 5.0 or more at Richter scale having epicenter in the state are given in table- VIII. The state has experienced 11 earthquakes under moderate and high intensity category during the period of 1862-2012. Moderate to heavy damage of property and human life occurred due to events of the earthquakes in the state as well as neighbouring regions. Mizoram state has experienced an earthquakes of maximum intensity of 6.0 at Richter scale having epicenter at 24º N and 93º E in July 1949 and at 22º 12' N and 93º 12' E in August 1920.

TABLE – I
MEAN WIND SPEED IN kmph AND PREDOMINANT WIND DIRECTION
MIZORAM

STATION			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Aizwal		a	7.1	6.0	7.7	11.0	9.6	9.3	10.4	8.5	6.6	6.6	5.8	5.1	7.8
		m	E	E	E/W/SW	W/E/SW	E/W/S	E/SW/C	E	E	E	E	E	E	
		e	W	W	W	W	W	SW/W	SW/W	SW/W	W	W	W	W	

a Mean Wind Speed in km per hour
m Predominant wind direction in the morning
e Predominant wind direction in the evening
C Calm
Var Variable

TABLE - II
MIZORAM
MEAN DAILY MAXIMUM AND MEAN DAILY MINIMUM TEMPERATURE (°C)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Aizwal	Max	20.5	22	25.3	27.2	26.6	25.4	25.3	25.6	25.8	24.6	22.7	21.3	24.4
	Min	11.4	13.5	15.6	17.9	18.6	19.2	19.3	19.2	19.5	18.1	15.1	12.6	16.7

TABLE III
MEAN RELATIVE HUMIDITY
MIZORAM

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Aizwal	M	61	55	54	62	76	84	85	85	84	87	75	67	73
	E	61	57	51	56	72	84	85	86	85	88	76	70	73

M : MORNING E : EVENING

TABLE IV

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

MIZORAM

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Aizwal	a	20	18	21	12	5	2	2	2	4	3	14	15	118
	b	2	2	3	5	8	15	18	18	12	11	4	3	101
	c	1.5	1.9	2.4	3.1	4.7	6.5	6.9	6.7	6.1	5.1	2.4	1.9	4.1

TABLE IV (A)

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

MIZORAM

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Aizwal	a	17	14	18	8	5	3	2	1	3	2	14	16	103
	b	1	2	3	7	7	17	20	21	19	13	2	3	115
	c	1.5	2.1	2.3	4.1	4.4	6.7	7.1	6.9	6.6	5.4	2.3	1.8	4.3

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE V

MEAN RAINFALL AND NUMBER OF RAINY DAYS

MIZORAM

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Aizwal		a	13.4	33.5	116.2	186.2	357.7	444.5	431.1	470.5	376.5	240.4	62.5	16.6	2749.1
		b	1.0	2.2	5.4	8.5	14.5	19.7	20.6	22.1	18.7	11.6	3.0	0.8	128.1
Kolasib		a	13.4	41.7	128.0	184.1	318.6	436.7	435.2	454.2	370.8	222.1	46.2	13.1	2664.1
		b	1.5	3.0	6.3	9.8	15.3	20.8	21.7	22.8	18.8	11.1	2.2	0.6	133.9
Lawngtlai		a	8.4	27.4	66.5	123.3	319.7	437.7	493.8	408.5	365.8	231.3	65.9	9.1	2557.4
		b	0.8	1.1	3.2	6.3	11.5	19.6	24.0	21.5	19.8	12.5	2.9	0.6	123.8
Lunglei		a	5.5	21.8	87.3	115.8	309.8	457.5	514.0	481.8	410.7	248.1	65.9	8.5	2726.7
		b	0.5	1.2	4.4	6.3	12.3	20.0	22.9	22.4	19.2	11.3	3.1	0.4	124.0
Champhai		a	13.9	23.0	86.4	124.7	254.1	351.5	372.4	341.3	306.7	227.7	66.4	23.7	2191.8
		b	1.1	2.0	4.8	7.4	12.5	19.0	22.4	21.4	17.7	12.8	3.5	1.0	125.6
State Mean		**a**	**10.9**	**29.5**	**96.9**	**146.8**	**312.0**	**425.6**	**449.3**	**431.3**	**366.1**	**233.9**	**61.4**	**14.2**	**2577.9**
		b	**1.0**	**1.9**	**4.8**	**7.7**	**13.2**	**19.8**	**22.3**	**22.0**	**18.8**	**11.9**	**2.9**	**0.7**	**127.0**

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE-VI

MEAN RAINFALL(mm) OVER DIFFERENT RIVER CATCHMENTS OF MIZORAM STATE

Sr.No	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1	**Streams of Assam, Tripura , Manipur,Mizoram, Meghalaya and Nagaland flowing into the Bay of Bengal. (catchment No.326)**												
	Districts/Parts of districts of Mizoram within this catchment:- **AIZWAL, KOLASIB, CHAMPHAI, LAWNGTLAI, LUNGLEI, MAMIT, SERCHHIP, CHHIMTUIPUI.**												
a	10.9	29.5	96.9	146.8	312.0	425.6	449.3	431.3	366.1	233.9	61.4	14.2	2577.9
b	1.0	1.9	4.8	7.7	13.2	19.8	22.3	22.0	18.8	11.9	2.9	0.7	127.0

a : Normal Rainfall in mm

b : Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

TABLE – VII

STORMS AND DEPRESSIONS AFFECTING MIZORAM STATE

DURING 1891 – 2012

MONTH	*NO. OF STORMS/ DEPRESSIONS*	*MONTH*	*NO. OF STORMS/ DEPRESSIONS*	*MONTH*	*NO. OF STORMS/ DEPRESSIONS*
January	NIL	May	7	September	2
February	NIL	June	3	October	12
March	NIL	July	NIL	November	9
April	2	August	NIL	December	4
				Total	**39**

TABLE VIII

DETAILS OF EARTHQUAKES OF INTENSITY OF 5.0 OR MORE AT RICHTER SCALE HAVING EPICENTRE WITHIN MIZORAM STATE DURING YEARS 1862-2012

MONTHS	YEARS	FREQUENCY	EARTHQUAKE OF HIGHEST INTENSITY			EPICENTRE			
			INTENSITY AT RICHTER SCALE	DEPTH IN km	YEAR	LAT - N		LONG - E	
						DEG	MIN	DEG	MIN
JANUARY	1969, 2008	2	5.2	49.0	1969	22	59	92	24
FEBRUARY	1986	1	5.2	7.0	1986	23	52	93	0
MARCH	1964	1	5.0	94.0	1964	23	28	94	23
APRIL									
MAY									
JUNE									
JULY	1949, 2003	2	6.0		1949	24	0	93	0
AUGUST	1920	1	6.0		1920	22	12	93	12
SEPTEMBER									
OCTOBER	1977	1	5.2		1977	23	28	93	20
NOVEMBER	1997	1	5.9	54.0	1997	22	12	92	42
DECEMBER	1977, 2004	2	5.3	35.0	2004	24	51	92	36
TOTAL		**11**							

AIZWAL DISTRICT

Aizwal district has most hilly terrain and deep valleys. There is an average elevation of about 1100 metres and peak height of hills about 1900 metres above mean sea level in the district. The climate of this district is characterized by cold in winter, mild hot in summer and high humidity during the monsoon season. The year may be divided into four seasons. Winter season from December to February is followed by summer (pre-monsoon) season of thunderstorms from March to May. Southwest monsoon season starts from the beginning of June and lasts till mid-October. This is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for 5 raingauge stations for the period ranging from 10 to 30 years. The altitude of the raingauge stations varies from 400 m to 1500 m. The details of rainfall at these stations and for the district as a whole are given in Table 1 and 2. The average annual rainfall in the district is 2749.1 mm. The variation in the annual rainfall from year to year is large. On account of hilly nature of the terrain, the rainfall varies from place to place in the district. During the monsoon season (June to September) the district receives rainfall about 63% of the annual rainfall. The pre-monsoon months March to May contribute considerable rainfall about 24% of the annual rainfall. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 209% of the normal occurred in year 1953 while the lowest annual rainfall which was 73% of the normal occurred in 1961. In this fifty year period there was one year in which the annual rainfall in the district was less than 80% of the normal. It is seen from Table 2 that the annual rainfall in the district was between 2201 mm and 3300 mm in 19 years out of 24.

On an average there are 128 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 115 at Aizwal observatory to 147 at Sialsuk. The heaviest rainfall recorded in 24 hours at any station in the district was 281.0 mm at Sialsuk on 17 May 1995.

TEMPERATURE

There are two meteorological observatories in the district, one at Aizwal, at an altitude of 950 m and other at Lengpui with an altitude of 428 m. Temperature and other meteorological conditions vary from place to place in the district depending on its elevations and topography. Data of Lengpui observatory is not available, so the description which follows is based on the records of meteorological parameters recorded at Aizwal observatory. Both day and night temperatures begin to decrease rapidly from the middle of November. January is the coldest month with the mean maximum temperature at 20.5°C and mean minimum temperature at 11.4°C.

During the cold season, the minimum temperature may go down below 5°C on individual days. The temperatures begin to rise from the end of February. April and May are the warmest months with mean maximum temperature about 26.9°C and mean minimum temperature about 18.3°C. During the southwest monsoon season the day temperatures are nearly equal or a little low as during the hot season however the night temperatures are higher than in summer months. On individual days during summer season maximum temperature reaches up to 33°C. The temperatures may be 4°-6°C lower at high elevated areas and 3°-4°C high in valleys or low altitudinal areas with reference to Aizwal town. The day and night temperatures decrease after withdrawal of the southwest monsoon. Consequent upon weather becomes gradually cool and pleasant in post monsoon season.

The highest maximum temperature ever recorded at Aizwal was 35.2°C on 07 April 1969 and the lowest minimum temperature ever recorded was 3.9°C on 08 January 1945 and 13 February 1950.

HUMIDITY

Relative humidity is high about 85% during the southwest monsoon and post monsoon seasons, and it reaches the highest in October being about 87%. The period from February to April is comparatively drier when relative humidity is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during May to October months, when number of cloudy days in a month gradually varies from 7 to 21. Sometimes hill-tops are enveloped with clouds. The cloudiness decreases from November. In the cold season skies are generally lightly clouded except on occasions when the district is affected by passing western disturbances in Assam and consequent upon short spells of cloudy weather occurs in the district. The cloudiness increases from April onwards. Afternoons are generally more clouded than the mornings.

WINDS

Winds are generally light with some slight strengthening in force during the period from March to August. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. Winds generally blow from west in the afternoon and east in the mornings throughout the year. During the southwest monsoon period winds are also southwesterly. Winds are also westerly and southerly in the morning during summer season.

SPECIAL WEATHER PHENOMENA

Some storms and depressions from the Bay of Bengal in the post monsoon season reach the neighbourhood of the district causing high winds and widespread heavy rain. During the cold season, western disturbances passing eastwards over the Assam cause short spells of cloudy weather and some rains in the district. Thunderstorms occur in the district throughout the year and their frequency being highest in March. Thunderstorms during summer season are sometimes accompanied with hails and squalls. Fog occurs over the areas of low elevation in the winter and post monsoon seasons, and over valleys and hilly terrain in the monsoon season.

Table 3, 4, 5 and 6 give the temperature and humidity, cloudiness, mean wind speed and predominant wind directions and special weather phenomena respectively for Aizwal observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
AIZWAL

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Aizwal	13	a	12.7	40.9	141.6	183.9	381.7	346.3	356.5	433.0	309.2	176.7	53.1	18.2	2453.8	119	71	170.0	16 Jun 1995
		b	1.0	2.3	5.7	8.1	14.3	18.7	20.6	22.7	18.6	10.6	3.2	0.9	126.7	(1995)	(1994)		
Aizwal (Obsy)	30	a	8.9	30.5	94.4	162.6	286.5	363.0	322.5	303.6	211.8	51.9	13.5	214.9	2149.8	113	93	236.0	30 Oct 1959
		b	0.6	2.3	5.1	8.3	13.0	18.0	19.4	16.2	10.1	2.5	0.7	115.1	115.1	(1952)	(1961)		
Neihbawi Farm	15	a	15.2	47.3	141.9	216.3	390.5	430.4	500.6	512.9	447.0	267.4	78.4	31.6	3079.5	159	76	197.0	06 Sep 1999
		b	1.2	2.6	5.2	9.5	14.5	20.0	21.8	22.2	20.4	13.1	3.5	1.3	135.3	(1999)	(1994)		
Sairang	10	a	14.8	17.1	87.0	172.8	320.6	356.8	298.1	397.6	332.1	224.1	46.8	7.0	2274.8	118	80	99.8	21 Aug 1952
		b	1.1	1.7	5.9	8.4	15.8	17.9	16.2	19.6	16.7	11.1	2.0	0.6	117.0	(1952)	(1957)		
Sialsuk	23	a	15.6	31.9	116.3	195.6	409.0	725.8	699.8	686.3	490.8	322.2	82.5	12.8	3788.6	172	70	281.0	17 May 1995
		b	1.2	2.1	5.3	8.3	15.1	23.8	25.7	26.5	21.6	13.2	3.6	0.7	147.1	(1952)	(1987)		
Aizwal (Disrict)		a	13.4	33.5	116.2	186.2	357.7	444.5	431.1	470.5	376.5	240.4	62.5	16.6	2749.1	209	73		
		b	1.0	2.2	5.4	8.5	14.5	19.7	20.6	22.1	18.7	11.6	3.0	0.8	128.1	(1953)	(1961)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. .
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
AIZWAL
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1901 – 2000	1	3901 – 4000	0
2001 – 2100	0	4001 – 4100	0
2101 – 2200	0	4101 – 4200	0
2201 – 2300	2	4201 – 4300	0
2301 – 2400	0	4301 – 4400	0
2401 – 2500	0	4401 – 4500	0
2501 – 2600	1	4501- 4600	0
2601 – 2700	2	4601 – 4700	0
2701 – 2800	5	4701 – 4800	1
2801 – 2900	3	4801 – 4900	0
2901 – 3000	2	4901 – 5000	0
3001 – 3100	1	5001 – 5100	0
3101 – 3200	0	5101 – 5200	0
3201 – 3300	3	5201 – 5300	0
3301 – 3400	0	5301 – 5400	0
3401 – 3500	0	5401 – 5500	0
3501 – 3600	0	5501 – 5600	0
3601 – 3700	0	5601 – 5700	0
3701 – 3800	0	5701 – 5800	1
3801 – 3900	2		

(Data available for 24 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(AIZWAL)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	20.5	11.4	25.0	08-01-1954	3.9	08-01-1945	61	61
February	22.0	13.5	27.8	19-02-1960	3.9	13-02-1950	55	57
March	25.3	15.6	32.1	31-03-1963	5.6	01-03-1947	54	51
April	27.2	17.9	35.2	07-04-1969	9.4	03-04-1963	62	56
May	26.6	18.6	33.1	01-05-1960	10.0	10-05-1961	76	72
June	25.4	19.2	31.1	20-06-1938	9.4	24-06-1944	84	84
July	25.3	19.3	30.6	10-07-1945	14.4	13-07-1941	85	85
August	25.6	19.2	29.7	02-08-1962	12.8	08-08-1946	85	86
September	25.8	19.5	30.4	18-09-1969	14.9	28-09-1963	84	85
October	24.6	18.1	29.3	07-10-1958	8.9	24-10-1947	87	88
November	22.7	15.1	29.2	09-11-1969	7.8	01-11-1960	75	76
December	21.3	12.6	27.2	02-12-1969	5.6	26-12-1947	67	70
Annual	24.4	16.7	35.2	07-04-1969	3.9	08-01-1945	73	73

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies
(AIZWAL)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	20	18	21	12	5	2	2	2	4	3	14	15	118
b	2	2	3	5	8	15	18	18	12	11	4	3	101
c	1.5	1.9	2.4	3.1	4.7	6.5	6.9	6.7	6.1	5.1	2.4	1.9	4.1
1730 HOURS IST													
a	17	14	18	8	5	3	2	1	3	2	14	16	103
b	1	2	3	7	7	17	20	21	19	13	2	3	115
c	1.5	2.1	2.3	4.1	4.4	6.7	7.1	6.9	6.6	5.4	2.3	1.8	4.3

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction
(AIZWAL)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	7.1	6.0	7.7	11.0	9.6	9.3	10.4	8.5	6.6	6.6	5.8	5.1	7.8
Direction in morning	E	E	E/W/SW	W/E/SW	E/W/S	E/SW/C	E	E	E	E	E	E	
Direction in evening	W	W	W	W	W	SW/W	SW/W	SW/W	W	W	W	W	

TABLE - 6
Special Weather Phenomena
(AIZWAL)

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.1	0.2	2.7	1.3	1.6	0.3	0.3	0.5	1.4	1.5	0.2	0.1	10.2
Hail	0.0	0.0	1.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6
Dust storm	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Fog	0.1	0.0	0.1	0.3	1.0	0.5	0.9	0.8	4.2	1.3	0.9	0.2	10.3
Squall	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

CHAMPHAI DISTRICT

Champhai is a hilly district with an average elevation of approximately 1600 metres and peak height about 1900 metres above mean sea level. The hill ranges are mostly spread from north to south in the district. The climate of this district is characterized by mild hot in summer, cold in winter and highly humid atmosphere. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season of thunderstorms and is followed by southwest monsoon season till mid-October. The southwest monsoon season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station at Champhai town for the period of 23 years. The details of rainfall at this station which may be considered as representative for the district as a whole are given in Table 1 and 2. The average annual rainfall in the district is 2191.8 mm. The variation in the annual rainfall from year to year is not large. On account of hilly nature of the terrain, the rainfall varies from place to place in the district. During the monsoon season (June to September) the district receives rainfall about 63% of the annual rainfall. The pre-monsoon months- March to May contribute a considerable rainfall of about 21% of the annual rainfall. July is the rainiest month with average rainfall of 372.4 mm. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 131% of the normal occurred in year 1988 while the lowest annual rainfall was 73% of the normal occurred in 1994. In this period there was one year in which the annual rainfall in the district was less than 80% of the normal. It is seen from Table 2 that annual rainfall in the district was between 1701 mm and 2700 mm in 17 years out of 19 for which whole year data is available. On an average there are 126 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at Champhai town was 200 mm on 17 May 1995.

TEMPERATURE

There is no meteorological observatory in the district. The description which follows is based on the records of meteorological parameters recorded at neighbouring observatory Aizwal at an altitude of 950 m. Temperature and other meteorological conditions may vary in different areas of the district depending on elevations and topography of the place. Champhai town is situated at an elevation of 1680 m. Both day and night temperatures begin to decrease rapidly from middle of November. January is the coldest month with mean maximum temperature of about 17°C and mean minimum temperature of about 8°C at Champhai town. During the cold season, the minimum temperature may go down below 2°C on individual days. The temperatures begin to rise rapidly from the end of February. April and May are the warmest months with mean maximum temperature at about 24°C and mean minimum at about 16°C. During summer season maximum temperature may go up to

31°C on individual days. The temperatures may be 1°- 2°C lower in high elevated areas and 4° - 6°C high in areas of low elevation with reference to Champhai town. During the southwest monsoon season the day temperatures are nearly equal or a little low as during the summer season, however the night temperatures are higher than in summer months. The day and night temperatures decrease after withdrawal of the southwest monsoon. Consequently, weather becomes gradually cool and pleasant during post monsoon season.

HUMIDITY

Relative humidity is high about 85% during the southwest monsoon and post monsoon seasons and it reaches the highest in October being about 87%. The period from February to April is comparatively drier when relative humidity is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and continue to remain cloudy till October. The hill-tops are frequently enveloped with clouds. The cloudiness decreases from November. In the winter season skies are generally lightly clouded except on occasions when the district is affected by passing western disturbances over Assam and consequent upon short spells of cloudy weather occurs in the district. The cloudiness increases from April onwards.

WINDS

Winds are generally light with some slight strengthening in force during the period from March to August. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. Winds generally blow from west in the afternoon and east in the mornings throughout the year. During the southwest monsoon period winds are also southwesterly. Winds are also westerly and southerly in the morning during summer season.

SPECIAL WEATHER PHENOMENA

Some of the storms and depressions originating from the Bay of Bengal in the post monsoon season reach the district causing high winds and widespread heavy rain. During the cold season western disturbances passing eastwards over the Assam and its neighbourhood cause short spells of cloudy weather and some rain in the district. Thunderstorms occur in the district throughout the year and their frequency being highest in March. Thunderstorms during the pre-monsoon season sometimes accompanied with hails and squalls. Fog occurs over the areas of low elevation in the winter and post monsoon seasons, and over valleys and hilly terrain in the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
CHAMPHAI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Champhai Town	13	a	13.9	23.0	86.4	124.7	254.1	351.5	372.4	341.3	306.7	227.7	66.4	23.7	2191.8	131	73	200.0	17 May 1995
		b	1.1	2.0	4.8	7.4	12.5	19.0	22.4	21.4	17.7	12.8	3.5	1.0	125.6	(1988)	(1994)		
Champhai (District)	13	a	13.9	23.0	86.4	124.7	254.1	351.5	372.4	341.3	306.7	227.7	66.4	23.7	2191.8	131	73		
		b	1.1	2.0	4.8	7.4	12.5	19.0	22.4	21.4	17.7	12.8	3.5	1.0	125.6	(1988)	(1994)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. .
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
CHAMPHAI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1601 - 1700	01	2301 - 2400	00
1701 - 1800	00	2401 - 2500	01
1801 - 1900	01	2501 - 2600	01
1901 - 2000	02	2601 - 2700	02
2001 - 2100	00	2701 - 2800	00
2101 - 2200	06	2801 - 2900	01
2201 - 2300	04		

(Data available for 19 years)

CHHIMTUIPUI DISTRICT

Chhimtuipui district lies in north-south running mountain ranges (up to an elevation of 2065 metres above mean sea level) with a small strip of low lying plain in the western part. The hill ranges are generally spread from north to south in the district. The climate of the district is characterized by mild hot in summer, cold in winter and humid in monsoon months. The western part of the district has a low elevation compared to the eastern hilly regions, the western region experiences slightly higher temperatures. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season of thunderstorms and is followed by southwest monsoon season till mid-October. This is followed by post monsoon season till November month.

RAINFALL

There is no raingauge station in the district. The description of rainfall for the district has been obtained by averaging the rainfall pattern of raingauge stations in the adjoining districts of Lunglei and Lawngtlai. The average annual rainfall in the district is approximately 2700 mm. On account of the hilly nature of the terrain, the rainfall varies from place to place in the district. During the monsoon season (June to September) the district receives rainfall about 65% of the annual rainfall. The pre-monsoon months (March to May) contribute considerable rainfall of about 25% of the annual rainfall. July is the rainiest month with a rainfall of approximately 500 mm. On an average there would be approximately 125 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

TEMPERATURE

There is no meteorological observatory in the district. The description which follows is based on the records of meteorological parameters recorded at neighbouring observatory Aizwal at an altitude of 950 m. Temperature and other meteorological conditions vary in the district depending on elevations and topography of the place. Chhimtuipui is a hilly town having an altitude of 1225 m. Both day and night temperatures begin to decrease from the middle of November. January is the coldest month with the mean maximum temperature about 19°C and mean minimum temperature about 10°C at Chhimtuipui town. During the cold season, the minimum temperature may go down below 4°C on individual days. The temperatures begin to rise rapidly from the middle of February. April and May are the warmest months with mean maximum temperature about 25°C and mean minimum about 18°C. On individual days the maximum temperature can go up to 32°C. The temperatures may be 4° - 5°C lower in high elevated areas and 2° -5°C high in areas of low elevation with reference to Chhimtuipui town. During the southwest monsoon season the day temperatures are nearly equal or

a little low as during the summer season, however, the night temperatures are little higher than in summer months. The day and night temperatures decrease after withdrawal of the southwest monsoon. Thereafter weather becomes gradually cool and pleasant in post monsoon season.

HUMIDITY

Relative humidity is high about 75% to 85 % during the southwest monsoon and post monsoon seasons The period from January to April is comparatively drier when relative humidity is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and continue to remain cloudy till October. The hill-tops are frequently enveloped with clouds. The cloudiness decreases from November. In the cold season skies are generally lightly clouded except on occasions when the district is affected by passing western disturbances over Assam and consequent upon short spells of cloudy weather occurs in the district. The cloudiness increases from April onwards.

WINDS

Winds are generally light with some slight strengthening in force during the period from March to August. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. Winds generally blow from west in the afternoon and east in mornings throughout the year. During the southwest monsoon period winds are also southwesterly. Winds are also westerly and southerly in the morning during summer season.

SPECIAL WEATHER PHENOMENA

Some of the storms and depressions originating from the Bay of Bengal in the post monsoon season reach the district causing high winds and widespread heavy rain. During the cold season western disturbances passing eastwards over the Assam and neighbourhood cause short spells of cloudy weather and some rain in the district. Thunderstorms occur in the district throughout the year and their frequency being highest in March. Thunderstorms during the pre-monsoon season sometimes accompanied with squalls and hails. Fog occurs over the areas of low elevation in the winter and post monsoon seasons, and over valleys and hilly terrain in the monsoon season.

KOLASIB DISTRICT

Kolasib has low lying plains, valleys and some hilly areas of elevation up to 1500 metres above mean sea level. The climate of this district is characterized by cold in winter, mild hot in summer, humid air and good rainfall during May to October months. The year may be divided into four seasons. Winter season from December to February is followed by summer (pre-monsoon) season of thunderstorms from March to May. Southwest monsoon season starts from the beginning of June and lasts till mid-October. The rest of October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for the period of 15 and 24 years. The details of 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 2664.1 mm. The variation in the annual rainfall from year to year is not large. On account of hilly nature of the terrain, the rainfall varies from place to place in the district. During the monsoon season (June to September) the district receives rainfall about 64% of the annual rainfall. The pre-monsoon months (March to May) contribute a significant rainfall of about 24% of the annual rainfall. August is the rainiest month with an average annual rainfall 454.2 mm. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 138% of the normal occurred in year 1952 while the lowest annual rainfall was 80% of the normal occurred in 1999. In this period there is no year in which the annual rainfall in the district was less than 80% of the normal. It is seen from Table 2 that annual rainfall in the district was between 2101 mm and 3200 mm in 20 years out of 22 for which whole year data is available. On an average there are 134 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at any station in the district was 339.0 mm at Kolasib on 17 May 1995.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district which follows is based on the records of meteorological data of neighbouring observatory Aizwal situated at an elevation of 950 m. Kolasib town is situated at an elevation of 722 m. Temperatures and other meteorological conditions vary in the district depending on its elevations and topography. Winter season commences by the end of November and both day and night temperatures begin to decrease rapidly. January is the coldest month with the mean maximum temperature about 22°C and a mean minimum temperature about 12°C at Kolasib town. During winter season, minimum temperature may go down to about 6°C on individual days. The temperatures begin to rise rapidly from the middle of February. May is the warmest month with mean maximum temperature about 28°C and mean minimum about 19°C. During the southwest monsoon season the day temperatures are

nearly equal or a little low as during the hot season, however, the night temperatures are slightly higher than in the summer months. On individual days during summer season the maximum temperature may go up to 34°C. The temperature may be 3° - 4°C lower in high elevated areas and 2° - 3°C high in areas of low elevation with reference to Kolasib town. The day and night temperatures decrease after withdrawal of the southwest monsoon. Thereafter weather becomes gradually cool and pleasant in post monsoon season.

HUMIDITY

Relative humidity is high about 80% during the southwest monsoon and post monsoon seasons and reaches its highest in October being about 85%. The period from January to April is comparatively drier when relative humidity is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and continue to remain cloudy till October. Sometimes the hill-tops are enveloped with clouds. The cloudiness decreases from November. In the cold season skies are generally lightly clouded except on occasions when the district is affected by passing western disturbances over Assam and consequent upon short spells of cloudy weather occurs in the district. The cloudiness increases from April onwards.

WINDS

Winds are generally light with some slight strengthening in force during the period from March to August. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. Winds generally blow from west in the afternoon and east in mornings throughout the year. During the southwest monsoon period winds are also southwesterly. Winds are also westerly and southerly in the morning during summer season.

SPECIAL WEATHER PHENOMENA

Some of the storms and depressions originating from the Bay of Bengal in the post monsoon season reach the district causing high winds and widespread heavy rain. During the cold season western disturbances passing eastwards over the Assam and neighbourhood cause short spells of cloudy weather and some rain in the district. Thunderstorms occur in the district throughout the year and their frequency being highest in March. Thunderstorms during the pre-monsoon season sometimes accompanied with hails and squalls. Fog occurs over the areas of low elevation in the winter and post monsoon seasons, and over valleys and hilly terrain during the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KOLASIB

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Bilkhawthlir	15	a	10.1	38.9	106.7	189.6	283.8	401.7	401.5	438.9	343.5	208.1	52.6	14.8	2490.2	119	72	142.0	17 May 1995
		b	1.4	3.3	6.7	10.1	15.0	21.2	21.8	23.5	19.0	10.5	2.3	0.7	135.5	(1993)	(1998)		
Kolasib	24	a	16.7	44.5	149.3	178.6	353.5	471.8	468.9	469.6	398.1	236.0	39.9	11.3	2838.2	148	77	339.0	17 May 1995
		b	1.6	2.8	5.8	9.5	15.5	20.4	21.7	22.2	18.7	11.8	2.1	0.4	132.5	(1997)	(1992)		
Kolasib (District)		a	13.4	41.7	128.0	184.1	318.6	436.7	435.2	454.2	370.8	222.1	46.2	13.1	2664.1	138	80		
		b	1.5	3.0	6.3	9.8	15.3	20.8	21.7	22.8	18.8	11.1	2.2	0.6	133.9	(1952)	(1999)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
KOLASIB
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
2101 – 2200	1	2901 – 3000	3
2201 – 2300	2	3001 – 3100	0
2301 – 2400	0	3101 – 3200	0
2401 – 2500	1	3201 – 3300	1
2501 – 2600	3	3301 – 3400	0
2601 – 2700	4	3401 – 3500	0
2701 – 2800	4	3501 – 3600	0
2801 – 2900	2	3601 – 3700	1

(Data available for 22 years)

LAWNGTLAI DISTRICT

Lawngtlai district is mostly hilly except with some strip of low lying plain areas along the western side of the Chamdur Valley. The district has an average elevation of about 700 metres and peak height about 1150 metres above mean sea level. The climate of this district is characterized by hot in summer, mild cold in winter and humid air. The year may be divided into four seasons. Winter season is from December to February followed by summer (pre-monsoon) season of thunderstorms till May. Southwest monsoon season starts from the beginning of June and continues till mid-October. The period of mid-October and November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station i.e. Lawngtlai for a period of 15 years. The details of rainfall at this station, which may be considered as representative for the district as a whole, are given in Tables 1 and 2. The average annual rainfall in the district is 2557.4 mm. The variation in the annual rainfall from year to year is not large. During the monsoon season (June to September) the district receives rainfall about 67% of the annual rainfall. The pre-monsoon months (March to May) contribute considerable rainfall of about 20% of the annual rainfall. July is the rainiest month with a rainfall of 493.8 mm. In the period 1986 to 2000, the highest annual rainfall amounting to 118% of the normal occurred in 1991 while the lowest annual rainfall was 72% of the normal occurred in 1994. In this period there were two years in which the annual rainfall in the district was less than 80% of the normal, but they were not consecutive. It is seen from Table 2 that the annual rainfall in the district was between 2001 mm and 3100 mm in 13 years out of 15. On an average there are 124 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at Lawngtlai was 296 mm on 19 May 1998.

TEMPERATURE

There is no meteorological observatory in the district. The description of the climate which follows is based on the records of meteorological parameters recorded at neighbouring observatory at Aizwal. Lawngtlai town is situated at an elevation of 897 m. Temperature and other meteorological conditions vary in areas of the district depending on elevations and topography of the place. Both day and night temperatures begin to decrease rapidly by the end of November. January is the coldest month with the mean maximum temperature about 21°C and mean minimum temperature about 12°C at Lawngtlai town. During the winter season, the minimum temperature may go down below 6°C on individual days. The temperatures begin to rise rapidly from the middle of February. April and May are the warmest months with mean maximum temperature at about 28°C and mean minimum at about 19°C. On individual days during summer season maximum temperature reaches up to 34C.

During the southwest monsoon season the day temperatures are nearly equal or a little low as during the hot season, however, the night temperatures are higher than in summer months. The temperature may be 1° – 2°C lower in high altitudinal areas and 2° -4°C high in areas of low elevation with reference to Lawngtlai town. The day and night temperatures decrease after withdrawal of the southwest monsoon. Consequently, the weather becomes gradually cool and pleasant in post monsoon season.

HUMIDITY

Relative humidity is high about 75% to 85 % during the southwest monsoon and post monsoon seasons The period from January to April is comparatively drier when relative humidity is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and continue to remain cloudy till October. The cloudiness decreases from November. In the cold season skies are generally lightly clouded except on occasions when the district is affected by passing western disturbances over Assam and consequent upon short spells of cloudy weather occurs. The cloudiness increases from April onwards.

WINDS

Winds are generally light with some slight strengthening in force during the period from March to August. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. Winds generally blow from west in the afternoon and east in the mornings throughout the year. During the southwest monsoon period winds are also southwesterly. Winds are also westerly and southerly in the morning during summer season.

SPECIAL WEATHER PHENOMENA

Some of the storms and depressions originating from the Bay of Bengal in the post monsoon season reach the district causing high winds and widespread heavy rain. During the cold season western disturbances passing eastwards over the Assam and neighbourhood cause short spells of cloudy weather and some rain in the district. Thunderstorms occur in the district throughout the year and their frequency being highest in March. Thunderstorms during the pre-monsoon season sometimes accompanied with squalls and hails. Fog occurs over the areas of low elevation in the winter and post monsoon seasons, and over valleys and hilly terrain in the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
LAWNGTLAI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Lawngtlai	15	a	8.4	27.4	66.5	123.3	319.7	437.7	493.8	408.5	365.8	231.3	65.9	9.1	2557.4	118	72	296.0	19 May 1998
		b	0.8	1.1	3.2	6.3	11.5	19.6	24.0	21.5	19.8	12.5	2.9	0.6	123.8	(1991)	(1994)		
Lawngtlai (District)		a	8.4	27.4	66.5	123.3	319.7	437.7	493.8	408.5	365.8	231.3	65.9	9.1	2557.4	118	72		
		b	0.8	1.1	3.2	6.3	11.5	19.6	24.0	21.5	19.8	12.5	2.9	0.6	123.8	(1991)	(1994)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
LAWNGTLAI
(Data 1986-2000)

Range in mm	No. of years	Range in mm	No. of years
1801 - 1900	01	2501 - 2600	00
1901 - 2000	01	2601 - 2700	02
2001 - 2100	00	2701 - 2800	03
2101 - 2200	00	2801 - 2900	00
2201 - 2300	00	2901 - 3000	02
2301 - 2400	01	3001 - 3100	01
2401 - 2500	04		

(Data available for 15 years)

LUNGLEI DISTRICT

Lunglei district has mostly hilly terrain and valleys of low elevation to its west. The altitude in the district varies from 20 metres to 1758 metres above mean sea level. The climate of the district is characterized by cold in winter, mild hot and pleasant in summer, humid atmosphere and abundant rainfall during the monsoon months. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer (pre-monsoon) season of thunderstorms from March to May. Southwest monsoon season starts from the beginning of June and lasts till mid-October. This is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for 4 raingauge stations for the period ranging from 13 to 26 years. The altitude of the raingauge stations vary from 21 m to 1128 m. The details of 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 2726.7 mm. The variation in the annual rainfall from year to year is not large. The rainfall varies from place to place in the district due to topographic variation. During the monsoon season (June to September) the district receives rainfall about 68% of the annual rainfall. The pre-monsoon months (March to May) contribute considerable rainfall of about 19% of the annual rainfall. July is the rainiest month with an average annual rainfall 514.0 mm. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 136% of the normal occurred in year 2000 while the lowest annual rainfall was 52% of the normal occurred in 1994. In this fifty year period there are three years in which the annual rainfall in the district was less than 80% of the normal and on one occasion such a low rainfall occurred in two consecutive years. It is seen from Table 2 that the annual rainfall in the district was between 2101 mm and 3300 mm in 15 years out of 21 for which whole year data is available. On an average there are 124 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 114 at Hnahthial to 143 at Lunglei / Sherkwan. The heaviest rainfall recorded in 24 hours at any station in the district was 335.0 mm at Hnahthial on 21 May 1998.

TEMPERATURE

There is no meteorological observatory in the district. The description of climate of the district, which follows, is based on meteorological data of neighbouring observatory Aizwal situated at an elevation of about 950 m. Lunglei town is situated at an elevation of 1160 m. Temperature and other meteorological conditions vary in different regions of the district depending on its elevations and topography. Both day and night temperatures begin to decrease rapidly from the middle of November. January is the coldest month with the mean maximum

temperature about 19°C and mean minimum temperature about 11°C at Lunglei town. During the winter season, the minimum temperature may go down to 5°C on individual days. The temperatures begin to rise rapidly from the end of February. April and May are the warmest months with mean maximum temperature about 26°C and mean minimum temperature about 17°C. During the southwest monsoon season the day temperatures are nearly equal or a little low as during the summer season, however the night temperatures are higher than those in the summer months. On individual days during summer season maximum temperature reaches upto 32°C. The temperatures may be 5°-7°C high in areas of low elevation and 2°-3°C lower over high altitudinal areas with reference to Lunglei town. The day and night temperatures decrease after the withdrawal of the southwest monsoon. The weather thereafter, becomes gradually cool and pleasant in post monsoon season.

HUMIDITY

Relative humidity is high about 80% during the southwest monsoon and post monsoon seasons. The period from January to April is comparatively drier when relative humidity is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and continue to remain cloudy till October. The hill-tops are frequently enveloped with clouds. The cloudiness decreases from November. In the cold season skies are generally lightly clouded except on occasions when the district is affected by passing western disturbances over Assam and consequent upon short spells of cloudy weather occurs in the district. The cloudiness increases from April onwards.

WINDS

Winds are generally light with some slight strengthening in force during the period from March to August. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. Winds generally blow from west in the afternoon and east in mornings throughout the year. During the southwest monsoon period winds are also southwesterly. Winds are also westerly and southerly in the morning during summer season.

SPECIAL WEATHER PHENOMENA

Some of the storms and depressions originating from the Bay of Bengal in the post monsoon season reach the district causing high winds and widespread heavy rain. During the cold season western disturbances

passing eastwards over the Assam and neighbourhood cause short spells of cloudy weather and some rain in the district. Thunderstorms occur in the district throughout the year and their frequency being highest in March. Thunderstorms during the pre-monsoon season sometimes accompanied with squalls and hails. Fog occurs over the areas of low elevation in the winter and post monsoon seasons, and over valleys and hilly terrain in the monsoon season.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
LUNGLEI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Demagiri / Tlabung	26	a	6.5	21.6	78.3	109.0	294.1	512.9	524.3	513.5	357.8	255.0	33.9	3.6	2710.5	141 (1956)	58 (1994)	253.0	26 May 2000
		b	0.5	1.2	3.9	5.8	12.5	19.6	22.2	22.9	17.7	11.5	2.3	0.2	120.3				
Hnahthial	15	a	4.5	20.7	79.7	108.2	293.9	270.6	343.9	338.8	338.2	212.1	41.7	6.5	2058.8	133 (1998)	42 (1994)	335.0	21 May 1998
		b	0.4	1.1	4.9	7.1	11.7	16.5	20.1	20.8	17.5	11.0	2.7	0.3	114.1				
Lunglei Hydro	13	a	2.8	25.4	100.6	107.1	263.6	444.5	565.2	470.2	469.9	220.1	122.8	11.7	2803.9	121 (1992)	65 (1997)	200.0	17 Nov 1988
		b	0.3	1.0	4.4	5.6	10.6	20.4	22.0	20.4	19.3	9.0	4.4	0.5	117.9				
Lunglei / Sherkwan	22	a	8.0	19.6	90.6	138.7	387.6	601.9	622.8	604.6	477.1	305.4	65.1	12.4	3333.8	167 (2000)	54 (1994)	192.0	23 Jun 1999
		b	0.7	1.7	4.5	6.5	14.3	23.4	27.2	25.5	22.2	13.8	3.1	0.6	143.5				
Lunglei (Disrict)		a	5.5	21.8	87.3	115.8	309.8	457.5	514.0	481.8	410.7	248.1	65.9	8.5	2726.7	136 (2000)	52 (1994)		
		b	0.5	1.2	4.4	6.3	12.3	20.0	22.9	22.4	19.2	11.3	3.1	0.4	124.0				

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. .
** Years of occurrence given in brackets.

TABLE - 2

Frequency of Annual Rainfall in the District

LUNGLEI

(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1401 – 1500	1	2601 – 2700	0
1501 – 1600	0	2701 – 2800	3
1601 – 1700	0	2801 – 2900	2
1701 – 1800	0	2901 – 3000	1
1801 – 1900	1	3001 – 3100	1
1901 – 2000	0	3101 – 3200	1
2001 – 2100	1	3201 – 3300	2
2101 – 2200	0	3301 – 3400	1
2201 – 2300	1	3401 – 3500	0
2301 – 2400	1	3501 – 3600	1
2401 – 2500	1	3601 – 3700	0
2501 – 2600	2	3701 – 3800	1

(Data available for 21 years)

MAMIT DISTRICT

Mamit district has areas of small and medium hills with gorges intervened by narrow valleys and rivers. The altitude in the district varies from 40 metres to 1485 metres above mean sea level. The climate of this district is characterized by cold in winter, mild hot in summer and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. The period of March to May is of summer (pre-monsoon) season associated with thunderstorms. This is followed by southwest monsoon season till mid-October. The period of mid-October and November is of post monsoon season.

RAINFALL

There is no raingauge station in the district. The description of rainfall for the district has been obtained by averaging the rainfall data recorded at the adjoining stations of Lunglei, Aizwal and Kolasib districts in Mizoram, Hailakandi, Karimganj districts in Assam and North Tripura states. The average annual rainfall in the district can be considered as 2500.0 mm. On account of the hilly nature of the terrain, the rainfall may vary from place to place in the district. During the monsoon season (June to September), the district receives rainfall about 60% of the annual rainfall. The pre-monsoon months (March to May) contribute considerable rainfall of about 25% of the annual rainfall. August is the rainiest month with an average rainfall of 400 mm.

On an average there are approximately 120 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

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TEMPERATURE

There is no meteorological observatory in the district. The description, which follows, is based on the records of meteorological parameters recorded at neighbouring observatory Aizwal. Mamit town is situated at an elevation of 900 m. Temperature and other meteorological conditions may vary in the district depending on elevations and topography of the place. Both day and night temperatures begin to decrease by the end of November. January is the coldest month with mean maximum temperature of about 21°C and mean minimum temperature of about 12°C at Mamit town. During the winter season, the minimum temperature may go down to 6°C on individual days. The temperatures begin to rise rapidly from the middle of February. May is the warmest month with mean maximum temperature of about 27°C and mean minimum of about 19°C. During the southwest monsoon season the day temperatures are nearly equal or a little low as during the summer season, however, the night temperatures are higher than in summer months. On individual days during summer season maximum temperature reaches up to 33°C. The temperatures may be 2° - 3°C lower at high elevated areas and 3°- 5°C

high at places of low elevation with reference to Mamit town. The day and night temperatures decrease after withdrawal of the southwest monsoon. Weather becomes gradually cool and pleasant in post monsoon season.

HUMIDITY

Relative humidity is high about 80% or more during the southwest monsoon and post monsoon seasons. The period from January to April is comparatively drier when relative humidity is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and continue to remain cloudy till October. Sometimes the hill-tops are enveloped with clouds. The cloudiness decreases from November. In the cold season skies are generally lightly clouded except on occasions when district is affected by passing western disturbances over Assam and consequent upon short spells of cloudy weather occurs in the district. The cloudiness increases from April onwards.

WINDS

Winds are generally light with some slight strengthening in force during the period from March to August. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. Winds generally blow from west in the afternoon and east in mornings throughout the year. During the southwest monsoon period winds are also southwesterly. Winds are also westerly and southerly in the morning during summer season.

SPECIAL WEATHER PHENOMENA

Some of the storms and depressions originating from the Bay of Bengal in the post monsoon season reach the district causing high winds and widespread heavy rain. During the cold season western disturbances passing eastwards over the Assam and neighbourhood cause short spells of cloudy weather and some rain in the district. Thunderstorms occur in the district throughout the year and their frequency being highest in March. Thunderstorms during the pre-monsoon season sometimes accompanied with hails and squalls. Fog occurs over the areas of low elevation in the winter and post monsoon seasons, and over valleys and hilly terrain in the monsoon season.

SERCHHIP DISTRICT

Serchhip district has plains, valleys and hilly terrain with elevations upto 1900 metres above mean sea level. The hill ranges are spread from north to south in this district. The climate of this district is characterized by mild hot and pleasant in summer, cold in winter and humid air throughout the year. The year may be divided into four seasons. Winter season is from December to February. This is followed by summer (pre-monsoon) season of thunderstorms from March to May. Southwest monsoon season starts from the beginning of June and lasts till mid-October. The period of mid-October and November is of post monsoon season.

RAINFALL

There is no raingauge station in the district. The description of rainfall for the district has been obtained by averaging the rainfall data recorded at the adjoining stations at Champhai Town, Sialsuk in Aizwal district and Lunglei Hydro in Lunglei district. The average annual rainfall in the district is about 3000 mm. On account of the hilly nature of the terrain more towards the east, the rainfall varies from place to place in the district. During the monsoon season (June to September) the district receives rainfall about 67% of the annual rainfall. The pre-monsoon months (March to May) contribute considerable rainfall of about 21% of the annual rainfall. June and July are the rainiest months with an average rainfall of about 500.0 mm.

On an average there are approximately 130 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district.

TEMPERATURE

There is no meteorological observatory in the district. The description, which follows, is based on the records of meteorological parameters recorded at neighbouring observatory Aizwal at an altitude of 950 m. Temperature and other meteorological conditions vary in the district depending on its elevations and topography. Serchhip town is situated at an elevation of 1280 m. Both day and night temperatures begin to decrease by the middle of November. January is the coldest month with the mean maximum temperature about 19°C and mean minimum temperature about 10°C at Serchhip town. During the cold season, the minimum temperature may go down below 3°C on individual days. The temperatures begin to rise rapidly from the end of February. April and May are the warmest months with mean maximum temperature about 25°C and mean minimum temperature about 17°C. During the southwest monsoon season the day temperatures are nearly equal or a little low as during the summer season, however, the night temperatures are higher than in summer months. On individual days during summer season, maximum temperature may go up to 32°C. The temperature may be 3 - 4°C lower

at high elevated areas and 4 - 6°C high in areas of low elevation with reference to Serchhip town. Day and night temperatures decrease after withdrawal of the southwest monsoon and weather becomes gradually cool and pleasant in post monsoon season.

HUMIDITY

Relative humidity is high about 80% during the southwest monsoon and post monsoon seasons. The period from January to April is comparatively drier when relative humidity is between 50% and 60%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season and continue to remain cloudy till October. The hill tops are frequently enveloped with clouds. The cloudiness decreases from November. In the cold season skies are generally lightly clouded except on occasions when the district is affected by passing western disturbances over Assam and when short spells of cloudy weather occurs. The cloudiness increases from April onwards.

WINDS

Winds are generally light with some slight strengthening in force during the period from March to August. As anabatic and katabatic winds prevail over hilly terrain due to convective motion and sometimes winds become strong. Winds generally blow from west in the afternoon and east in the mornings throughout the year. During the southwest monsoon period winds are also southwesterly. Winds are also westerly and southerly in the morning during summer season.

SPECIAL WEATHER PHENOMENA

Some of the storms and depressions originating from the Bay of Bengal in the post monsoon season reach the district causing high winds and widespread heavy rain. During the cold season western disturbances passing eastwards over the Assam and neighbourhood cause short spells of cloudy weather and some rain in the district. Thunderstorms occur in the district throughout the year and their frequency being highest in March. Thunderstorms during the pre-monsoon season sometimes accompanied with squalls and hails. Fog occurs over the areas of low elevation in the winter and post monsoon seasons, and over valleys and hilly terrain in the monsoon season.

CLIMATE OF TRIPURA

General Description

Tripura state is located in the northeastern region of India. The state lies approximately between latitude 22^0 56'N and 24^0 32'N and longitude $91^0$09'E and $92^0$10'E and covers an area of about 10492 Km^2. It is bordered by Bangladesh on the north, west, south and southeast, by Assam and Mizoram on the northeast.

Tripura is a land locked state and its aerial distance to Bay of Bengal is about 100 km. Tripura has small hills and low lying land with a numerous deep rivers and valleys. The hills of the state run from north to south and parallel to one another till they disappear in the plains of Sylhet in Bangladesh. The principal hill ranges are the Baramura-Deotamura ranges, Atharamura ranges, Langtari ranges, Sakhan ranges, and the Jampui hill ranges from the east. The highest peak of the state is known as Betling Shiv around 935 metres above mean sea level in the Jampui hill range. The hills are mostly of low elevation and are covered by thick forests.

Rivers and valleys cover about 40 per cent of the state's area. The rivers in the state of Tripura can be classified into two broad groups; 1) Rivers flowing towards the north viz. Khowai, Manu, Doloi, Deo, Dhalai, Langai and Juri, and 2) Rivers flowing towards the west viz. Gomati, Fenny, Muhuri and Haora (Saidra).

Rivers

Gomati is the largest river in the state. The river originates from Tirthamukh. The river receives a number of south-flowing streams and cuts across the ranges in a steep-sided valley from east to west before emerging out of the hills near Radhakishorepur.

Manu river has its origin in the mountainous region (Sakhan range) of the state. This river flows into a wide plain after running through mountainous regions. In the plain, the river flows slowly and has a winding course, flowing northward to Bangladesh via Kailashahar.

Khowai river originates from the eastern part of the Atharamura Hills. The river first flows towards northwest and then in the northward before entering Bangladesh at Balla in Sylhet district. The river further flows towards the east of Habiganj town and finally pours into the Meghna.

Haora (Saidra) river has its origin in Baramura hills situated in the central part of the state. The river then flows through the foothills. Finally, the river pours into the Padma, which is one of the most important rivers of Bangladesh.

The state has one forecasting centre (Meteorological Centre) at Agartala. Tripura state is a smaller part of one meteorological subdivision of Nagaland, Manipur, Mizoram and Tripura (NMMT). There are eight districts in the state:

S. No.	Name	S. No.	Name	S. No.	Name	S. No.	Name
1.	Dhalai	3.	Khowai	5.	Sepahijala	7.	Unakoti
2.	Gomati	4.	North Tripura	6.	South Tripura	8.	West Tripura

Climate

The climate of the state is generally cold in winter, hot in summer and monsoon period and humid throughout the year. The characteristics of climate are typically that of the hilly ranges and valleys region. It varies according to the topography from place to place. The state has a good amount of rainfall in the monsoon season and it also receives significant rainfall in April and May months.

Summer season starts by March and continues till May. Southwest monsoon season starts from the beginning of June and lasts till the middle of October. The period of mid-October and November is of post monsoon season which is most pleasant time of the year in the state. Winter sets in the beginning of December and continues till February.

Areas in the state under climate pattern based on Koppen's classification are shown in Fig. 2. This broad classification is based on mean annual and monthly values of rainfall in centimeters and temperatures in ºC. All districts of the state come under the climate type: Tropical monsoon, Hot, seasonally excessive rainfall (Am).

Sea level Pressure and Winds

Seasonal variation in atmospheric pressure over the state occurs in a systematic way with a maximum in the winter and a minimum in the southwest monsoon season. The pressure is slightly lower over the western portion of the state than over the eastern part throughout the year. The pressure gradient over the state is generally weak except during late summer (April-May). The pressure increases after the monsoon season however, the trend remains the same as in the monsoon months.

Winds are generally light, and blow mainly from the south direction throughout the year. The northerly component appears in the mornings during the late post monsoon season and continues till February, whereas in the winter season a westerly component is also seen in the evenings. As the pressure decreases from March to July, the winds become stronger.

October onwards, the change in the pressure and wind pattern to winter pattern commences. Table I gives the monthly mean wind speed in kilometer per hour and predominant wind direction in the morning and evening for observatory stations in the state.

Temperature

Table II gives the mean maximum and minimum temperatures at the observatory stations of 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 temperatures ever recorded on data up to 2010.

The spatial distribution of the mean maximum temperature for the representative months of the four seasons of the year is depicted in Fig. 2(a, b, c, d). May is the representative month of pre-monsoon season which is warm month of this season with mean maximum temperature about 32^0C in the plains, while the elevated places experience the temperature about 2^0C to 5^0C lower. During May, the mean maximum temperature ranges from 29^0C to 32.4^0C over the state, the values increasing westwards Fig. 2(a). Consequent upon mean maximum temperature of April month is the highest in a year as indicated in table II. During July, there is slight drop in mean maximum temperature with values ranging between 28^0C to 32^0C Fig. 2(b). The temperature pattern of October (Fig. 2(c)) is quite similar to that of July. The values of mean maximum temperature in October range between 27^0C to 31.4^0C with the values generally increasing westwards. From Fig. 2(d), it is seen that the mean maximum temperature of January ranges from 22^0C to 25.6^0C.

The spatial distribution of the mean minimum temperature for the representative months of the four seasons of the year is depicted in Fig. 3(a, b, c, d). January is the coldest month with mean minimum temperature about 10^0C. During this month the values range from 8^0C to 10^0C Fig. 3(a). It is seen from Fig. 3(b) that there is sharp increase in minimum temperature from January to April. During the month of April the mean minimum temperature is about 21.6^0C in the plains whereas the mean minimum in July or August is about 25^0C Fig. 3(c). Mean minimum temperature in the month of October is about 22.3^0C. In general the temperatures may be lower by 2^0C -4^0C over hilly areas in the state Fig. 3(d).

The temperatures start to rise from the middle of February. The day temperature reaches its peak in April, thereafter it remains equal or a little less till August. But night temperature is high in southwest monsoon

season and attains the maximum in August. Thus, the period of summer and southwest monsoon season is of the warmest period but moderate temperature is experienced over the elevated areas. The temperatures start to fall after withdrawal of the southwest monsoon season by about the middle of October when night temperatures show appreciable decrease. In October and November months the weather becomes cool and pleasant.

August is the warmest month with mean maximum about 32^0C and mean minimum about 25^0C. The highest maximum temperature and lowest minimum temperature ever recorded are depicted in Fig. 4 and Fig. 5 respectively. The highest maximum temperature ever recorded in the state is 42.2^0C on 01 May 1960 and 09 April 1960 at Agartala and Kailashahar observatories respectively. This temperature is higher than respective normal by 9.8^0C. The lowest minimum temperature ever recorded in the state is 2^0C at Agartala on 30 December 1972 which is lower than the respective normal by 9.4^0C.

The diurnal variation of temperature is large in the winter season when it is about 15^0C, while in the monsoon months it is less and around 7^0C to 8^0C.

Humidity

Table III gives the mean relative humidity at 0830 and 1730 HRS IST for observatory stations in the state.

It is generally highly humid throughout the year especially in the mornings except for months of February and April when it is the least. As such there is not much variation between the mornings and afternoons especially in the monsoon and post monsoon months.

The relative humidity is the highest during the period June to October when it is above 80%. It is the highest in September month. During the months of February to April, the relative humidity is low between 50% and 75%. It is the lowest in March when it is generally lower during the afternoons.

Cloudiness

Table IV and IV(a) give the mean monthly and total cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 HRS IST respectively.

There is cloudiness almost throughout the year. During the period of May to September the skies are heavily clouded to overcast. On an average the skies are overcast for 4 to 7 days during this period. By October the cloudiness decreases and at an average around 9 to 21 days the skies are clear during November to March.

Rainfall

Table V gives the districtwise and statewise mean monthly and annual rainfall and number of rainy days (i.e. days with rainfall of 2.5 mm or more). Fig. 6 and Fig. 6 (a to d) depict the spatial distribution of the annual and seasonal rainfall for the four seasons viz. winter, pre-monsoon, southwest monsoon and post monsoon respectively.

The rainfall varies with space in the state due to altitudinal variation from place to place and topography of the state. It may be said that there is good rainfall throughout the state. In general, the rainfall is more or less even throughout the state. It is seen from Table V that annual rainfall for the state as a whole is 243.2 cm and total number of rainy days in a year are 101. The pattern of spatial distribution of the rainfall over the state during the southwest monsoon season (Fig. 6(c)) and pre-monsoon season (Fig. 6(b)) generally resembles to that of the spatial distribution of the annual rainfall (Fig. 6). It is observed that annual rainfall is slightly more in North Tripura and South Tripura districts and slightly less in the West Tripura, Khowai and Gomati districts of the state.

The southwest monsoon season is the principal rainy season over the state. About 61% of the total annual rainfall is received in the southwest monsoon season, whereas 28% is received during the pre-monsoon season (March-May) and about 9% is received in the post monsoon season (October-November) and 2% in the winter season (December-February).

The percentage of seasonal number of rainy days with respect to the annual number of rainy days is 64% for the southwest monsoon season, 24% for the pre-monsoon season, 9% for the post-monsoon season and 3% for winter season.

The southwest monsoon sets in and covers the entire state by the first week of June. June and July are the rainiest months accounting for 36% of the annual rainfall with June accounting for 19% and July accounting for 17% of the annual rainfall. The number of rainy days during the southwest monsoon season ranges from 13 to 18 with a maximum of 18 in July.

The withdrawal of the southwest monsoon begins by the first week of October and completely withdraws from the state by the middle of the month.

The most common rain giving systems over the state are depressions and cyclones originating in the Bay of Bengal and low pressure associated with thunderstorms.

The occasional winter rain accounting for around 2% of the annual rainfall which is very vital for agriculture occurs in association with the induced lows arising due to the passage of western disturbances

moving eastward over the region. About 28% of the annual rainfall received in the pre-monsoon months is a good amount of rainfall due to convective activity i.e. occurrence of thunderstorms.

The features of rainfall described above are also evident from Fig. 7(g), which shows the annual and seasonal rainfall for the individual districts as well as for the state and provides a measure for comparison of seasonal rainfall with the annual for both district wise and state wise rainfall.

The annual rainfall of the river catchment No. 326 is shown in Fig. 8. Table VI gives the monthly and annual rainfall for part of river catchment No. 326 which covers Tripura state. Table VI shows that part of catchment No. 326 is formed by the rivers Gomati, Fenny, Muhuri, Haora, Manu, Deo, Doloi, Dhalai, Langai, Juri, Khowai etc. flowing in Tripura. The part of the catchment (all districts) receives an annual rainfall of 2432.2 mm with 101 rainy days.

Rainfall Variability

The spatial distribution of variation of annual rainfall over Tripura is depicted in Fig. 9. Coefficient of Variation (CV) which is expressed as percentage is defined as:

$$C.V. = \frac{\text{Standard deviation } (\sigma)}{\text{Normal } (N)} \times 100$$

It is observed from Fig. 9 that the values of CV of annual rainfall range between 4.9% and 32.9% over the entire state of Tripura. The variability is the highest in extreme southern parts of the state.

The spatial distribution of CV of seasonal rainfall over Tripura is shown in Fig. 9(a), 9(b), 9(c) and 9(d) for the seasons: pre-monsoon season (March to May), southwest monsoon season (June to September), post-monsoon season (October and November) and winter season (December to February) respectively.

It is observed that the values of CV range between 16.7% and 61.8% (Fig. 9(a)) in the pre-monsoon season. The southern and northeastern regions of Tripura exhibit the highest variability with values of CV exceeding 50% while the central and northwestern regions of the state exhibit the least CV of less than 30%.

During the southwest monsoon season the rainfall variability is low with CV ranging between 1.8% and 31.2% (Fig. 9(b)). The rainfall variability is some high in extreme south western area of the state with an average CV of about 30% during this season while in the remaining parts CV is at an average of less than 25%.

During the post monsoon season the values of CV range between 24.1% and 98.3% (Fig. 9(c)). The small portion in central part of the state exhibits lower variability less than 30%. Central and northeastern parts exhibit variability 30% to 60% while remaining parts of the state exhibit CV of above 60%.

During the winter season the values of CV show a steep gradient with range between 21.3% and 130.4% (Fig. 9(d)). The eastern region of the state exhibits lower variability i.e. less than 75% while the remaining parts of the state exhibit higher variability of about 90% to 120% or even higher.

The variability of annual rainfall over Tripura state ranges between 4.9% and 32.9% (Fig. 9). As the variability of annual rainfall and rainfall during the southwest monsoon season over Tripura is relatively low and nearly equal while variability during pre-monsoon season is some high. The variability of seasonal rainfall for the other seasons are very high, it may be said that the contribution of southwest monsoon season rainfall to the annual rainfall is more over the state.

Droughts:

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

Sepahijala district in the state during 1951-2000, which satisfies the criteria for “drought areas”, while no district in the state satisfies the criteria for “chronically drought affected areas”. Khowai district which experienced severe drought condition in the year 1955, when annual rainfall was 41% of the annual normal rainfall.

All districts of the state were affected by drought during some year or the other during the period 1951-2000. The details of year wise occurrence of drought over each district during this period are given below. The figures within the brackets against each district indicate the number of occasions during the 50 year period when these districts were affected by drought.

Dhalai (4), Gomati (6), Khowai (6), Sepahijala (7), Unakoti (2), North Tripura(1), South Tripura(8) and West Tripura(8)

Occurrence of drought conditions in successive years is not frequent in the state. However, individual district have had successive years of drought. Severity of drought not only depends upon the order of the 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 year may not be as high as in a single year.

The following table (i) depicts districtwise years of drought and successive drought during the 50 year period 1951-2000.

Table (i)

Sr. No.	Name of Affected districts	Years of Successive Drought	Drought	Data Available Years	Drought Years %
1.	Dhalai	1979, 1980	1957, 1972, 1979, 1980	37	10.8
2.	Gomati	NIL	1957,1962,1965,1967,1972, 1992.	42	14.3
3.	Khowai	NIL	1953, 1955, 1957, 1968, 1972, 1975	37	16.2
4.	North Tripura	NIL	1964	40	2.5
5.	Sepahijala	1969-1970	1962, 1969, 1970, 1979, 1992, 1994, 1996	34	20.6
6.	South Tripura	1957-1958, 1966-1967, 1980-1981	1957, 1958, 1966, 1967, 1972,1980, 1981, 1996	41	19.5
7.	Unakoti	NIL	1958, 1998	40	5.0
8.	West Tripura	1999-2000	1957, 1972, 1980, 1985, 1992, 1994, 1999, 2000	45	17.8

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

Incidence of widespread and fairly widespread drought over the state in any particular year was not common. However, 5 districts out of eight in the state experienced drought condition in the year 1972.

There were no drought conditions in the state in the following years: 1951, 1952, 1954, 1956, 1959 to 1961, 1963, 1964, 1971, 1973, 1974, 1976 to 1978, 1982 to 1984, 1986 to 1991, 1993, 1995 and 1997.

Excessive Rainfall:

Rainfall sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall regions. An annual rainfall of 125% or more of the normal is considered as excessive rainfall.

Fig. 11 shows the percentage frequency of excessive rainfall years and successive years of excessive rainfall during the period 1951-2000. It is seen from the figure that the frequency of excessive rainfall is generally higher in some central area of the state.

The following table (ii) gives the district wise excessive rainfall years and the highest annual rainfall (expressed as percentage of normal) with the years of occurrence.

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Table (ii)

S. No.	District	Years of excessive rainfall	Highest amount of Rainfall in cm	Rainfall in % to normal	Year
1.	Dhalai	1969, 1976, 1983, 1991, 1993, 1995, 1998, 2000.	378.2	154%	1993
2.	Gomati	1964, 1976, 1983, 1988, 1991, 1993.	322.3	145%	1976
3.	Khowai	1959, 1977, 1978, 1990, 1991, 1993.	372.0	163%	1990
4.	North Tripura	1968, 1977, 1993, 1995	408.7	156%	1995
5.	Sepahijala	1952, 1953, 1956, 1959, 1988, 1991.	398.3	167%	1988
6.	South Tripura	1988, 1990, 1991, 1993.	445.4	167%	1993
7.	Unakoti	1956, 1973, 1977, 1983, 1991, 1993.	399.7	156%	1993
8.	West Tripura	1956, 1977, 1978, 1988.	400.3	177%	1978

From the above table, it is seen that during the 50 year period 1951-2000, there were 19 years in which some districts or the other in the state recorded excessive rainfall. In the year 1978, West Tripura district has received highest excessive rainfall, 177% of the annual normal rainfall. In the year 1991and 1993 six districts of the state out of eight experienced excessive rainfall. Dhalai district experienced maximum number of excessive rainfall years (8). Gomati, Khowai, Sepahijala and Unakoti experienced six excessive rainfall years, while other three districts experienced excessive rainfall for four years. The successive years of excessive rainfall against each district are listed below:

Table (iii)

Successive years of Excessive Rainfall (Districtwise)

Sr. No.	Districts	Successive years of Excessive Rainfall
1.	Dhalai	NIL
2.	Gomati	NIL
3.	Khowai	1977-1978, 1990-1991
4.	North Tripura	NIL
5.	Sepahijala	1952-1953
6.	South Tripura	1990-1991
7.	Unakoti	NIL
8.	West Tripura	1977-1978

The heaviest one day rainfall on record at any station in the state was 480.0 mm on 29 April 1989 at Amarpur in Gomati district.

Cyclonic storms and depressions

Table VII depicts the total number of storms/depressions which affected the state during the period 1891-2012. The cyclonic storms and depressions which affect India, mostly originate and/or intensify over the Bay of Bengal, mainly during the months of May to December. They usually travel northwestwards or westwards and cross the east coast of India. During the course of their movement, they sometimes turn or recurve towards north or northeast and also affect the weather of the state. This point of turning or recurving progressively shifts westwards till September. In general, storms and depressions become weak on entering land. Tripura though an inland state, the coast is only about 100 km away. Generally this state does not experience the full fury of severe storms/depressions like the coastal regions especially in the post monsoon months. However, in association with these systems, heavy to very heavy rainfall occurs over the affected districts.

During the period of January to April and July to August, the state was not affected by Bay storms/depressions even on a single occasion since 1891 to 2012, but during the remaining months, it was affected 22 times. The minimum number of storms/depressions that affected the state in June and December was 1 each while the maximum number being 10 in the month of October. The storms/depressions during October and November generally form over the Bay of Bengal and some of them travel towards Tripura and other states in the Northeast.

Other Weather Phenomena

(a) Thunderstorms and Dust storms

Convective activity is essential for the occurrence of thunderstorms and dust storms. With the advance of the summer, thunder activity becomes pronounced due to unequal heating of the land and moisture in north eastern region. When the moisture in the atmosphere is insufficient, dry thunderstorms or dust storms occur. Thunderstorms occur throughout the year. Thunderstorms occurrence is significant during pre-monsoon and southwest monsoon seasons. Thunderstorm activity attains its maximum in April and May. During the winter season, the state may experience thunderstorm activity resulting from low pressure areas induced due to eastward moving upper air disturbances known as "Western Disturbances". Thunderstorm activity is the least and minimum in December. Hailstorms occur rather rarely in the state and they occasionally occur during the months of January to April. Squalls occasionally occur in the state, mainly during the pre-monsoon and southwest monsoon months and their maximum frequency is in May.

(b) Fog

Fog is experienced during the post monsoon and winter months, when the air is still moist and is easily cooled below the dew point while rising over high elevations. Favourable conditions for formation of radiation fog such as light or calm wind, clear skies, low temperatures etc., do exist after withdrawal of the monsoon till March and their frequency of occurrence is maximum during the months of December and January.

Earthquakes

Tripura state is prone to seismic activity and comes under seismic zone V. Details of earthquake of moderate and high intensity of 5.0 or more at Richter scale having epicenter in the state are given in Table VIII. The state experienced 3 earthquakes during the period 1862-2012. Moderate to heavy damage in property and human life occurred due to these events of the earthquakes in the state as well as in neighbouring regions. It is seen from Table VIII that the state experienced an earthquake having maximum intensity of 6.3 Richter scale in December 1950 at 24^0 latitude and $91^0$48' longitude.

TABLE - I

TRIPURA
MEAN WIND SPEED (Kmph) AND PREDOMINANT WIND DIRECTION

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Agartala(A)	a	2.3	3.3	5.4	7.2	5.8	6.0	6.4	5.0	3.8	2.5	2.1	1.9	4.3
	m	C/N/S	C/S	S	S	S	S	S	S/SE	S	C/S	C/N/NE	C/N	
	e	C	C/SW/N	C/S	S	S/C	S	S	S/C	C/S	C	C	C	
Kailashahar(A)	a	2.4	3.6	5.0	6.2	5.5	6.0	6.8	5.4	4.2	3.1	2.5	2.2	4.4
	m	C/S	C/S	S	S	S/C	S	S	S	S/C	C/S	C/S	C/S	
	e	C/W/NW	C/W/NW	C/NW/W	C/S	C/S	S	S	S/C	C/S	C/S	C	C	
State Mean		2.4	3.5	5.2	6.7	5.7	6.0	6.6	5.2	4.0	2.8	2.3	2.1	4.4

a: Mean Wind Speed in kms per hour
m: Predominant wind direction in the morning
e: Predominant wind direction in the evening
C: Calm

TABLE - II
TRIPURA
MEAN DAILY MAXIMUM AND MEAN DAILY MINIMUM TEMPERATURE (°C)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Agartala(A)	Max	25.5	27.9	32.2	33.1	32.4	32.0	31.4	31.9	31.6	31.2	29.5	26.4	30.4
	Min	10.0	13.1	18.8	22.2	23.3	24.8	24.9	25.0	24.4	22.2	17.1	11.4	19.8
Kailashahar(A)	Max	25.6	27.7	31.6	32.4	31.8	32.1	32.0	32.3	31.9	31.4	29.4	26.5	30.4
	Min	10.3	12.6	17.4	21.0	22.8	24.6	24.8	24.8	24.4	22.3	17.4	11.9	19.5
State Mean	**Max**	**25.6**	**27.8**	**31.9**	**32.8**	**32.1**	**32.1**	**31.7**	**32.1**	**31.8**	**31.3**	**29.5**	**26.5**	**30.4**
	Min	**10.2**	**12.9**	**18.1**	**21.6**	**23.1**	**24.7**	**24.9**	**24.9**	**24.4**	**22.3**	**17.3**	**11.7**	**19.7**

TABLE – III
TRIPURA
MEAN RELATIVE HUMIDITY (%)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Agartala(A)	M	81	72	70	74	78	82	83	83	83	81	78	80	79
	E	66	56	52	66	74	80	82	82	84	83	79	75	73
Kailashahar(A)	M	86	79	75	78	82	84	84	85	86	85	85	86	83
	E	68	58	55	68	75	82	84	84	85	84	80	75	75
State Mean	**M**	**83**	**75**	**73**	**76**	**80**	**83**	**84**	**84**	**84**	**83**	**81**	**83**	**81**
	E	**67**	**57**	**53**	**67**	**75**	**81**	**83**	**83**	**85**	**83**	**79**	**75**	**74**

TABLE IV

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

TRIPURA

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Agartala (A)	a	21	14	11	2	1	0	0	0	0	4	13	18	84
	b	1	1	1	2	3	6	7	4	3	2	1	1	32
	c	1.5	2.1	3.0	4.5	5.3	6.4	6.6	6.4	5.9	4.0	2.3	1.4	4.1
Kailashahar(A)	a	20	15	12	3	1	0	0	0	0	3	10	15	79
	b	1	1	2	3	6	7	6	5	4	3	1	1	40
	c	1.5	2.0	2.8	4.5	5.3	6.3	6.5	6.3	5.8	3.9	2.5	1.7	4.1
State Mean	**a**	**21**	**15**	**12**	**3**	**1**	**0**	**0**	**0**	**0**	**4**	**12**	**17**	85
	b	**1**	**1**	**2**	**3**	**5**	**7**	**7**	**5**	**4**	**3**	**1**	**1**	40
	c	**1.5**	**2.1**	**2.9**	**4.5**	**5.3**	**6.4**	**6.6**	**6.4**	**5.9**	**4.0**	**2.4**	**1.6**	4.1

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.

TABLE IV (A)
MEAN CLOUD AMOUNT **(OKTA OF THE SKY) AND NUMBER OF DAYS OF CLEAR AND OVERCAST SKIES AT 1730 HRS IST

TRIPURA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Agartala (A)	a	17	12	11	3	1	0	0	0	0	3	8	15	70
	b	0	1	1	2	5	5	4	3	3	2	1	0	27
	c	1.5	2.2	2.5	4.1	5.0	6.1	6.5	6.4	5.8	3.8	2.5	1.6	4.0
Kailashahar(A)	a	15	12	8	2	1	0	0	0	0	4	10	14	66
	b	1	1	2	3	4	6	7	4	5	3	2	1	39
	c	1.6	2.3	2.9	4.4	5.0	6.3	6.5	6.3	5.9	3.5	2.1	1.6	4.0
State Mean	**a**	**16**	**12**	**9**	**3**	**1**	**0**	**0**	**0**	**0**	**3**	**9**	**15**	**68**
	b	**1**	**1**	**2**	**3**	**5**	**6**	**6**	**4**	**4**	**3**	**2**	**1**	**38**
	c	**1.6**	**2.3**	**2.7**	**4.3**	**5.0**	**6.2**	**6.5**	**6.4**	**5.9**	**3.7**	**2.3**	**1.6**	**4.0**

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.

TABLE V
MEAN RAINFALL AND NUMBER OF RAINY DAYS
TRIPURA

DISTRICT		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Dhalai	a	11.1	36.0	93.4	220.3	367	498.5	401.8	321.2	258.9	176.3	59.6	11.8	2455.9
	b	0.8	2.0	4.0	8.3	12.8	17.5	17.5	17.6	14.1	7.5	1.9	0.5	104.5
Gomati	a	8.0	30.7	64.4	165.2	327.5	433.3	419.0	340.5	220.4	166.6	35.9	11.0	2222.5
	b	0.6	1.9	3.2	6.5	12.1	15.7	17.7	17.3	12.0	6.7	1.8	0.5	96.0
Khowai	a	10.8	30.6	83.4	200.8	399.6	420.3	337.1	322.9	250.0	172.4	43.0	11.4	2282.3
	b	0.8	1.4	3.7	8.0	12.6	15.8	16.5	15.9	13.8	7.0	2.0	0.4	97.9
N.Tripura	a	12.5	33.0	119.0	266.4	411.9	452.3	427.7	383.7	287.7	168.7	46.3	10.5	2619.6
	b	0.9	2.2	5.5	11.0	15.4	19.3	19.6	19.6	14.8	7.4	2.2	0.5	118.4
Sepahijala	a	9.3	26.7	64.9	184.2	328.6	452.6	474.1	350.8	261.2	184.0	40.9	7.9	2385.2
	b	0.6	1.4	3.2	6.3	11.3	15.1	16.7	15.1	12.1	6.2	1.5	0.3	89.8
S.Tripura	a	7.7	32.0	91.6	169.6	328.0	512.5	559.4	445.8	282.2	178.8	52.2	7.4	2667.2
	b	0.6	1.7	3.5	6.3	11.0	16.0	17.5	16.7	12.3	6.1	1.9	0.4	94.0
Unakoti	a	11.6	38.5	116.9	266.9	442.2	467.5	365.4	355.7	265.7	173.6	45.4	12.8	2562.2
	b	1.0	2.3	5.2	10.4	15.1	18.3	18.5	18.6	14.0	7.3	2.0	0.6	113.3
W.Tripura	a	8.9	32.2	73.5	193.5	355.4	413.5	411.1	298.0	248.4	175.0	42.7	9.6	2261.8
	b	0.8	2.0	3.5	7.8	12.4	16.1	16.6	15.8	12.8	7.3	1.8	0.5	97.4
State Mean	a	**10.0**	**32.5**	**88.4**	**208.4**	**370.0**	**456.3**	**424.5**	**352.3**	**259.3**	**174.4**	**45.8**	**10.3**	**2432.2**
	b	**0.8**	**1.9**	**4.0**	**8.1**	**12.8**	**16.7**	**17.6**	**17.1**	**13.2**	**6.9**	**1.9**	**0.5**	**101.5**

a: Normal rainfall in mmb: Average number of rainy days

TABLE-VI

MEAN RAINFALL(mm) OVER DIFFERENT RIVER CATCHMENTS OF TRIPURA STATE

Sr.No	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1	**Streams of Tripura flowing in to the Bay of Bengal. (catchment No.326)**												
	Districts/Parts of districts of Tripura within this catchment:- **DHALAI, GOMATI, KHOWAI, NORTH TRIPURA ,SEPAHIJALA, SOUTH TRIPURA, UNAKOTI, WEST TRIPURA**												
a	**10.0**	**32.5**	**88.4**	**208.4**	**370.0**	**456.3**	**424.5**	**352.3**	**259.3**	**174.4**	**45.8**	**10.3**	**2432.2**
b	**0.8**	**1.9**	**4.0**	**8.1**	**12.8**	**16.7**	**17.6**	**17.1**	**13.2**	**6.9**	**1.9**	**0.5**	**101.5**

a: Normal rainfall in mm
b: Average number of rainy days

TABLE – VII

STORMS AND DEPRESSIONS AFFECTING TRIPURA STATE

DURING 1891 – 2012

MONTH	*NO. OF STORMS/ DEPRESSIONS*	*MONTH*	*NO. OF STORMS/ DEPRESSIONS*	*MONTH*	*NO. OF STORMS/ DEPRESSIONS*
January	NIL	May	2	September	2
February	NIL	June	1	October	10
March	NIL	July	NIL	November	6
April	NIL	August	NIL	December	1
				Total	**22**

TABLE - VIII

DETAILS OF EARTHQUAKES OF INTENSITY OF 5.0 OR MORE AT RICHTER SCALE HAVING EPICENTRE WITHIN TRIPURA STATE DURING YEARS 1862-2012									
MONTHS	**YEARS**	**FREQU-ENCY**	**EARTHQUAKE OF HIGHEST INTENSITY**			**EPICENTRE**			
			INTENSITY AT RICHTER SCALE	**DEPTH IN km**	**YEAR**	**LAT - N**		**LONG - E**	
						DEG	**MIN**	**DEG**	**MIN**
JANUARY									
FEBRUARY	1971	1	5.4	37	1971	23	43	91	40
MARCH									
APRIL									
MAY	1984	1	5.2	12	1984	23	40	91	31
JUNE									
JULY									
AUGUST									
SEPTEMBER									
OCTOBER									
NOVEMBER									
DECEMBER	1950	1	6.3		1950	24	0	91	48
TOTAL		**3**							

DHALAI DISTRICT

Dhalai district has mostly hilly areas of low elevation up to 750 metres above mean sea level with hill ranges lying north to south and some plain areas. Ambassa is the headquarters of the district at an elevation of 100 metres. The climate of this district is characterized by mild cold in winter, hot in summer season and humid throughout the year. The year may be divided into four seasons. The period of December to February is of winter season which is followed by summer season associated with thunderstorms till May. Southwest monsoon season starts from the beginning of June and lasts till the middle of October. The period of mid-October and November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for the period of 20 and 44 years. The details of 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 2455.9 mm. About 60% of the annual rainfall is received in the southwest monsoon season (June to September). The rainfall in the summer months (March to May), mostly associated with thunderstorms, contributes to about 28% to the annual rainfall. There is also some rain in the post monsoon season. The year to year variation in the annual rainfall is large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 154% of the normal occurred in year 1993, while the lowest annual rainfall which was 57% of the normal occurred in 1979. During this fifty year period there were only 6 years when the rainfall was less than 80% of the normal and on two occasions when they were consecutive for two years. It is seen from Table 2 that the annual rainfall in the district was between 1901 to 3000 mm in 23 years out of 37. On an average there are 105 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at any station in the district was 360.0 mm at Kamalapur on 03 August 1982.

TEMPERATURE

There is no meteorological observatory in the district. The meteorological data of Kailashahar observatory in the neighbouring district; North Tripura may be taken as representative of the climatic conditions for the district as a whole. The winter starts from December however both day and night temperatures decrease rapidly from November. January is the coldest month when mean maximum temperature is about 26°C and mean minimum temperature is about 10°C. The temperatures begin to rise slightly from the middle of February. Day temperature reaches maximum in the month of April and its mean maximum temperature is about 32°C. The day temperatures in the summer season are more or less equal to the temperatures in the southwest monsoon season, however, night temperatures during southwest monsoon season are high. August is experienced as the warmest month when mean maximum temperature is about 32°C and mean minimum temperature is about

25°C. In the southwest monsoon season the weather sometimes becomes oppressive due to the high humidity in absence of rain. The weather becomes cool after withdrawal of the southwest monsoon and pleasant during the post monsoon season. The temperatures may be 3 - 4°C lower over hilly areas. On individual days the temperature may reach a maximum of about 40°C in April and May and a minimum of about 3°C in January.

HUMIDITY

Humidity is generally high throughout the year. The relative humidity is about 80% or more during the period; May to December. This is slightly low between 55% and 75% in the afternoons in the winter and summer seasons. The humidity in the mornings is generally more than in the afternoons.

CLOUDINESS

The skies are heavily clouded to overcast in southwest monsoon season and latter part of summer season. Skies are moderately clouded in the post monsoon season. In winter season clear or lightly clouded skies prevail, however, cloudiness increases with the approach of summer months. In the winter season skies sometimes get obscured in the morning on many days due to lifted fog in the hilly area.

WINDS

Winds are generally light in the year except in the latter part of the summer season and southwest monsoon season when they are moderate. Southerly winds prevail in the district throughout the year except in the winter months when westerly and northwesterly winds are also seen in the afternoons. Sometimes wind is also calm.

SPECIAL WEATHER PHENOMENA

In the post monsoon months; October and November, and latter part of summer season, some of the cyclonic storms and depressions originated in the Bay of Bengal affect the weather of the district causing high winds and widespread rain. The depressions affect this district in the monsoon months which originate and intensify over the north-Bay of Bengal. Thunderstorms generally occur throughout the year; however, they are frequent in the summer and monsoon seasons and attain maximum in May. In the summer season, some of them are violent and are associated with hails and squalls. Fog occurs frequently in post monsoon and winter seasons, and occasionally in the rest of the year.

TABLE – 1
NORMALS AND EXTREMES OF RAINFALL
DHALAI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Gumani S. Para	20	a	8.8	32.3	81.1	193.6	323.8	518.6	436.0	310.6	269.3	172.2	78.3	12.2	2436.8	138	65	300.0	08 Jun 1975
		b	0.7	1.8	3.4	7.0	11.7	17.9	17.9	18.5	14.7	7.4	2.2	0.4	103.6	(1976)	(1957)		
Kamalapur	44	a	13.5	39.7	105.6	247.0	410.2	478.4	367.7	331.7	248.5	180.3	40.8	11.4	2474.8	153	57	360.0	03 Aug 1982
		b	0.8	2.3	4.5	9.5	13.9	17.2	17.2	16.8	13.5	7.6	1.6	0.6	105.5	(1993)	(1979)		
Dhalai (District)		a	11.1	36.0	93.4	220.3	367.0	498.5	401.8	321.2	258.9	176.3	59.6	11.8	2455.9	154	57		
		b	0.8	2.0	4.0	8.3	12.8	17.5	17.5	17.6	14.1	7.5	1.9	0.5	104.5	(1993)	(1979)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
DHALAI
(Data 1956-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1401 – 1500	1	2001 – 2100	1	2601 – 2700	3	3201 – 3300	2
1501 – 1600	2	2101 – 2200	2	2701 – 2800	1	3301 – 3400	1
1601 - 1700	1	2201 – 2300	3	2801 – 2900	2	3401 – 3500	0
1701 - 1800	0	2301 – 2400	2	2901 – 3000	0	3501 – 3600	0
1801 – 1900	2	2401 – 2500	2	3001 – 3100	1	3601 – 3700	2
1901 – 2000	3	2501 – 2600	4	3101 – 3200	1	3701 - 3800	1

(Data available for 37 years)

GOMATI DISTRICT

Gomati district has mostly plain areas and some hill ranges having an elevation upto about 400 metres above mean sea level. Udaipur is headquarters of the district at an elevation of about 18 metres. The climate of this district is characterized by hot in summer, mild cold in winter and humid throughout the year. The year may be divided into four seasons. December to February is the winter season which is followed by summer season from March to May. Southwest monsoon season commences from the beginning of June and lasts till the middle of October. The period of mid-October and November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for the period of 46 and 49 years. The details of 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 2222.5 mm. The year to year variation in the annual rainfall is not very large. Rainfall about 64% of the annual rainfall is received in the southwest monsoon season (June to September). The rainfall in summer months (March to May) mostly associated with thunderstorms, contributes about 25% of the annual rainfall, whereas rainfall in the post monsoon season contributes about 9% of the annual rainfall. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 145% of the annual normal occurred in year 1976, while the lowest annual rainfall was 64% of the normal occurred in 1972. In the fifty years, there were 9 years when the rainfall was less than 80% of the normal and during these 7 years there was one occasion of two consecutive years of such a low rainfall. It is seen from Table 2 that annual rainfall in the district was between 1701 to 2700 mm in 30 years out of 42.

On an average there are 96 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 93 at Udaipur and 99 at Amarpur.

The heaviest rainfall recorded in 24 hours at any station in the district was 480.0 mm at Amarpur on 29 April 1989.

TEMPERATURE

There is no meteorological observatory in the district. The meteorological data of neighbouring observatory Agartala(A) in the district of West Tripura may be taken as representative of the climatic conditions of the district as a whole. The cold weather starts from December, however both day and night temperatures begin to decrease rapidly from November. January is the coldest month when mean maximum temperature is about 25°C and mean minimum temperature is about 10°C. The temperatures begin to rise from the middle of

February. Day temperatures continue to rise and attain its highest in May. However, mean maximum temperature is the highest i.e. 33°C in April month. The day temperatures slightly fall after onset of the monsoon whereas the night temperatures continue to rise till August and mean minimum temperature is 25°C for this month. The night temperatures in southwest monsoon season are higher than in summer season. During the southwest monsoon season the weather sometimes becomes oppressive due to the high humid atmosphere in between two spells of rain. The temperatures begin to decrease from the middle of October after withdrawal of the monsoon. The weather becomes cool and pleasant till November month. Day and night temperatures over hilly areas may be lower by 1°C to 2°C than plain areas as the district has some hilly ranges. The highest temperatures in the district sometimes go up to about 41°C in the summer and lowest temperature may be about 3°C in January month.

HUMIDITY

Humidity is generally high throughout the year. The summer season is comparatively the driest part of the year when the relative humidity in the afternoon is low in the range of 50% to 75%. The humidity is the highest during the southwest monsoon season when it ranges between 80% and 85%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season. Skies are moderately clouded in the post monsoon season. In winter season skies are clear or lightly clouded. Cloudiness increases in summer season and skies are heavily clouded in the latter part of summer season.

WINDS

Winds are generally light, but they prevail moderately in summer and southwest monsoon seasons. In the latter part of summer and southwest monsoon season winds are southerly. They gradually turn northerly in the post monsoon and winter seasons. Sometimes calm condition also prevails in the district.

SPECIAL WEATHER PHENOMENA

Some cyclonic storms and depressions originating from the Bay of Bengal move towards the district, which affect the weather of the district causing high winds and widespread rain. Thunderstorms occur throughout the year. Frequency of thunderstorms however, is more in latter part of summer and southwest monsoon season and less in winter season. Thunderstorms in summer season are sometimes very violent and are accompanied with heavy rain. Squall sometimes occurs in the summer and southwest monsoon seasons. Fog generally occurs in winter and post monsoon seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
GOMATI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Amarpur	46	a	8.0	33.3	68.2	177.7	338.6	451.7	436.8	356.8	222.1	179.5	37.5	10.7	2320.8	158	64	480.0	29 Apr 1989
		b	0.6	2.0	3.3	6.9	12.3	16.1	18.7	17.7	12.2	6.8	1.6	0.5	98.7	(1973)	(1972)		
Udaipur	49	a	7.9	28.2	60.6	152.7	316.3	414.9	401.1	324.3	218.6	153.7	34.3	11.2	2123.8	175	63	263.0	04 Aug 1983
		b	0.6	1.8	3.1	6.1	11.8	15.3	16.8	16.9	11.9	6.5	2.0	0.5	93.3	(1976)	(1962)		
Gomati (District)		a	8.0	30.7	64.4	165.2	327.5	433.3	419.0	340.5	220.4	166.6	35.9	11.0	2222.5	145	64		
		b	0.6	1.9	3.2	6.5	12.1	15.7	17.7	17.3	12.0	6.7	1.8	0.5	96.0	(1976)	(1972)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall
GOMATI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1401 – 1500	3	2101 – 2200	4	2801 – 2900	1
1501 – 1600	3	2201 – 2300	4	2901 – 3000	1
1601 – 1700	0	2301 – 2400	3	3001 – 3100	0
1701 – 1800	4	2401 – 2500	1	3101 – 3200	2
1801 – 1900	2	2501 – 2600	2	3201 – 3300	2
1901 – 2000	5	2601 – 2700	0		
2001 – 2100	5	2701 – 2800	0		

(Data available for 42 years)

KHOWAI DISTRICT

Khowai district has mostly plain areas and some hills at an elevation upto about 450 metres above mean sea level. Khowai is the headquarters of the district at an elevation at about 14 metres. The climate of this district is characterized by hot in summer, mild cold in winter and humid throughout the year. The year may be divided into four seasons. The period of December to February is of winter season which is followed by summer season till May. Southwest monsoon season starts from the beginning of June and lasts till the middle of October. The period of mid-October and November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for only one raingauge station for the period of 49 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 2282.3 mm. Rainfall about 58% of the annual is received in the southwest monsoon season (June to September). The rainfall in summer months (March to May) mostly associated with thunderstorms contributes good amount about 30% of the annual rainfall, while the rainfall in the post monsoon season contributes about 9% to the annual rainfall. The year to year variation in the annual rainfall is large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 164% of the annual normal occurred in year 1976, while the lowest annual rainfall was 41% of the normal occurred in 1955. In the fifty years there were 10 years when the rainfall was less than 80% of the normal. There was one occasion of such a low rainfall which occurred in three consecutive years. It is seen from Table 2 that annual rainfall in the district was between 1801 and 2800 mm in 21 years out of 37. On an average there are 98 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in at Khowai. The heaviest rainfall recorded in 24 hours at Khowai 325.0 mm on 9 June 1976.

TEMPERATURE

There is no meteorological observatory in the district. So the description which follows is based upon Agartala (A) obsertvatory in neighboruing district of West Tripura. The cold weather starts by about the end of November when both day and night temperatures begin to decrease steadily. January is the coldest month when mean maximum temperature is at about 25°C and mean minimum temperature is at about 10.0°C. The temperatures begin to rise from the middle of February. Day temperatures continue to rise and attain its highest in May. However, mean maximum temperature is the highest i.e. 33°C in April month. The day temperatures slightly fall after onset of the monsoon whereas the night temperatures continue to rise till August and mean minimum temperature is 25°C for this month. The night temperatures in southwest monsoon season are higher than in summer season. The temperatures may be lower by 2°c over hilly areas. During southwest monsoon

season the weather becomes sometimes oppressive due to high humid atmosphere in absence of rain. The temperatures begin to decrease from the middle of October after withdrawal of the monsoon. Weather becomes cool and pleasant till November month.

HUMIDITY

Humidity is generally high throughout the year. Relative humidity is the highest in southwest monsoon season when it ranges between 80% and 85%. The summer season is comparatively the driest part of the year when the relative humidity in the afternoons is low in the range of 50% to 75%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season. Skies are moderately clouded in the post monsoon season. In winter season skies are clear or lightly clouded. Cloudiness increases in summer season and skies are heavily clouded in the latter part of summer season.

WINDS

Winds are generally light, but they prevail moderately in summer and southwest monsoon seasons. In the latter part of summer and southwest monsoon season winds are southerly. They gradually turn northerly in the post monsoon and winter seasons. Sometimes wind is calm also.

SPECIAL WEATHER PHENOMENA

Some cyclonic storms and depressions originating from the Bay of Bengal move towards the district, which affect the weather of the district causing high winds and widespread rain. Thunderstorms occur throughout the year. Frequency of thunderstorms is more in latter part of summer and southwest monsoon season and less in winter season. Thunderstorms in summer season are sometimes very violent and are accompanied with heavy rain. Squall occurs in the summer and southwest monsoon seasons. Fog occurs frequently in winter and post monsoon seasons.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
KHOWAI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Khowai	49	a	10.8	30.6	83.4	200.8	399.6	420.3	337.1	322.9	250.0	172.4	43.0	11.4	2282.3	164	41	325.0	09 Jun 1976
		b	0.8	1.4	3.7	8.0	12.6	15.8	16.5	15.9	13.8	7.0	2.0	0.4	97.9	(1976)	(1955)		
Khowai (District)		a	10.8	30.6	83.4	200.8	399.6	420.3	337.1	322.9	250.0	172.4	43.0	11.4	2282.3	164	41		
		b	0.8	1.4	3.7	8.0	12.6	15.8	16.5	15.9	13.8	7.0	2.0	0.4	97.9	(1976)	(1955)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
KHOWAI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
901 – 1000	1	1501 – 1600	2	2101 – 2200	3	2701 – 2800	2	3301 – 3400	1
1001 – 1100	0	1601 – 1700	1	2201 – 2300	2	2801 – 2900	0	3401 – 3500	0
1101 – 1200	0	1701 – 1800	4	2301 – 2400	2	2901 – 3000	0	3501 – 3600	0
1201 - 1300	2	1801 – 1900	1	2401 – 2500	2	3001 – 3100	1	3601 – 3700	0
1301 - 1400	0	1901 – 2000	6	2501 – 2600	1	3101 – 3200	2	3701 – 3800	1
1401 – 1500	0	2001 – 2100	2	2601 – 2700	0	3201 – 3300	1		

(Data available for 37 years)

NORTH TRIPURA DISTRICT

The climate of this district is largely influenced by two parallel hill ranges from north to south direction, having an elevation up to 935 metres above mean sea level. Dharmanagar is the headquarters of the district at an elevation of about 16 metres. The climate of this district is characterized by cold in winter, hot in summer and humid throughout the year. The year may be divided into four seasons. The period of December to February is of winter season which is followed by summer season of thunderstorms till May. Southwest monsoon season starts from the beginning of June and lasts till the middle of October. This season is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only 1 raingauge station for the period of 49 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 2619.6 mm. The year to year variation in the annual rainfall is not large. Rainfall about 59% of the annual is received in the southwest monsoon season (June to September). The rainfall in summer months (March to May), mostly associated with thunderstorms, contributes a good amount about 30% to the annual rainfall. There is some rain in the post monsoon season also. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 156% of the normal occurred in year 1995, while the lowest annual rainfall which was 70% of the normal occurred in 1994. There were 4 years when the rainfall was less than 80% of the normal and they were not consecutive. It is seen from Table 2 that annual rainfall in the district was between 2001 to 3200 mm in 32 years out of 40. On an average there are 118 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district at Dharmanagar. The heaviest rainfall recorded in 24 hours at Dharmanagar in the district was 350.8 mm on 14 May 1984.

TEMPERATURE

There is no meteorological observatory in the district. The meteorological data of Kailashahar Aerodrome (Alt. 29 m) observatory in the neighbouring Unakoti district may be taken as representative of the climatic conditions of the district as a whole. The winter season starts by about the end of November when both day and night temperatures decrease steadily. January is the coldest month when mean maximum temperature is about 26°C and mean minimum temperature is about 10°C. The temperatures begin to rise slightly from the middle of February. Day temperature reaches maximum in the month of April and its mean maximum temperature is about 32°C. The day temperatures in the summer season are more or less equal to the temperatures in the southwest monsoon season, however, night temperatures during southwest monsoon season are high. August is experienced as the warmest month when mean maximum temperature is about 32°C

and mean minimum temperature is about 25°C. In the southwest monsoon season the weather sometimes becomes oppressive due to the high humidity in absence of rain. The weather becomes cool after withdrawal of the southwest monsoon and pleasant during the post monsoon season. The temperatures may be 3 -5°C lower over hilly areas. On individual days the temperature may reach a maximum of about 40°C in April and May and a minimum of about 3°C in January.

HUMIDITY

Humidity is generally high throughout the year. The relative humidity is about 80% or more during the period of May to December. This is slightly low between 55% and 75% in the afternoons in the months of January to April. The humidity in the afternoons is less than that of mornings.

CLOUDINESS

The skies are heavily clouded to overcast in southwest monsoon season and latter part of summer season. Skies are moderately clouded in the post monsoon season. In winter season clear or lightly clouded skies prevail, however cloudiness increases in the summer months. In the winter season skies sometimes get obscured in the morning on many days due to lifted fog in the hilly areas.

WINDS

Winds are generally light in the year except in the latter part of summer season and southwest monsoon season when they are moderate. Southerly winds prevail in the district throughout the year except in the winter months when westerly and northwesterly winds are seen in the afternoon. Sometimes wind is also calm.

SPECIAL WEATHER PHENOMENA

In the months of October to November and April to May, some of the cyclonic storms and depressions originated in the Bay of Bengal affect the weather of the district causing high winds and widespread rain. During the monsoon season the depressions originate and intensify over the north-Bay of Bengal and some of them affect the weather of this district. Thunderstorms generally occur throughout the year. They are frequent in the summer and monsoon seasons and attain maximum in May. In the summer season, some of them are violent and are associated with hails and squalls. Fog occurs frequently in post monsoon and winter seasons.

TABLE – 1
NORMALS AND EXTREMES OF RAINFALL
NORTH TRIPURA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Dharmanagar	49	a	12.5	33.0	119.0	266.4	411.9	452.3	427.7	383.7	287.7	168.7	46.3	10.4	2619.6	156	70	350.8	14 May 1984
		b	0.9	2.2	5.5	11.0	15.4	19.3	19.6	19.6	14.8	7.4	2.2	0.5	118.4	(1995)	(1994)		
N.Tripura (District)		a	12.5	33.0	119.0	266.4	411.9	452.3	427.7	383.7	287.7	168.7	46.3	10.4	2619.6	156	70		
		b	0.9	2.2	5.5	11.0	15.4	19.3	19.6	19.6	14.8	7.4	2.2	0.5	118.4	(1995)	(1994)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)

* Based on all available data upto 2010. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
NORTH TRIPURA
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1801 – 1900	1	3001 – 3100	2
1901 – 2000	0	3101 – 3200	2
2001 – 2100	3	3201 – 3300	3
2101 – 2200	3	3301 – 3400	1
2201 – 2300	2	3401 – 3500	1
2301 – 2400	2	3501 – 3600	1
2401 – 2500	6	3601 – 3700	0
2501 – 2600	3	3701 – 3800	0
2601 – 2700	3	3801 – 3900	0
2701 – 2800	2	3901 - 4000	0
2801 – 2900	2	4001 - 4100	1
3901 – 3000	2		

(Data available for 40 years)

SEPAHIJALA DISTRICT

Sepahijala district has mostly plain areas at an elevation up to about 100 metres above mean sea level. The climate of this district is characterized by hot in summer, mild cold in winter and humid throughout the year. The year may be divided into four seasons. The period of December to February is of winter season which is followed by summer season from March to May. Southwest monsoon season starts from the beginning of June and lasts till the middle of October. This is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for only one raingauge station (Sonamura) for the period of 47 years. The details of rainfall at this station and for the district as a whole are given in Tables 1 and 2. The average annual rainfall in the district is 2385.2 mm. Rainfall about 65% of the annual is received in the southwest monsoon season (June to September). The rainfall in summer months (March to May) mostly associated with thunderstorms, contributes about 24% of the annual rainfall. The year to year variation in the annual rainfall is large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 167% of the annual normal occurred in year 1988, while the lowest annual rainfall was 59% of the normal occurred in 1979. In the fifty years there were 9 years when the rainfall was less than 80% of the normal. There was one occasion of such a low rainfall which occurred in three consecutive years. It is seen from Table 2 that the annual rainfall in the district was between 1901 mm and 2900 mm in 17 years out of 34.

On an average there are 90 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in Sepahijala district at Sonamura.

The heaviest rainfall ever recorded in 24 hours at Sonamura was 309.9 mm on 2 June 1956.

TEMPERATURE

There is no meteorological observatory in the district. So the description which follows is based on meteorological data of Agartala (A) observatory in neighbouring district of West Tripura. The cold weather starts from December, however, both day and night temperatures begin to decrease steadily from November. January is the coldest month when mean maximum temperature is at about 25°C and mean minimum temperature is at about 10.0°C. The temperatures begin to rise from the middle of February. Day temperatures continue to rise and attain its highest on individual days in May. However, mean maximum temperature is the highest i.e. about 33°C in April month. The day temperatures slightly fall after onset the monsoon whereas the night temperatures

continue to rise till August and mean minimum temperature is about 25°C for this month. The night temperatures in southwest monsoon season are higher than in summer season. During southwest monsoon season the weather becomes sometimes oppressive due to high humid atmosphere in absence of rain. The temperatures begin to decrease from the middle of October after withdrawal of the monsoon. Consequent upon weather becomes cool and pleasant till November month.

HUMIDITY

Humidity is generally high throughout the year. Relative humidity is the highest in southwest monsoon season when it ranges between 80% and 85%. The summer season is comparatively the driest part of the year when relative humidity in the afternoon is low in the range of 50% to 75%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season. Skies are moderately clouded in the post monsoon season. In winter season skies are clear or lightly clouded. Cloudiness increases in summer season and skies are heavily clouded in the latter part of summer season.

WINDS

Winds are generally light, but they prevail moderately in summer and southwest monsoon seasons. In the latter part of summer and southwest monsoon season winds are southerly. They gradually turn northerly in the post monsoon and winter seasons. Sometimes wind is calm also.

SPECIAL WEATHER PHENOMENA

Some cyclonic storms and depressions originating from the Bay of Bengal move towards the district, which affect the weather of the district causing high winds and widespread rain. Thunderstorms occur throughout the year. Frequency of thunderstorms is more in latter part of summer and southwest monsoon season and less in winter season. Thunderstorms in summer season are sometimes very violent and are accompanied with heavy rain. Squall occurs in the summer and southwest monsoon seasons. Fog occurs in winter and post monsoon seasons, and its frequency is the highest in January month.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
SEPAHIJALA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Sonamura	47	a	9.3	26.7	64.9	184.2	328.6	452.6	474.1	350.8	261.2	184.0	40.9	7.9	2385.2	167	59	309.9	02 Jun 1956
		b	0.6	1.4	3.2	6.3	11.3	15.1	16.7	15.1	12.1	6.2	1.5	0.3	89.8	(1988)	(1979)		
Sepahijala (District)		a	9.3	26.7	64.9	184.2	328.6	452.6	474.1	350.8	261.2	184.0	40.9	7.9	2385.2	167	59		
		b	0.6	1.4	3.2	6.3	11.3	15.1	16.7	15.1	12.1	6.2	1.5	0.3	89.8	(1988)	(1979)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
SEPAHIJALA
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1401 – 1500	2	2301 – 2400	3	3201 – 3300	1
1501 – 1600	0	2401 – 2500	3	3301 – 3400	0
1601 – 1700	1	2501 – 2600	0	3401 – 3500	1
1701 – 1800	4	2601 - 2700	0	3501 – 3600	0
1801 – 1900	2	2701 – 2800	0	3601 – 3700	0
1901 – 2000	1	2801 – 2900	2	3701 – 3800	0
2001 – 2100	2	2901 – 3000	3	3801 – 3900	0
2101 – 2200	2	3001 – 3100	0	3901 - 4000	2
2201 – 2300	4	3101 – 3200	1		

(Data available for 34 years)

SOUTH TRIPURA DISTRICT

South Tripura district has mostly plain areas and some hill ranges of low elevation upto 200 metres above mean sea level, lying north to south. The climate of this district is characterized by hot in summer, mild cold in winter and humid throughout the year. The year may be divided into four seasons. The period of December to February is of winter season which is followed by summer season associated by thunderstorms from March to May. Southwest monsoon season starts from the beginning of June and lasts till the first week of October. The period of October and November is of post monsoon season.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for the period of 46 and 47 years. The details of 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 2667.2 mm. Rainfall about 67% of the annual rainfall is received in the southwest monsoon season (June to September). The rainfall in summer months (March to May) mostly associated with thunderstorms, contributes about 22% of the annual rainfall, whereas rainfall in the post monsoon season contributes about 9% of the annual rainfall. The year to year variation in the annual rainfall is large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 167% of the annual normal occurred in year 1993, while the lowest annual rainfall was 64% of the normal occurred in 1972. In the fifty years, there were 9 years when the rainfall was less than 80% of the normal and there were three occasions of two consecutive years of such a low rainfall. It is seen from Table 2 that the annual rainfall in the district was between 2101 to 3000 mm in 28 years out of 41. On an average there are 94 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number is 92 at Belonia and 96 at Sabroom. The heaviest rainfall recorded in 24 hours at any station in the district was 425.0 mm at Belonia on 04 August 1983.

TEMPERATURE

There is no meteorological observatory in the district. The meteorological data of neighbouring observatory Agartala(A) in the district; West Tripura may be taken as representative of the climatic conditions of the district as a whole. The winter season starts from the end of November when both day and night temperatures begin to decrease steadily. January is the coldest month when mean maximum temperature is about 25°C and mean minimum temperature is about 10°C. The temperatures begin to rise from the middle of February. Day temperatures continue to rise and attain its highest on individual days in May. But the mean maximum temperature is the highest i.e. about 33°C in April month. The day temperatures slightly fall after onset the monsoon, whereas the night temperatures continue to rise till August and mean minimum temperature is about 25°C for this month. The night temperatures during the southwest monsoon season are higher than in the

summer season. During the southwest monsoon season the weather sometimes becomes oppressive due to the high humid atmosphere in between two spells of rain. The temperatures begin to decrease from the middle of October. The weather becomes cool and pleasant till November month. Day and night temperatures over hilly areas may be lower than plain areas as the district has some hilly ranges. The highest temperatures in the district sometimes go up to about 41°C in the summer and the lowest temperature may be about 3°C in January month.

HUMIDITY

Humidity is generally high throughout the year. The relative humidity is the highest during the southwest monsoon season when it ranges between 80% and 85%. The summer season is comparatively the driest part of the year when the humidity in the afternoon is low in the range of 50% to 75%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season. Skies are moderately clouded in the post monsoon season. In winter season skies are clear or lightly clouded. Cloudiness increases in summer season and skies are heavily clouded in the latter part of summer season.

WINDS

Winds are generally light, but they prevail moderately in summer and southwest monsoon seasons. In the latter part of summer and southwest monsoon season winds are southerly. They gradually turn northerly in the post monsoon and winter seasons. Sometimes calm conditions also prevail in the district.

SPECIAL WEATHER PHENOMENA

Some cyclonic storms and depressions originating from the Bay of Bengal move towards the district, which affect the weather of the district causing high winds and widespread rain. Thunderstorms occur throughout the year. Frequency of thunderstorms however, is more in latter part of summer and southwest monsoon season and less in winter season. Thunderstorms in summer season are sometimes very violent and are accompanied with heavy rain. Squall sometimes occurs in the summer and southwest monsoon seasons. Fog generally occurs in winter and post monsoon seasons and its frequency is the highest in January month.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
SOUTH TRIPURA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Belonia	46	a	7.8	27.6	80.3	172.1	323.1	472.5	503.4	421.1	300.8	157.3	43.4	7.5	2516.9	191	60	425.0	04 Aug 1983
		b	0.6	1.6	3.4	6.5	11.2	15.6	17.1	16.1	11.8	5.7	1.8	0.4	91.8	(1986)	(1992)		
Sabroom	47	a	7.5	36.4	102.9	167.0	333.0	552.4	615.4	470.6	263.7	200.3	60.9	7.2	2817.3	209	53	378.0	05 Jul 1988
		b	0.7	1.7	3.5	6.1	10.9	16.3	18.0	17.2	12.7	6.6	2.1	0.4	96.2	(1993)	(1972)		
S.Tripura (District)		a	7.7	32.0	91.6	169.6	328.0	512.5	559.4	445.8	282.2	178.8	52.2	7.4	2667.2	167	64		
		b	0.6	1.7	3.5	6.3	11.0	16.0	17.5	16.7	12.3	6.1	1.9	0.4	94.0	(1993)	(1972)		

a: Normal rainfall in mm. b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data. ** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
SOUTH TRIPURA
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years	Range in mm	No. of years
1701 – 1800	1	2401 – 2500	7	3101 – 3200	0	3801 - 3900	0
1801 – 1900	3	2501 – 2600	2	3201 – 3300	1	3901 - 4000	2
1901 – 2000	4	2601 – 2700	3	3301 – 3400	0	4001 - 4100	0
2001 – 2100	1	2701 – 2800	3	3401 – 3500	0	4101 - 4200	0
2101 – 2200	2	2801 – 2900	3	3501 – 3600	0	4201 - 4300	0
2201 – 2300	2	2901 – 3000	2	3601 – 3700	0	4301 - 4400	1
2301 – 2400	0	3001 – 3100	3	3701 – 3800	0	4401 - 4500	1

(Data available for 41 years)

UNAKOTI DISTRICT

Unakoti district has mostly plain areas and some hilly areas at an elevation up to about 250 metres above mean sea level. The climate of this district is largely influenced by two parallel hill ranges from north to south direction. The climate of this district is characterized by cold in winter, hot in summer and humid throughout the year. The year may be divided into four seasons. The period of December to February is of winter season which is followed by summer season associated with thunderstorms till May. Southwest monsoon season starts from the beginning of June and lasts till the middle of October. This is followed by post monsoon season till November.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for the period ranging from 38 to 49 years. The details of 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 2562.2 mm. The year to year variation in the annual rainfall is not large. Rainfall about 52% of the annual is received in the southwest monsoon season (June to September). The rainfall in summer months (March to May), mostly associated with thunderstorms, contributes a good amount about 32% of annual rainfall. There is some rain in the post monsoon season also. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 156% of the normal occurred in year 1993, while the lowest annual rainfall was 69% of the normal occurred in 1958. There were only 2 years when the rainfall was less than 80% of the normal and none of them were consecutive. It is seen from Table 2 that annual rainfall in the district was between 2001 to 2900 mm in 32 years out of 40. On an average there are 113 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 109 at Kailashahar to 117 at Kailashahar Aero Observatory. The heaviest rainfall recorded in 24 hours at any station in the district was 377.2 mm at Kailashahar and Kailashahar Aero Observatory on 6 June 1993.

TEMPERATURE

There is one meteorological observatory in the district at Kailashahar Aerodrome. The data of this station may be taken as representative of the climatic conditions of the district as a whole. The cold weather starts by about the end of November when both day and night temperatures decrease steadily. January is the coldest month when mean maximum temperature is 25.6°C and mean minimum temperature is 10°C. The temperatures begin to rise slightly from the middle of February. Day temperature reaches maximum in the month of April and its mean maximum temperature is about 32.4°C. The day temperatures in the summer season are more or less equal to the temperatures in the southwest monsoon season, however, night temperatures during

southwest monsoon season are high. August is experienced as the warmest month when mean maximum temperature is about 32.3°C and mean minimum temperature is about 24.8°C. In the southwest monsoon season the weather sometimes becomes oppressive due to high humid in absence of rain. The weather becomes cool after withdrawal of the southwest monsoon and pleasant during post monsoon season. The highest maximum temperature ever recorded at Kailashahar (A) observatory was 42.2°C on 09 April 1960 and lowest minimum temperature ever recorded was 2.4°C on 15 January 1976.

HUMIDITY

Humidity is generally high throughout the year. The relative humidity is about 80% or more during the period of May to December. This is slightly low between 55% and 75% in the afternoon in the months of January to April. The humidity in the afternoons is less than that of mornings.

CLOUDINESS

The skies are heavily clouded to overcast in southwest monsoon season and latter part of summer season. Skies are moderately clouded in the post monsoon season. In winter season clear or lightly clouded skies prevail, however, cloudiness increases in the summer months.

WINDS

Winds are generally light in the year except in the latter part of summer season and southwest monsoon season when they are moderate. Southerly winds prevail in the district throughout the year except in the winter months when westerly and northwesterly winds are seen in the afternoon. Sometimes wind is also calm.

SPECIAL WEATHER PHENOMENA

In the post monsoon months; October and November, and latter part of summer season some of the cyclonic storms and depressions originated in the Bay of Bengal affect the weather of the district causing high winds and widespread rain. During the monsoon season the depressions originate and intensify over the north-Bay of Bengal and some of them affect the weather of this district. Thunderstorms generally occur throughout the year. They are frequent in the summer and monsoon seasons and attain maximum in May. In the summer season, some of them are violent and are associated with hails and squalls. Fog occurs frequently in post monsoon and winter seasons.

Tables 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Kailashahar (A) observatory.

TABLE – 1
NORMALS AND EXTREMES OF RAINFALL
UNAKOTI

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Kailashahar	49	a	10.2	36.0	112.6	250.1	445.4	457.4	353.7	360.6	271.1	182.1	47.3	10.3	2536.8	157	70	377.2	06 Jun 1993
		b	0.8	2.0	4.8	9.7	14.6	18.1	18.1	18.2	13.6	7.2	1.9	0.5	109.5	(1993)	(1998)		
Kailashahar (A) Obsy	38	a	13.0	41.1	121.2	283.7	439.1	477.6	377.1	350.8	260.2	165.0	43.6	15.2	2587.6	153	80	377.2	06 Jun 1993
		b	1.1	2.6	5.6	11.1	15.5	18.5	19.0	19.0	14.3	7.4	2.1	0.8	117.0	(1993)	(1979)		
Unakoti (District)		a	11.6	38.5	116.9	266.9	442.2	467.5	365.4	355.7	265.7	173.6	45.4	12.8	2562.2	156	69		
			1.0	2.3	5.2	10.4	15.1	18.3	18.5	18.6	14.0	7.3	2.0	0.6	113.3	(1993)	(1958)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
UNAKOTI
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1701 - 1800	2	2801 – 2900	3
1801 – 1900	0	2901 – 3000	0
1901 – 2000	0	3001 – 3100	0
2001 – 2100	6	3101 – 3200	0
2101 – 2200	4	3201 – 3300	1
2201 – 2300	4	3301 – 3400	1
2301 – 2400	6	3401 – 3500	1
2401 – 2500	1	3501 – 3600	1
2501 – 2600	4	3601 – 3700	1
2601 – 2700	1	3701 – 3800	0
2701 – 2800	3	3801 - 3900	0
		3901 – 4000	1

(Data available for 40 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(KAILASHAHAR (A))

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum Temperature ever recorded		Lowest Minimum Temperature ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	25.6	10.3	31.4	27-01-1982	2.4	15-01-1976	86	68
February	27.7	12.6	34.5	28-02-2006	3.9	05-02-1968	79	58
March	31.6	17.4	38.6	30-03-1986	7.2	02-03-1972	75	55
April	32.4	21.0	42.2	09-04-1960	12.1	01-04-1968	78	68
May	31.8	22.8	42.0	01-05-1960	17.5	06-05-1977	82	75
June	32.1	24.6	38.3	06-06-1979	19.3	19-06-1993	84	82
July	32.0	24.8	37.8	29-07-1963	19.7	17-07-1961	84	84
August	32.3	24.8	37.5	19-08-1987	20.8	27-09-1968	85	84
September	31.9	24.4	37.2	15-09-1996	20.0	07-09-1976	86	85
October	31.4	22.3	36.0	02-10-2009	15.4	31-10-1976	85	84
November	29.4	17.4	36.8	23-11-1981	8.8	28-11-1969	85	80
December	26.5	11.9	31.7	05-12-1968	6.3	27-12-1972	86	75
Annual	30.4	19.5	42.2	09-04-1960	2.4	15-01-1976	83	75

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (KAILASHAHAR(A))

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	20	15	12	3	1	0	0	0	0	3	10	15	79
b	1	1	2	3	6	7	6	5	4	3	1	1	40
c	1.5	2.0	2.8	4.5	5.3	6.3	6.5	6.3	5.8	3.9	2.5	1.7	4.1
1730 HOURS IST													
a	15	12	8	2	1	0	0	0	0	4	10	14	66
b	1	1	2	3	4	6	7	4	5	3	2	1	39
c	1.6	2.3	2.9	4.4	5.0	6.3	6.5	6.3	5.9	3.5	2.1	1.6	4.0

a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** 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.

TABLE - 5
Mean Wind Speed and Predominant Wind Direction (KAILASHAHAR(A))

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	2.4	3.6	5.0	6.2	5.5	6.0	6.8	5.4	4.2	3.1	2.5	2.2	4.4
Direction in morning	C/S	C/S	S	S	S/C	S	S	S	S/C	C/S	C/S	C/S	
Direction in evening	C/W/NW	C/W/NW	C/NW/W	C/S	C/S	S	S	S/C	C/S	C/S	C	C	

TABLE - 6
Special Weather Phenomena (KAILASHAHAR(A))

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.6	2.3	6.9	13.6	16.8	13.5	9.8	12.2	13.3	5.5	0.6	0.2	95.3
Hail	0.0	0.1	0.3	0.3	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.9
Dust storm	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.9	0.0	0.1	1.2
Fog	7.4	2.5	0.9	0.2	0.3	0.1	0.0	0.2	1.5	6.7	9.7	8.6	38.1
Squall	0.0	0.0	0.1	1.0	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.7

WEST TRIPURA DISTRICT

West Tripura district has mostly plain areas and some hill of low elevation upto 250 metres above mean sea level. The climate of this district is characterized by hot in summer, mild cold in winter and humid throughout the year. The year may be divided into four seasons. The period of December to February is of winter season. The period of March to May is of summer season of thunderstorms which is followed by southwest monsoon season till the first week of October. October and November months constitute the post monsoon season.

RAINFALL

Records of rainfall in the district are available for 2 raingauge stations for the period ranging from 45 to 48 years. The details of 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 2261.8 mm. Rainfall about 61% of the annual is received in the southwest monsoon season (June to September). The rainfall in summer months (March to May) mostly associated with thunderstorms, contributes a good amount about 28% of the annual rainfall, whereas rainfall in the post monsoon season contributes about 10% to the annual rainfall. The year to year variation in the annual rainfall is large. In the fifty year period 1951 to 2000, the highest annual rainfall amounting to 177% of the annual normal occurred in year 1978, while the lowest annual rainfall was 58% of the normal occurred in 1972. In the fifty years there were 9 years when the rainfall was less than 80% of the normal. There were two occasions of such a low rainfall which occurred in two consecutive years. It is seen from Table 2 that the annual rainfall in the district was between 1801 to 2800 mm in 31 years out of 45. On an average there are 97 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 96 at Agartala Aero to 98 at Agartala (Sadar). The heaviest rainfall recorded in 24 hours at any station in the district was 463.0 mm at Agartala (Sadar) on 25 September 1987.

TEMPERATURE

There is one meteorological observatory in the district at Agartala Aerodrome. The meteorological conditions prevailing at this station may be taken as representative of the climate of the district. The cold weather starts by about the end of November when both day and night temperatures begin to decrease steadily. January is the coldest month when mean maximum temperature is 25.5°C and mean minimum temperature is 10.0°C. The temperatures begin to rise from the middle of February. Day temperatures continue to rise and attain its highest in May. However, mean maximum temperature is the highest i.e. 33.1°C in April month. The day temperatures slightly fall after onset of the monsoon whereas the night temperatures continue to rise till August and mean minimum temperature is 25°C for this month. The night temperatures in southwest monsoon season

are higher than in summer season. During southwest monsoon season the weather becomes sometimes oppressive due to high humid atmosphere in absence of rain. The temperatures begin to decrease from the middle of October after withdrawal of the monsoon. Consequent upon weather becomes cool and pleasant till November month. The temperatures may be lower by 1°-2°C over hilly areas. The highest maximum temperature ever recorded at Agartala (A) observatory was 42.2°C on 1st May 1960 and the lowest minimum temperature ever recorded was 2.0°C on 30 December 1972.

HUMIDITY

Humidity is generally high throughout the year except for February to April when the relative humidity is low in the range of 50% to 75%. Relative humidity is the highest in southwest monsoon season when it ranges between 80% and 85%.

CLOUDINESS

The skies are heavily clouded to overcast during southwest monsoon season. Skies are moderately clouded in the post monsoon season. In winter season skies are clear or lightly clouded. Cloudiness increases in summer season and skies are heavily clouded in the latter part of summer season.

WINDS

Winds are generally light, but they prevail moderately in summer and southwest monsoon seasons. In the latter part of summer and southwest monsoon season winds are southerly. They gradually turn northerly in the post monsoon and winter seasons. Sometimes wind is calm also.

SPECIAL WEATHER PHENOMENA

Some cyclonic storms and depressions originating from the Bay of Bengal move towards the district, which affect the weather of the district causing high winds and widespread rain. Thunderstorms occur throughout the year. Frequency of thunderstorms is more in latter part of summer and southwest monsoon season and less in winter season. Thunderstorms in summer season are sometimes very violent and are accompanied with heavy rain. Squall occurs in the summer and southwest monsoon seasons. Fog occurs frequently in winter and post monsoon seasons.

Table 3, 4, 5 and 6 give temperatures and relative humidity, cloudiness, mean wind speed and predominant wind directions, special weather phenomena respectively for Agartala (A) observatory.

TABLE - 1
NORMALS AND EXTREMES OF RAINFALL
WEST TRIPURA

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Agartala Aero (Obsy)	45	a	8.7	26.4	69.4	186.5	323.3	405.3	376.2	288.8	229.7	167.1	40.5	10.3	2132.2	136	63	257.2	22 Jul 1993
		b	0.7	2.0	3.5	8.0	12.3	16.2	16.2	15.9	12.2	7.1	1.8	0.5	96.4	(1956)	(1972)		
Agartala (Sadar)	48	a	9.1	38.1	77.6	200.5	387.5	421.6	446.0	307.3	267.1	182.9	45.0	8.8	2391.5	218	50	463.0	25 Sep 1987
		b	0.9	2.0	3.5	7.5	12.5	16.0	17.0	15.7	13.3	7.4	1.9	0.5	98.2	(1988)	(1994)		
W.Tripura (District)		a	8.9	32.2	73.5	193.5	355.4	413.5	411.1	298.0	248.4	175.0	42.7	9.6	2261.8	177	568		
		b	0.8	2.0	3.5	7.8	12.4	16.1	16.6	15.8	12.8	7.3	1.8	0.5	97.4	(1978)	(1972)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2010.
** Years of occurrence given in brackets.

TABLE - 2
Frequency of Annual Rainfall in the District
WEST TRIPURA
(Data 1951-2000)

Range in mm	No. of years	Range in mm	No. of years
1301 - 1400	2	2701 – 2800	1
1401 – 1500	1	2801 – 2900	3
1501 – 1600	3	2901 – 3000	0
1601 – 1700	2	3001 – 3100	0
1701 – 1800	1	3101 – 3200	0
1801 – 1900	4	3201 – 3300	0
1901 – 2000	3	3301 – 3400	0
2001 – 2100	3	3401 – 3500	0
2101 – 2200	1	3501 – 3600	0
2201 – 2300	7	3601 – 3700	0
2301 – 2400	3	3701 – 3800	0
2401 – 2500	2	3801 – 3900	0
2501 – 2600	4	3901 – 4000	1
2601 - 2700	3	4001 – 4100	1

(Data available for 45 years)

TABLE – 3
Normals of Temperature and Relative Humidity
(AGARTALA(A))

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum Temperature ever recorded		Lowest Minimum Temperture ever recorded		Relative Humidity (%)	
	^{0}C	^{0}C	^{0}C	Date	^{0}C	Date	0830 IST	1730 IST
January	25.5	10.0	31.9	23-01-1990	3.5	31-01-1964	81	66
February	27.9	13.1	35.1	28-02-1969	4.7	07-02-1983	72	56
March	32.2	18.8	38.9	31-03-1962	9.4	04-03-1972	70	52
April	33.1	22.2	41.5	30-04-1960	13.2	09-04-1997	74	66
May	32.4	23.3	42.2	01-05-1960	16.1	02-05-1955	78	74
June	32.0	24.8	40.2	01-06-1979	18.9	03-06-1997	82	80
July	31.4	24.9	37.7	14-07-1972	21.2	27-07-1997	83	82
August	31.9	25.0	36.4	21-08-1957	20.0	18-08-1997	83	82
September	31.6	24.4	36.1	11-09-1963	20.0	08-09-1997	83	84
October	31.2	22.2	38.2	06-10-2002	14.6	31-10-1967	81	83
November	29.5	17.1	34.2	03-11-2009	9.2	26-11-1982	78	79
December	26.4	11.4	33.1	21-12-1990	2.0	30-12-1972	80	75
Annual	30.5	19.8	42.2	01-05-1960	2.0	30-12-1972	79	73

TABLE – 4
Mean Cloud Amount **(Okta of the Sky) and Mean Number of days of Clear and Overcast Skies (AGARTALA(A))

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0830 HOURS IST													
a	21	14	11	2	1	0	0	0	0	4	13	18	84
b	1	1	1	2	3	6	7	4	3	2	1	1	32
c	1.5	2.1	3.0	4.5	5.3	6.4	6.6	6.4	5.9	4.0	2.3	1.4	4.1
1730 HOURS IST													
a	17	12	11	3	1	0	0	0	0	3	8	15	70
b	0	1	1	2	5	5	4	3	3	2	1	0	27
c	1.5	2.2	2.5	4.1	5.0	6.1	6.5	6.4	5.8	3.8	2.5	1.6	4.0

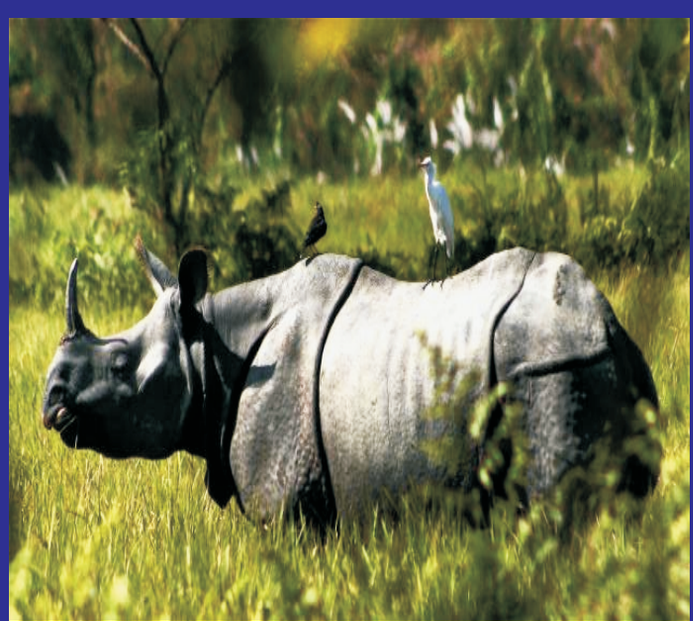
a: Days with clear sky.
b: Days with sky overcast.
c: Mean cloud amount in Okta.
** Okta = Unit equal to area of one eighth of the sky used in specifying cloud amount. For example: 1 Okta means 1/8th of the sky covered.

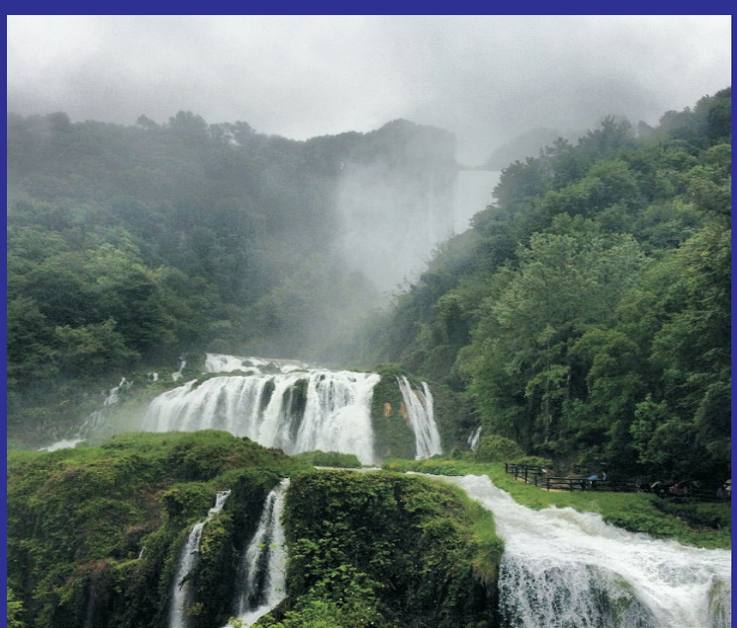
TABLE - 5
Mean Wind Speed and Predominant Wind Direction (AGARTALA (A))

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr	2.3	3.3	5.4	7.2	5.8	6.0	6.4	5.0	3.8	2.5	2.1	1.9	4.3
Direction in morning	C/N/S	C/S	S	S	S	S	S	S/SE	S	C/S	C//N/NE	C/N	
Direction in evening	C	C/SW/N	C/S	S	S/C	S	S	S/C	C/S	C	C	C	

TABLE - 6
Special Weather Phenomena (AGARTALA(A))

Mean No. of Days With	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.5	1.8	4.3	11.0	13.0	8.9	6.7	8.7	9.4	4.5	0.6	0.1	69.5
Hail	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Dust storm	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Fog	7.1	2.0	1.1	0.4	0.1	0.1	0.0	0.1	0.6	1.3	3.0	6.3	22.1
Squall	0.1	0.0	1.0	2.2	2.8	0.4	0.2	0.2	0.2	0.1	0.0	0.0	7.2





PREPARED AND DESIGNED AT
CLIMATOLOGICAL PUBLICATION SECTION
AND PRINTED AT
CENTRAL PRINTING UNIT,
OFFICE OF THE
ADDITIONAL DIRECTOR GENERAL
OF METEOROLOGY (RESEARCH),PUNE