CLIMATE OF PUNJAB

GOVERNMENT OF INDIA
INDIA METEOROLOGICAL DEPARTMENT
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FIG.1: PHYSICAL FEATURES

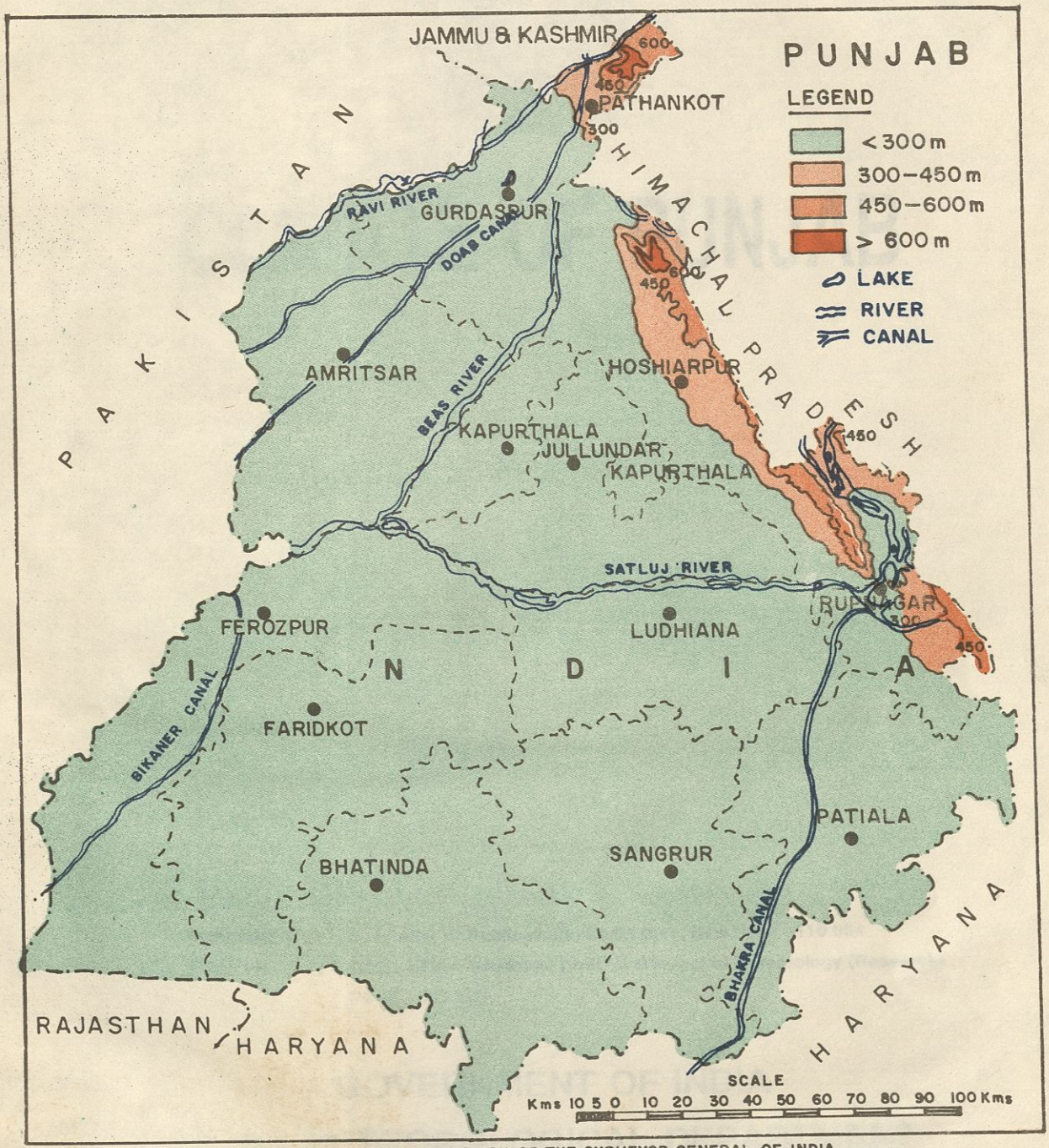
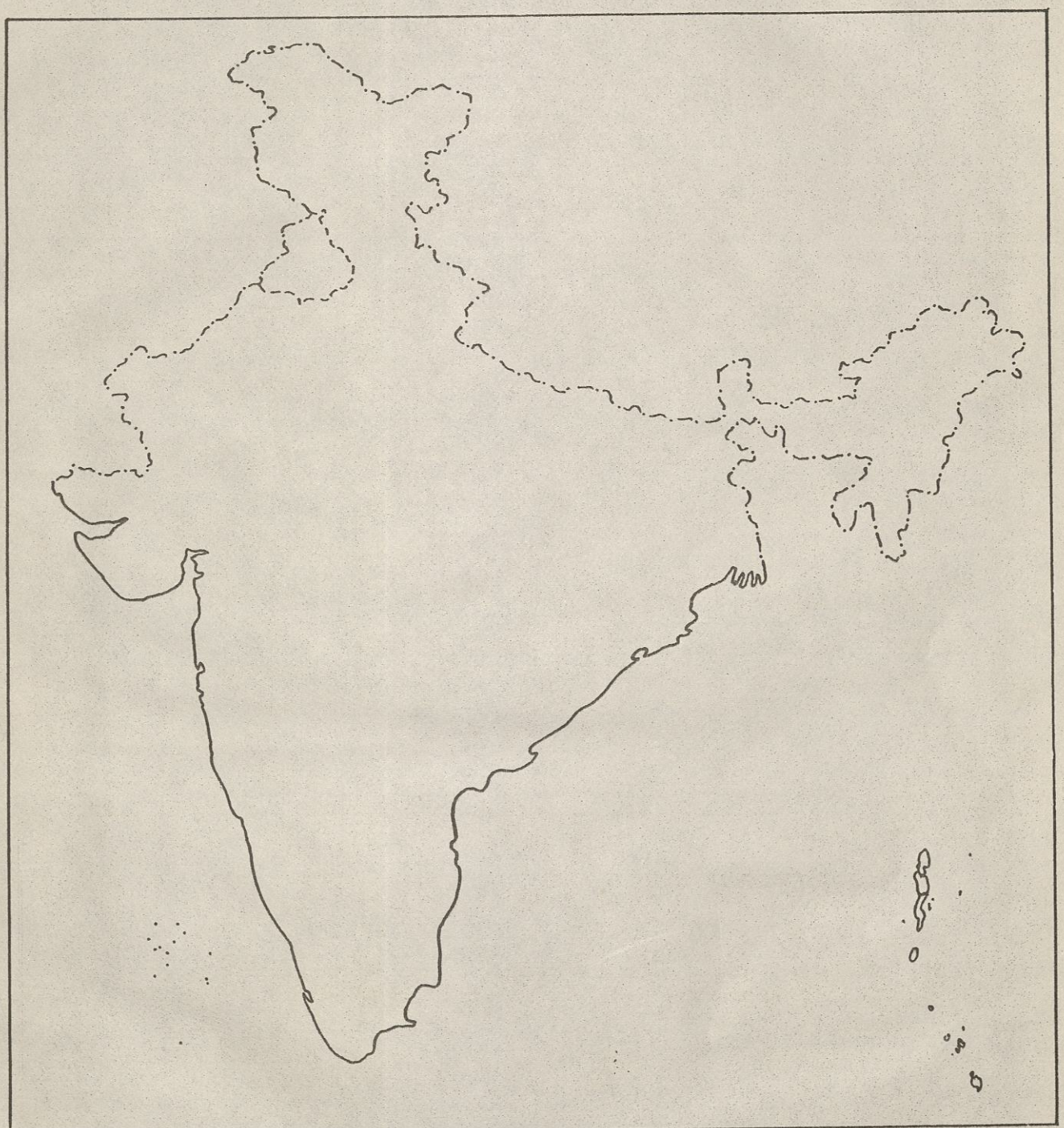


FIG. 1 (a)



FOREWORD

The importance of meteorology for economic and social benefits to society is being realised increasingly all over the world. In our country also, various projects undertaken in agriculture, aviation, energy, industry and other sectors, often require from this Department the climatological information pertaining to different regions of the country, for planning and executing projects, with a view to derive maximum advantage out of meteorological and/or climatological conditions. Keeping these requirements in view, it was decided to publish Climatological Summaries for each state. The tenth issue in the series 'State Climatological Summaries' is the *"CLIMATE OF PUNJAB"*.

The present publication contains extensive information on rainfall in various districts in Punjab and is based on the available rainfall data for the period 1901-1980. The climatological data in respect of temperature, wind, clouds and other weather parameters for the period 1931-1960 are also given. Information relating to the years of severe droughts in the district of Punjab State, has been included for the period 1901-1980.

The climatological Summary and related maps were prepared at the Climatological Publications Division of the office of the Additional Director General of Meteorology (Research), India Meteorological Department, Pune under supervision of Shri M.R. Das and Shri B.K. Sridhar, Directors, Shri S.V. Datar, Deputy Director General of Meteorology and Dr. H.N. Srivastava, Additional Director General of Meteorology (Research).

NEW DELHI
19 MARCH, 1993.
28 PHALGUNA 1914 SE
18 Pausa 1913 S.E.

N. SENROY
DIRECTOR GENERAL OF METEOROLOGY

INTRODUCTION

The meteorological conditions of the Punjab State as a whole are described in the first chapter followed by detailed description of the climate of each district in the succeeding chapters. The districts which were in existence as on 1st January, 1980 are arranged alphabetically.

The normals of meteorological elements used for describing the climate are generally based on data for the period 1931-60 except in the case of rainfall where normals based on data from 1901 to 1980, as available from National Data Centre, Pune, have been used. The extreme values of temperature and rainfall presented in the summary are based on data updated upto 1990 and 1980 respectively.

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CLIMATE OF PUNJAB

General Description

The state of Punjab lies roughly between 29°30'N and 32°30'N latitudes, 73°30'E and 77°00'E longitudes. It is bounded by Pakistan on its west; Sirsa, Hissar, Jind and Kurukshetra districts of Haryana and Ganganagar district of Rajasthan on its south; Ambala district of Haryana and Solan, Bilaspur, Una, Kangra districts of Himachal Pradesh on the east and Kathua district of Jammu and Kashmir on its north. The area of the state which is mostly plain is roughly 50,300 square kilometres.

Punjab, literally means "Land of five rivers", but now there are only three rivers, namely the Ravi, the Beas and the Sutlej. The state comprises of two doabs or tracks, lying between the three rivers. They are, the Bist-Jullundur also called the Saharwal-Doab, lying between the Beas and the Sutlej; and the Bari, between the old bed of the Beas and the Ravi.

The whole state is a vast alluvial plain, except in the northeast region which falls under Himalayan (Siwaliks) submontane-region. All the three rivers of the state rise in the Himalayas and after a long course of several hundred kilometres amidst snow-clad ranges, emerge on to the plains. In the course of its travel each stream cuts a wide valley, which lies well below the level of the plains. Within this valley, the river meanders in narrow, ill-defined and ever shifting route. In winter, the stream is comparatively small, but as the mountain snow melts at the approach of the hot season, the waters rise and overflow the surrounding country, often submerging several kilometres on either side. At the close of the rainy season, the waters recede, leaving wide areas of fertile loam.

The Beas flows along the northern flank of the Siwaliks and enters the plains within a few kilometres of the Ravi. Thence, its course is more southward and it falls into the Sutlej. The Sutlej pierces the Siwaliks near Ropar; thence runs almost west and joins the Beas, near Sabraon where it takes a more southerly course.

The important irrigation canals in Punjab are the Bhakra, Sirhind, Upper Bari Doab and the Bikaner. The state is totally free from oceanic influence. General orographic features and absence of the oceanic influence affect to a large extent the climate of the state. Fig.1 shows the orographic features of Punjab. The state as a whole experiences extreme type of climate.

The state consists of the following districts namely Amritsar, Gurdaspur, Hoshiarpur, Kapurthala, Jullundur, Ludhiana, Ferozpur, Faridkot,Bhatinda, Sangrur, Patiala and Rupnagar.

The preparation of the climate has been made based on rainfall data for the period 1901 to 1980 and other meteorological parameters for the period 1931 to 1960.

I. Climate

Areas of the state are covered by the following climatic patterns (Koppen's). They are tropical steppe, semi arid, hot and sub-tropical monsoon, mild winter and hot summer pattern (Fig.1(b)).

The state experiences four seasons in the year namely, the cold season from November to March, hot season from April to June, southwest monsoon season from the beginning of July to the first week of September and the post monsoon or transition season from September till the beginning of November.

During the cold season a series of western disturbances affect the climate of the state. In the summer months namely April to June, the weather is very dry and uncomfortable. Weather tends to be humid during July to September due to rise in the moisture content of the atmosphere. These monsoon months are fairly comfortable due to reduced day temperature, although humidity continues to be high.

II. Sea level pressure and winds

The seasonal variation of atmospheric pressure over the state takes place in a systematic manner with a maximum in the winter (January) and a minimum in the southwest monsoon season (July). The pressure gradient over the state generally remains weak. During January, the higher pressure is to the north. In April, the pressure is maximum towards west and it decreases eastwards. Winds, which are variable in January become westerly to northwesterly. With the advance of the summer, a low pressure area develops over the state. In July, the pressure decreases mainly from south to north over the state and the winds become southeasterly. October is the month of transition with the weakest pressure gradient. From October onwards the change over of the pressure and wind pattern to winter type commences. Table-1 gives the mean monthly wind speeds (kmph), predominant wind direction, during the year over six stations of the state.

III. Temperature

Table-2 gives the district mean daily maximum and minimum temperatures. Figures 2(a,b,c,d) and Figures 3(a,b,c,d) show the distribution of mean maximum and mean minimum temperatures

respectively for selected months. Figures 4 and 5 give the extremes of temperatures ever recorded based on available data, upto 1990.

Day temperatures are more or less uniform over the plains except during winter and monsoon seasons. In general, the night temperatures are lower in higher latitudes except during the post monsoon when they are more or less uniform. Both day and night temperatures are lower at high altitude stations than over the plains.

June is the hottest month with the mean maximum temperature of 41°C in the plains, elevated places recording 2°C to 5°C lower. The highest temperature ever recorded at an individual station in the plains is 48.5°C at Bhatinda on 26th May, 1984, which is about 6.5°C higher than the normal of the warmest month.

January is the coldest month, when the mean minimum temperature for the state as a whole is 5.3°C, varying from 4°C to 5°C in the west to 6°C to 7°C in the east. During winter, much lower temperatures may be experienced in the wake of western disturbances. On such occasions, minimum temperatures may drop below the freezing point at many places of the state. The lowest temperature on record at an individual station was -3.4°C at Bhatinda on 4th January, 1975 and Ludhiana on 18th November, 1976. This was about 8.0°C below the normal of the coldest month.

Both the maximum and minimum temperatures rise rapidly from January onwards till June. The increase in minimum temperature in the period from January to June ranges from 20°C to 22°C at individual stations. From July onwards, both the maximum and minimum temperatures start falling. From the beginning of July to the end of August, the maximum temperatures fall by 1.3°C to 2.0°C, whereas the minimum temperatures fall by about 0.5°C to 1.2°C. In September, a slight rise in the maximum temperatures is experienced due to the increased insolation. In August night temperatures start falling rapidly while the day temperatures follow this trend after October. Lowest values are attained in January. The fall in the minimum temperature and maximum temperature is about 17°C-22°C and 12°C-14°C respectively during these periods. In both cases the fall is more in the southern parts of the state.

The diurnal range of temperatures in July and August (about 8°C-11°C) is least during the year. It increases rapidly after the withdrawal of the monsoon. It is of the order of 14°C-18°C during November to May.

IV. Humidity

Table 3 gives the mean relative humidity observed at 0830 and 1730hours IST for the six individual stations and the whole of the state. The relative humidity is generally high throughout the year except during April to June. The mean is about 32% in May rising to 73% during August.

The diurnal variation in relative humidity is smallest during monsoon season and the highest during the winter period. The relative humidity is lowest during the summer afternoons of April and May.

V. Cloudiness

The period from October to November, May to June is cloudless or lightly clouded. During the period January to April, 2 to 3 Oktas of the sky will remain covered with clouds. During the monsoon season (July to September), skies are mostly clouded. July and August are the two months when 4 to 4.5 Oktas of the sky are covered with clouds. On an average in each of these two months, the sky remains overcast for 7 days and clear on 5.3 days. During October clouding becomes minimum over the entire state. Clouding is generally more in the afternoon than in the forenoon.

Tables 4 and 4(a) give the details of mean monthly total cloud amount and mean number of days with clear and overcast skies at 0830 and 1730 hours IST respectively. Table 4(b) shows the mean number of hours of bright sunshine per day for the three stations namely, Gurdaspur, Jullundur and Amritsar.

VI. Rainfall

Table-5 gives districtwise (12 districts) and meteorological subdivisional mean monthly and annual rainfall with number of rainy days in each month. The annual and seasonal distribution of rainfall are shown in Figures 6 to 6(d). From figures it can be seen that the total rainfall in the state varies from 26 cm over the extreme southwestern parts to 72 cm over the extreme southeastern parts and the same varies from 42 cm over the southern parts to 135 cm over northern parts.

The southwest monsoon season is the principal rainy season when the state receives 70 to 75% of the annual rainfall. Rainfall in the winter season (November-March) is about 11 to 16%

of the annual total, while in the hot weather season (April-June) and in the post monsoon season about 5 to 11% and 3 to 6% respectively.

Districts to the north of Gurdaspur constitute the area of maximum rainfall in the state and the districts situated to the southwestern side of Ferozpur receive minimum amount of rainfall. In the central parts of the state, annual rainfall varies from 40 cm to 60 cm. The districts adjacent to Rajasthan are more dry as compared to others. Annual rainfall over Ferozpur and Gurdaspur district are 38.9 cm and 110.6 cm respectively. These represent lowest and highest district rainfall. The state as a whole receives a total annual rainfall of 66 cm.

The southwest monsoon sets in the eastern parts of the state by about the last week of June and covers the entire state by the first week of July. July and August are the rainiest months, accounting individually to about 30% and 27% of the annual rainfall respectively. In each of these months, there are 7 to 8 rainy days (with daily rainfall of atleast 2.5 mm) for the state.

The withdrawal of the southwest monsoon begins from the western parts of the state around 1st September. The monsoon withdraws from the entire state by 15th September.

During winter (November-March), the state receives about 10 cm of rainfall, which although small in amount, is of great importance for agriculture. The rainfall occurs in association with western disturbances which move from west to east across northern parts of the country.

Table 6 gives the monthly and annual rainfall for three river catchments in the state. This shows that the river catchments belonging tothe northern parts of the state receive maximum amount of rainfall. As for example, 45% of the total rainfall in river catchment areas is contributed by Beas catchment in the state.

VII. Rainfall Variability

Co-efficient of variation of annual rainfall is 25 to 40% over the entire state. The co- efficient of variation lies between 60% and 80% over the state except over extreme south- western parts,

where it is more than 80%. In winter, co-efficient of variation is between 60 and 80% over the major portion of the state. In the post monsoon season the co-efficient of variation is extremely high.

VIII. Droughts and Excessive Rainfall

A. Droughts:

Meteorologically, drought over an area or a place may be defined as a situation when annual rainfall over the area or place is less than 75% of the normal. It is further classified as "Moderate Drought" if the rainfall deficit is between 26 and 50% and "Severe Drought" when it is more than 50%.

Areas where frequency of drought as defined above is 20% of the years examined are classified as 'drought areas' and areas having drought condition for more than 40% of the years under consideration represent 'chronically drought affected areas'.

During 80 years period from 1901 to 1980, drought conditions as prevailed over Punjab are described below.

The number of years for which the districts were affected by drought and also the total number of years whose rainfall data have been considered in this regard are shown below:-

	Districts	No.of years of drought	Total No.of years whose rainfall data are available
1.	Amritsar	20	79
2.	Gurdaspur	22	80
3.	Hoshiarpur	13	71
4.	Kapurthala	02	19
5.	Jullundur	17	79
6.	Ludhiana	14	79
7.	Ferozpur	22	79
8.	Bhatinda	29	78
9.	Faridkot	18	72
10.	Sangrur	24	70
11.	Patiala	20	78
12.	Rupnagar	13	68

The districts Hoshiarpur, Ludhiana and Rupnagar experienced the drought condition for less than 20% of the years under consideration and therefore, do not come under drought areas while the district Jullundur and Kapurthala satisfy marginally the criteria for being classed as "drought areas". Other districts come under drought area. It is noticed that drought conditions over the eastern part of the state is not as severe as it is over the remaining part.

Occasions of occurrence of drought conditions of districts in successive years were very frequent in this state. Severity of drought not only depends upon the order of rainfall deficiency in a single year, but also upon continued occurrence of deficient rain in successive years, even though the deficiency in each such successive year may not be as high as ina single year. The following Table (i) gives the years of successive drought as found from the available rainfall data during the 80 years period from 1901 to 1980 and the districts in which it occurred.

Table (i)

Years of successive drought	Affected districts
1901-1906	Bhatinda
1902-1903	Patiala, Sangrur
1904-1905	Amritsar, Gurdaspur, Rupnagar
1905-1906	Sangrur
1911-1913	Bhatinda
1915-1916	Bhatinda, Gurdaspur
1918-1922	Sangrur
1920-1921	Hoshiarpur,Ludhiana,Ferozpur,Gurdaspur, Patiala,Faridkot
1920-1922	Amritsar, Bhatinda, Jullundur
1927-1928	Amritsar, Gurdaspur
1928-1929	Hoshiarpur,Jullundur,Ludhiana,Bhatinda, Patiala, Sangrur,Rupnagar.
1931-1932	Patiala
1934-1935	Hoshiarpur, Rupnagar
1938-1939	Jullundur,Ludhiana,Ferozpur,Rupnagar, Faridkot
1938-1940	Patiala, Sangrur
1938-1941	Bhatinda
1946-1947	Ferozpur
1951-1952	Amritsar
1952-1953	Bhatinda

Years of successive drought	Affected districts
1963-1964	Kapurthala
1968-1969	Sangrur
1969-1970	Ferozpur
1968-1970	Faridkot

The above table clearly brings out the area which was simultaneously affected by drought conditions. Further, rainfall of less than 50% of the annual normal representing severe drought conditions occurred in various districts as indicated in the following Table (ii), where the actual rainfall expressed as percentage of the normal rainfall is given in brackets against each district.

Table (ii)

Year	Districts affected (actual rainfall as % of normal)
1902	Gurdaspur (42)
1904	Bhatinda (49)
1905	Sangrur (49)
1915	Bhatinda (33)
1918	Rupnagar (40)
1920	Bhatinda (35)
1921	Bhatinda (37), Amritsar (49)
1929	Bhatinda (48), Patiala (48)
1932	Sangrur (45)
1934	Sangrur (42)
1939	Bhatinda (47)
1943	Bhatinda (47)
1946	Ferozpur (38), Bhatinda (47) Sangrur (45), Faridkot (46)
1968	Faridkot (44)
1974	Ludhiana (44)
1978	Patiala (17)

It can be seen that the lowest district rainfall expressed as percentage of the annual normal was only 17 in Patiala district in 1978.

1918, 1920, 1921, 1939 were the years of widespread drought when the number of districts experiencing rainfall less than 75% of the annual normal was 10 to 11 out of 12 district of the state.

In the year 1918 and 1921, almost the whole state was affected by drought condition. Hoshiarpur, Jalandhar and Kapurthala have never been affected by severe drought so far. Considering the state as a whole, the probability of occurrence of mild drought and moderate drought is about 19% i.e. 19 times in 100 years in the long run. The probability of occurrence of severe drought (rainfall less than 50% of the normal) is nil.

During the period 1901 to 1980, the state was free from drought in the 28 years namely 1909, 1910, 1914, 1917, 1923, 1925, 1926, 1930, 1933, 1936, 1942, 1944, 1948, 1950, 1954, 1955, 1956, 1957, 1958, 1959, 1961, 1962, 1966, 1971, 1973, 1975, 1977 and 1980.

In the 11 years namely, 1908, 1919, 1931, 1937, 1945, 1947, 1953, 1964, 1967, 1976 and 1978 only one district experienced the drought condition. From what has been stated, it is seen that the state as a whole can generally be considered as non drought prone, only in the meteorological sense of severe drought (Rainfall <50% of normal).

B. Excessive Rainfall

It may generally be said that rainfall, sufficiently in excess of the normal is a predominant factor for occurrence of floods, particularly in high rainfall region. Even with coefficient of variation of rainfall of 20% or less, these regions are prone to frequent floods. For the purpose of the present description, annual rainfall of 125% or more of normal is considered as excessive rain.

The following Table (iii) gives the district-wise excessive rainfall years, the highest annual rainfall with the year of occurrence and the same expressed as % of normal.

Table (iii)

Districts	Years of Excessive Rainfall	Highest amount of rainfall (expressed as % of normal with year).
Amritsar	1908, 1914, 1917, 1933, 1950, 1955, 1956, 1958, 1959, 1961, 1962, 1966, 1967, 1971, 1973, 1976, 1977, 1978.	110.5 cm in 1955 and 1976 (185%)
Gurdaspur	1917, 1942, 1950, 1955, 1956, 1958, 1959, 1961, 1967, 1971, 1974, 1975, 1976, 1977, 1978.	168.8 cm in 1955 (153%)
Hoshiarpur	1906, 1909, 1910, 1914, 1917, 1942, 1945, 1950, 1955, 1956, 1957, 1959, 1970, 1975, 1976.	186.0 cm in 1976. (227%)

Districts	Years of Excessive Rainfall	Highest amount of rainfall (expressed as % of normal with year).
Kapurthala	1955.	126.8 cm in 1955 (163%)
Jalandhar	1909, 1914, 1917, 1933, 1945, 1950, 1955, 1957, 1958, 1962, 1966, 1973, 1978, 1980.	127.3 cm in 1917 (181%)
Ludhiana	1909, 1917, 1923, 1933, 1942, 1945, 1950, 1955, 1958, 1962, 1963, 1964, 1977.	131.0 cm in 1917 (198%)
Ferozepur	1908, 1909, 1914, 1917, 1931, 1942, 1950, 1954, 1958, 1961, 1962, 1964, 1973, 1976, 1979, 1980.	100.3 cm in 1980 (258%)
Faridkot	1908, 1909, 1914, 1917, 1923, 1933, 1942, 1945, 1950, 1955, 1961, 1962, 1966, 1967, 1976.	91.9 cm in 1917 (212%)
Bhatinda	1908, 1909, 1917, 1923, 1933, 1942, 1945, 1950, 1951, 1955, 1956, 1958, 1975, 1976.	94.4 cm in 1917 (220%)
Sangrur	1909, 1917, 1923, 1942, 1945, 1955, 1957, 1958, 1960, 1964, 1970.	110.4 cm in 1970 (198%)
Patiala	1909, 1914, 1917, 1933, 1942, 1947, 1949, 1950, 1953, 1955, 1958, 1959, 1960, 1967, 1970, 1973, 1976, 1977.	118.2 cm in 1933 (182%)
Rupnagar	1906, 1917, 1933, 1936, 1942, 1945, 1955, 1958, 1959, 1961, 1964.	135.5 cm in 1942 (169%)

From the above table it can be seen that during the period under consideration, the districts of the state recorded excessive rainfall in 40 years, the maximum amount being 258% of normal annual rainfall in the year 1980 for the district Ferozepur. Amritsar, Patiala, Ferozepur had 18,18,16 years of such excess rainfall respectively. Other districts had 11 to 15 years of such rainfall (except Kapurthala which had only 1 year of such rainfall). Two or more successive years of excessive rainfall are shown against each district.

	Districts	Successive years of excessive rainfall
1.	Amritsar	1955-56, 1958-59, 1961-62, 1966-67, 1976-77-78
2.	Gurdaspur	1955-56, 1958-59, 1974-75-76-77-78
3.	Hoshiarpur	1909-10, 1955-56-57, 1975-76
4.	Kapurthala	Nil
5.	Jullundur	Nil
6.	Ludhiana	1962-63-64
7.	Ferozpur	1908-09, 1961-62, 1979-80
8.	Faridkot	1908-09, 1961-62, 1966-67
9.	Bhatinda	1908-09, 1950-51, 1955-56, 1975-76
10.	Sangrur	1957-58
11.	Patiala	1949-50, 1958-60, 1976-77
12.	Rupnagar	1958-59

None of the districts Kapurthala, Jullundur, experienced two consecutive years of excessive rainfall. Each of the districts Amritsar, Hoshiarpur, Ludhiana and Patiala experienced excessive rainfall in 3 consecutive years only once and the district Gurdaspur experienced the same in 5 consecutive years only once. The heaviest one day rainfall recorded at any station in the state was 538.5 mm at Rohiti (Patiala district) on September 28, 1958.

While noting vagaries of rainfall over the state, it is seen that in the period 1901-43, the state as a whole experienced drought conditions 13 times whereas in the period 1944-80, it experienced the same only twice. It is thus seen that the number of occasions of drought declined considerably during the period 1944-80. The Fig.7 shows the annual rainfall series (1901-80) (expressed as % of normal) for the state.

The probability of occurrence of excessive rain over the state is seen to be about 15% i.e. 3 times in the 20 years in the long run.

IX. Cyclonic storms and depressions:

A. Cyclonic Storms:

The cyclonic storms and depressions which affect India originate and/or intensify over the Bay of Bengal, mostly during May to November or December.

Some of them originating over the Arabian Sea also affect Konkan, Gujarat, Saurashtra and Kutch and northwest India during the above period. They usually travel west northwest and

cross the coast. In general, storms and depressions weaken on entering land. Hence, the state situated far inland does not experience the full fury of the severe storms or depressions like the coastal regions. During the course of movement, the disturbances sometimes turn or recurve towards north or northeast. This point of turning progressively shifts westwards till September. For example, the distrubances in May recurve while still out in the Bay of Bengal. As such, exceptionally a few of them which cross the coast and travel inland, weaken far away from the state and cannot affect it. During the period 1891-1970, 3 such storms originating over the Arabian Sea affected Punjab viz. in May 1892, May 1902, September 1947. The disturbances during the period June to September form over the head Bay of Bengal and travelling westwards pass across the state of Madhya Pradesh. During this period, sometimes they move west or northwestwards as far as Rajasthan and recurve northeastwards under the influence of the deep westerly system moving slowly across west Pakistan and northwest India. With the advance of the year, the Bay storms and depressions progressively take southerly course.

B. Depressions:

The tracks of Bay cyclones are still more southerly in October and November and these have no influence on Punjab weather. The Bay cyclonic storms or depressions which reach the state generally become weak considerably due to long land travel. Maximum number of storms and depressions affect the state in the month of August/September.

Table 7 gives the total number of depressions or storms which affected the state during 80 years period ending 1970.

X. Other Weather Phenomena

With the advance of the summer, thunder activity becomes pronounced due to ground heating. When moisture is insufficient in the atmosphere, dry thunderstorms or duststorms occur. The maximum number of thunderstorms occur with the approach of monsoon current, while duststorms are mainly confined to summer months of April to June. Premonsoon and monsoon thunderstorms are sometimes severe and accompanied by squall.

The average number of days of thunderstorms during the monsoon may vary from 15 to 2 for an individual station. The northern parts of the state experience more thunderstorms than the southern parts, the maximum being in the June/July months. In the winter months the state experiences thunderstorms sometimes accompanied by hail in association with western disturbances.

Fog

Conditions like light to calm wind, clear skies etc favour the occurrence of radiation fog. These exist after the withdrawal of the monsoon till March. Fog occurs occasionally during November to March.

Western Disturbances

The extra tropical disturbances (known as the western disturbances) originating from Caspian Sea and Mediterranean Sea and moving across Iran, Afghanistan and South USSR reach northwest India as:

(a) Depressions or well marked low pressure areas at the surface associated with upper air cyclonic circulation,

(b) Weak low pressure areas on the surface,

(c) Upper air cyclonic circulations or troughs.

Winter precipitation over the Himalayan regions of Jammu & Kashmir, Himachal Pradesh and hills of Uttar Pradesh and other parts of northwest India are mainly due to the passage of these western disturbances. It is observed that when the surface low associated with the disturbance forms to the north of 30°N latitude, Great Himalayan ranges receive maximum snow precipitation. When the distinct low forms over the central Pakistan and adjoining Punjab, Haryana and Rajasthan areas, the Pir Panjal range and Central Himalayan ranges receive more precipitation.

TABLE - I

Mean Wind Speed (kmph) and Predominant Wind Direction

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
PUNJAB														
Amritsar	a	6.9	7.6	9.8	10.1	12.1	12.3	11.7	9.1	6.9	6.6	5.2	5.4	8.6
	m	C/NW	C/NW	NW/Var	NW/Var	E/NW	SE/Var	SE/E	E/SE	C/E	C/E	C/E	C/NW	
	e	NW	NW	NW	NW	NW	W/NW	SE/E	E/SE	NW	NW	NW	NW	
Bhatinda	a	3.1	4.0	5.1	5.7	5.8	7.0	8.0	5.8	4.1	3.4	2.5	2.9	4.8
	m						- Data not available -							
	e						- Data not available -							
Ferozpur	a	1.8	2.6	3.3	3.3	3.5	3.2	2.8	2.2	2.0	1.7	1.4	1.3	2.4
	m	C	C/Var	C/NW/NE	C/NE/NW	C/NE/NW	C/SW	C/SE	C/SW	C/SW	C/Var	C	C	
	e	C/NW	C/NW	C/NW	C/NW	C/NW	C/NW	C/NW	C/NE	C/NW	C/Var	C	C	
Ludhiana	a	2.6	3.2	3.9	4.0	4.8	4.9	4.2	3.4	2.9	2.2	2.0	1.9	3.3
	m	C/NW	C/NW	C/NW	C/NW	C/SE	SE/C	SE/C	C/SE	C/SE	C/SE	C/Var	C/NW	
	e	C/NW	NW	NW	NW	NW	NW/C	C/SE	C/NE/SE	C/NW	C/NW	C/NW	C/NW	
Patiala	a	7.2	9.3	9.3	9.6	9.8	9.3	7.5	6.1	5.9	6.2	6.5	6.2	7.7
	m	NW/C	NW	NW/N	NW/N	N/NW	SE	SE	SE	SE	SE/C	C/NW	C/NW	
	e	NW	NW	NW	NW	NW	NW	SE	SE/C	NW/C	C/NW/N	NW/C	NW/C	
Pathankot	a	5.7	6.4	8.8	9.9	11.8	10.9	9.0	6.8	6.9	5.7	6.1	5.1	7.8
	m	C/E/NE	C/E/NE	E	C/E/NE	C/NE	C/E	C/E	C/NE	C/E	C/E/NE	E	C/E	
	e	W	W	W	W	W	W	W	C/W	C/W	C/W	C/W	C/W	
Sub-Div. Means (Wind Speed)		4.5	5.5	6.7	7.1	8.0	7.9	7.2	5.6	4.8	4.3	3.9	3.8	5.8

a: *Mean wind speed in Kms per hour.*
m: *Predominant wind direction in the morning.*
e: *Predominant wind direction in the evening.*
Var: *Variable.*
C: *Calm. The next predominant direction is also indicated when calm is mentioned.*

TABLE - II

Mean Maximum and Mean Minimum Temperature ^{0}C

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
							PUNJAB							
Amritsar	Max.	18.6	22.6	27.5	34.2	38.9	40.4	35.6	34.2	34.4	31.9	26.5	21.4	30.5
	Min.	4.5	6.5	11.5	16.2	21.4	25.2	25.9	25.3	23.3	16.6	8.8	5.0	15.9
Bhatinda	Max.	21.2	24.2	29.4	35.1	39.6	42.0	37.9	35.9	35.4	34.1	27.9	22.5	32.1
	Min.	3.9	8.3	12.6	18.3	22.4	27.6	27.0	25.8	23.2	16.7	9.4	4.4	16.6
Firozpur	Max.	19.3	23.4	28.2	34.8	39.5	41.1	36.6	35.3	34.6	32.9	27.5	21.9	31.3
	Min.	5.1	7.6	12.6	17.4	22.4	26.3	26.6	26.1	23.4	16.9	9.7	6.2	16.7
Ludhiana	Max.	20.2	23.3	29.0	36.0	41.2	41.1	36.0	34.7	35.3	33.9	28.8	22.9	31.9
	Min.	5.8	8.4	12.9	18.5	24.2	27.1	26.7	26.1	23.9	17.5	10.1	6.2	17.3
Patiala	Max.	20.2	24.2	29.4	36.0	40.2	40.4	35.2	33.5	34.4	32.4	28.2	23.1	31.4
	Min.	7.1	9.3	13.8	19.2	24.0	26.7	26.4	25.5	23.8	17.8	10.6	7.3	17.6
Pathankot	Max.	18.4	22.2	27.1	33.5	39.0	40.2	34.1	32.5	32.8	30.8	25.9	21.1	29.8
	Min.	5.6	8.4	13.5	17.9	23.2	26.1	25.0	24.0	22.4	16.9	9.8	6.9	16.6
Sub-Div.	Max.	19.7	23.3	28.4	34.9	39.7	40.9	35.9	34.3	34.5	32.7	27.5	22.1	31.2
Means.	Min.	5.3	8.1	12.8	17.9	22.9	26.5	26.3	25.5	23.3	17.1	9.7	6.0	16.8

TABLE - III

Mean Relative Humidity (%)

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
							PUNJAB							
Amritsar	M	92	84	72	48	38	46	75	82	76	74	79	88	71
	E	61	45	40	23	19	26	57	65	53	45	45	54	44
Bhatinda	M	68	66	62	52	51	53	71	77	72	61	62	67	63
	E	52	47	43	39	40	36	58	65	58	47	49	53	49
Ferozpur	M	89	80	71	55	48	53	73	79	73	70	79	89	72
	E	55	43	45	31	28	31	56	65	56	46	50	59	47
Ludhiana	M	83	78	67	47	37	49	74	79	74	64	64	79	66
	E	53	44	38	27	22	32	60	66	53	39	39	50	44
Patiala	M	81	69	59	40	36	51	77	83	76	66	62	78	65
	E	55	41	34	20	20	31	60	67	58	47	45	53	44
Pathankot	M	84	74	56	34	25	35	75	82	74	60	60	75	61
	E	61	46	40	24	19	28	61	70	63	52	49	58	48
Sub-Div.	M	83	75	65	46	39	48	74	80	74	66	68	79	66
Means.	E	56	44	40	27	25	31	59	66	57	46	46	55	46

M: Morning.
E: Evening.

TABLE - IV

Mean Cloud Amount ** (Okta of the Sky)And Mean Number of Days of Clear or Overcast Skies at 0830 Hours IST.

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
PUNJAB														
Amritsar	a	8	9	7	12	17	17	5	4	12	23	17	9	11.7
	b	4	2	3	1	1	1	6	5	2	1	0	2	2.3
	c	3.1	2.7	3.1	2.2	1.9	1.6	3.8	4.0	1.9	0.9	1.4	2.6	2.4
Bhatinda	a													
	b						- Data Not Available -							
	c													
Ferozpur	a	16	15	16	19	23	22	11	9	17	26	22	19	17.9
	b	4	2	2	1	1	1	4	4	2	1	0	2	2.0
	c	2.5	2.1	2.1	1.4	1.1	1.2	3.0	3.1	1.7	0.8	1.0	1.8	1.8
Ludhiana	a	13	12	15	18	21	17	6	5	15	25	23	16	15.5
	b	3	3	3	2	1	3	6	6	3	1	1	2	2.8
	c	2.9	2.7	2.4	1.7	1.3	2.1	4.5	4.4	2.9	0.8	0.8	2.1	2.4
Patiala	a	9	12	10	14	19	17	5	3	10	22	20	13	12.8
	b	2	1	2	1	2	2	5	7	3	1	0	1	2.3
	c	3.1	2.6	2.9	1.9	1.7	1.7	4.7	5.1	3.1	1.2	1.1	2.5	2.6
Pathankot	a	9	9	7	10	15	14	3	2	9	21	16	11	10.5
	b	9	6	8	5	4	5	13	14	7	2	2	6	6.7
	c	3.9	3.3	3.7	2.9	2.5	2.6	5.4	5.7	3.5	1.2	1.9	3.0	3.3
Sub-Div. Means.	a	11.0	11.4	11.0	14.6	19.0	17.4	6.0	4.6	12.6	23.4	19.6	13.6	13.7
	b	4.4	2.8	3.6	2.0	1.8	2.4	6.8	7.2	3.4	1.2	0.6	2.6	3.2
	c	3.1	2.7	2.8	2.0	1.7	1.8	4.3	4.5	2.6	1.0	1.2	2.4	2.5

** *Okta = Unit, equal to area of one eighth of the sky used in describing the extent of cloud cover.*

For example, 1 okta means 1/8th of the sky covered.

a - Days with clear sky. *b - Days with sky overcast.* *c - Mean cloud amount.*

TABLE - IV(a)

Mean Cloud Amount ** (Okta of the Sky)And Mean Number of Days of Clear or Overcast Skies at 1730 Hours IST.

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
							PUNJAB							
Amritsar	a	6	8	5	8	16	18	5	2	11	21	16	8	10.3
	b	4	2	3	2	1	0	3	2	1	0	0	3	1.7
	c	3.4	2.7	3.4	2.6	1.7	0.9	3.2	3.6	2.3	0.7	1.5	2.8	2.4
Bhatinda	a													
	b						- Data Not Available -							
	c													
Firozpur	a	13	16	13	17	21	23	10	8	17	27	22	18	17.2
	b	4	2	2	0	1	1	4	3	2	1	1	2	1.9
	c	2.9	1.9	2.6	1.7	1.2	0.8	2.9	3.4	1.8	0.7	1.3	2.1	1.9
Ludhiana	a	13	12	13	14	19	17	6	4	12	25	22	14	14.3
	b	4	2	3	2	1	1	4	4	3	1	0	2	2.3
	c	3.0	2.6	2.6	2.2	1.7	1.8	4.0	4.3	2.3	0.7	1.0	2.3	2.4
Patiala	a	6	9	5	8	12	11	2	1	5	17	16	7	8.3
	b	1	1	3	2	2	2	2	3	1	1	0	1	1.6
	c	3.1	2.8	3.4	2.8	2.0	2.0	4.8	5.0	3.2	1.3	1.3	2.8	2.9
Pathankot	a	6	5	5	7	8	8	2	2	6	14	14	9	7.2
	b	13	9	12	9	7	6	11	9	5	2	5	10	8.2
	c	4.6	4.1	4.7	4.1	3.2	2.9	4.7	4.6	3.1	1.5	2.6	3.7	3.7
Sub-Div.	a	8.8	10.0	8.2	10.8	15.2	15.4	5.0	3.4	10.2	20.8	18.0	11.2	11.4
Means.	b	5.2	3.2	4.6	3.0	2.4	2.0	4.8	4.2	2.4	1.0	1.2	3.6	3.1
	c	3.4	2.8	3.3	2.7	2.0	1.7	3.9	4.2	2.5	1.0	1.5	2.7	2.6

** *Okta = Unit, equal to area of one eighth of the sky used in describing the extent of cloud cover.*

For example, 1 okta means 1/8th of the sky covered.

a - Days with clear sky. *b - Days with sky overcast.* *c - Mean cloud amount.*

TABLE - IV(b)

Mean Number of Hours of Bright Sunshine Per Day

Station	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
							PUNJAB						
Gurdaspur	6.1	7.5	7.1	9.3	10.1	9.1	7.0	7.6	8.0	9.3	9.1	7.4	8.1
Jullundur	7.1	8.3	7.7	9.5	10.3	9.7	7.3	7.5	7.9	9.3	8.8	7.7	8.4
Amritsar	6.9	8.0	7.7	9.2	10.0	9.1	7.6	7.8	8.6	9.2	8.5	7.2	8.3

TABLE - V

Mean Rainfall (mm) and Number of Rainy Days

District		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
							PUNJAB							
Hoshiarpur	a	38.9	37.7	32.9	13.8	14.7	55.0	247.7	213.9	116.0	23.3	5.1	19.8	818.8
	b	2.7	2.6	2.3	1.3	1.2	3.2	9.5	8.6	4.2	0.9	0.4	1.5	38.4
Jullundur	a	29.9	32.1	29.4	11.3	14.1	51.3	206.7	183.9	101.0	21.9	5.1	16.3	703.0
	b	2.4	2.4	2.3	1.2	1.3	3.1	8.5	7.9	4.0	0.9	0.5	1.2	35.7
Ludhiana	a	27.8	29.1	26.5	11.6	14.1	47.2	194.5	172.0	101.0	17.5	4.2	14.8	660.3
	b	2.1	2.3	2.0	1.1	1.3	3.1	8.2	7.7	4.0	0.8	0.5	1.2	34.3
Ferozpur	a	17.5	14.4	15.3	8.1	7.9	28.2	109.9	102.6	65.2	8.7	2.3	8.5	388.6
	b	1.5	1.3	1.3	0.7	0.8	1.8	4.8	4.6	2.4	0.5	0.2	0.7	20.6
Amritsar	a	30.1	24.9	27.8	14.5	11.4	35.9	170.2	159.5	85.8	19.5	4.3	14.8	598.7
	b	2.3	2.1	2.2	1.5	1.1	2.4	7.2	7.0	3.3	0.8	0.4	1.1	31.4
Kapurthala	a	37.8	23.9	24.5	6.3	8.9	23.6	255.9	174.2	122.1	88.3	3.4	10.0	778.9
	b	3.1	1.2	2.3	0.5	0.9	2.1	8.1	7.4	4.3	1.4	0.3	0.9	32.5
Gurdaspur	a	59.4	50.3	50.9	22.9	18.6	58.9	325.0	317.6	136.2	28.9	8.2	29.1	1106.1
	b	3.4	3.2	3.3	2.0	1.6	3.5	11.1	11.1	4.9	1.1	0.7	1.7	47.6

contd.....

TABLE - V(contd.)

Mean Rainfall (mm) and Number of Rainy Days

District		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
							PUNJAB							
Bhatinda	a	12.4	15.7	12.3	3.4	8.3	25.4	121.3	123.2	75.2	24.1	1.6	6.9	429.8
	b	1.0	1.1	1.1	0.4	0.7	1.6	4.9	5.2	2.8	0.7	0.2	0.6	20.3
Patiala	a	28.7	22.6	19.3	5.2	8.9	36.3	190.1	172.8	120.7	31.3	2.8	9.4	648.1
	b	2.0	1.7	1.5	0.5	0.8	2.0	7.1	7.1	4.1	1.1	0.2	0.7	28.8
Sangrur	a	20.2	18.0	16.0	6.2	12.4	35.9	162.0	143.2	105.5	25.3	3.0	9.9	557.6
	b	1.5	1.4	1.4	0.6	0.9	2.0	6.0	6.0	3.5	0.9	0.3	0.7	25.2
Rupnagar	a	41.9	37.5	26.5	11.0	14.9	58.5	240.5	207.3	122.6	20.9	4.7	15.1	801.4
	b	2.9	2.7	2.1	1.1	1.3	3.7	9.9	9.4	4.8	1.1	0.4	1.3	40.7
Faridkot	a	17.9	14.9	17.9	7.6	10.8	30.6	119.0	112.0	77.2	13.0	3.1	9.0	433.0
	b	1.4	1.4	1.6	0.7	1.1	1.9	5.7	5.8	3.1	0.6	0.3	0.8	24.4
Sub-Div.	a	30.2	26.8	24.9	10.2	12.1	40.6	195.2	173.5	102.4	26.9	4.0	13.6	660.4
Means.	b	2.2	1.9	1.9	1.0	1.1	2.5	7.6	7.3	3.8	0.9	0.4	1.0	31.6

a) Normal rainfall.
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 basins of Punjab State

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1) **River Sutlej :**													
Districts/Parts of districts within this catchment:- Rupnagar, Hoshiarpur, Jalandhar, Ludhiana, Ferozepur, Bhatinda,Kapurthala, Patiala, Sangrur.	22.5	21.3	18.7	7.1	10.6	36.0	162.2	148.3	95.1	22.4	3.0	10.4	557.6
2) **River Beas :**													
Districts/Parts of districts within this catchment:- Hoshiarpur, Gurdaspur, Kapurthala.	55.9	46.3	47.5	20.1	17.4	56.5	316.7	294.6	136.1	37.6	7.6	26.2	1062.6
3) **River Ravi :**													
Districts/Parts of districts within this catchment:- Amritsar, Gurdaspur.	37.1	31.5	33.3	16.5	13.1	40.8	207.3	201.0	97.7	21.6	5.0	18.4	723.3

TABLE - VII

STORMS/DEPRESSIONS AFFECTING PUNJAB STATE DURING 1891 TO 1970

Month	No. of Storms/Depressions
January	-
February	-
March	-
April	-
May	2
June	1
July	1
August	2
September	14
October	1
November	-
December	-
TOTAL	21

AMRITSAR DISTRICT

The climate of this district is characterised by general dryness except in the brief southwest monsoon season, a hot summer and bracing winter. The year may be divided into four seasons. The cold season is from November to March. The period from April to June is the hot season. The southwest monsoon season is from about the beginning of July to the first week of September. The succeeding period lasting till the beginning of November is the post monsoon or transition period.

RAINFALL

Records of rainfall are available for 8 stations, for sufficiently long periods, the details of which are given in tables 1 and 2. The average annual rainfall is 598.7 mm. Rainfall increases generally from the southwest towards the northeast and varies from 508.8 mm at Khara to 681.1 mm at Amritsar (Aerodrome). About 69 percent of the annual normal rainfall is received during the period July to September and about 12 percent during the period December to February. The variation in the rainfall from year to year is large. During the 80 year period (1901 to 1980) the highest annual rainfall, 185 percent of the normal, occurred in 1955 and 1976 while the lowest annual rainfall, 49 percent of the normal, occurred in 1921. During this period the annual rainfall was less than 80 percent of the normal in 26 years. Two consecutive years of such rainfall occurred four times, three consecutive years occurred once. Annual rainfall was between 301 to 800 mm in 66 years out of 79 years (Table 2).

In the district, there are generally 31 rainy days in a year. These vary from 25 at Khara to 36 at Amritsar (Aerodrome).

The heaviest rainfall in 24 hours recorded at any station in the district is 457.2 mm at Khara on 5th October, 1955.

TEMPERATURE

A meteorological observatory is located at Amritsar and records of this obervatory may be taken as representative of the conditions in the district, in general.

Temperatures increase steadily from about the end of March till June, which is the hottest month, with mean daily maximum and minimum temperature being 40.4°C and 25.2°C respectively. The heat during the summer is intense and the hot dust laden winds which blow during the afternoons add to the discomfort.

Appreciable drop in day temperatures occur with the onset of the monsoon towards the end of June or the beginning of July. The nights are, however, as warm during the monsoon season as in summer and due to the increased moisture the weather is often oppressive.

After the withdrawal of the monsoon, early in September, the day temperatures remain as in the monsoon season but nights become progressively cooler. From October there is a rapid drop in temperatures. January is generally the coldest month with the mean daily maximum and minimum temperatures being 18.6°C and 4.5°C respectively.

During the cold season the district is affected by cold waves in the rear of passing western disturbances and the minimum temperature occasionally drops down to a degree or two below the freezing point. Frosts are common during the cold season.

The highest maximum temperature recorded at Amritsar was 47.7°C on 21st May 1978. The lowest minimum was -3.3°C on 25th December 1984.

HUMIDITY

Relative humidity is generally high in the mornings, exceeding 70 percent, except during the summer season when it is less than 50 percent.

The humidity is comparatively less in the afternoons. The driest part of the year is the summer season when the relative humidities in the afternoons are about 25 percent or less.

CLOUDINESS

The skies are generally partly to heavily clouded and occasionally overcast during the monsoon season and for brief spells of a day or two in association with passing western disturbances during the cold season. During the rest of the year the skies are mostly clear or lightly clouded.

WINDS

Winds are generally light with some strengthening in the summer and early part of the monsoon season. In the post monsoon and cold season winds are light and variable in direction in the mornings and mostly from the west or northwest in the afternoons. In April and May winds are mainly from directions between northwest and northeast in the mornings and between west and northeast in the afternoons. By June easterlies and southeasterlies also blow and in the southwest monsoon season winds are more commonly from directions between northeast and southeast.

SPECIAL WEATHER PHENOMENA

Western disturbances affect the weather over the district during the cold season, causing widespread rain and gusty winds. Duststorms and thunderstorms occur in the summer season. Occasional fog occurs in the cold season.

Tables 3, 4 and 5 give the temperature and humidity, mean wind speed and special weather phenomena respectively for Amritsar.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Amritsar (Aerodrome)	30	a	28.0	21.7	29.0	12.2	14.4	57.6	186.2	184.0	102.2	24.8	6.2	14.8	681.1	156 (1978)	50 (1972)	308.4	1962 Sep 22
		b	2.4	2.0	2.6	1.5	1.3	3.1	8.2	8.0	3.6	1.2	0.6	1.2	35.7				
Bhuchar	68	a	28.1	21.2	26.8	14.9	8.4	35.0	170.8	164.0	86.7	18.1	4.1	13.7	591.8	242 (1976)	28 (1921)	239.7	1976 Aug 01
		b	2.1	1.7	1.9	1.2	0.9	2.1	6.3	6.2	2.8	0.7	0.3	1.0	27.2				
Khara	64	a	26.3	22.6	23.6	12.9	7.7	21.9	144.2	139.3	73.7	20.2	3.4	13.0	508.8	382 (1955)	31 (1927)	457.2	1955 Oct 05
		b	1.8	1.9	1.6	1.3	0.8	1.6	5.9	5.7	2.5	0.4	0.3	0.9	24.7				
Taran-Taran	72	a	28.1	23.6	26.3	13.3	12.1	30.4	155.1	140.9	78.9	18.0	4.1	14.4	545.2	215 (1917)	40 (1932)	258.3	1894 Jun 19
		b	2.1	2.2	2.2	1.4	1.3	2.2	7.0	6.3	3.1	0.7	0.3	1.1	29.9				
Raya	64	a	36.6	31.2	29.7	15.0	12.4	36.6	185.9	174.1	87.5	27.5	3.8	15.6	655.9	212 (1956)	24 (1902)	367.0	1955 Oct 05
		b	2.6	2.5	2.3	1.6	1.1	2.8	8.1	7.6	3.7	0.8	0.4	1.2	34.7				
Amritsar-Jail Hospital	61	a	32.5	26.7	28.2	16.3	11.3	37.5	169.2	155.9	81.9	19.1	4.5	16.1	599.2	191 (1908)	49 (1927)	227.8	1955 Oct 05
		b	2.5	2.3	2.3	1.7	1.3	2.5	7.3	7.1	3.5	0.8	0.5	1.2	33.0				
Amritsar	72	a	30.5	26.7	28.1	16.0	10.5	32.5	175.2	154.5	92.0	15.0	4.4	16.1	601.5	213 (1976)	47 (1922)	396.2	1881 Jul 10
		b	2.2	2.2	2.4	1.6	1.3	2.4	7.3	7.3	3.6	0.8	0.4	1.2	32.7				
Ajnala	72	a	30.4	25.3	30.9	15.8	14.6	35.8	175.0	163.3	83.2	12.9	4.0	14.7	605.9	190 (1976)	45 (1918)	240.2	1962 Sep 22
		b	2.4	2.4	2.5	1.5	1.2	2.4	7.5	7.6	3.3	0.7	0.4	1.1	33.0				
Amritsar (District)		a	30.1	24.9	27.8	14.5	11.4	35.9	170.2	159.5	85.8	19.5	4.3	14.8	598.7	185 (1976)	49 (1921)		
		b	2.3	2.1	2.2	1.5	1.1	2.4	7.2	7.0	3.3	0.8	0.4	1.1	31.4				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2
Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(A M R I T S A R)

Range in mm	No. of years	Range in mm	No. of years
201 - 300	1	701 - 800	13
301 - 400	10	801 - 900	7
401 - 500	16	901 - 1000	1
501 - 600	19	1001 - 1100	2
601 - 700	8	1101 - 1200	2

(Data available for 79 years only).

TABLE - 3
Period Averages of Temperature and Relative Humidity
(A M R I T S A R)

MONTH	Mean Daily Maximum Temperature °C	Mean Daily Minimum Temperature °C	Highest ever °C	Maximum recorded Date	Lowest ever °C	Minimum recorded Date	Relative Humidity 0830 %	Relative Humidity 1730★ %
January	18.6	4.5	26.2	1965 Jan 15	-2.9	1989 Jan 12	92	61
February	22.6	6.5	32.2	1953 Feb 28	-2.6	1974 Feb 08	84	45
March	27.5	11.5	35.6	1953 Mar 25	2.0	1979 Mar 09	72	40
April	34.2	16.2	44.1	1979 Apr 29	6.8	1986 Apr 03	48	23
May	38.9	21.4	47.7	1978 May 21	11.9	1986 May 21	38	19
June	40.4	25.2	47.1	1978 Jun 04	15.6	1958 Jun 01	46	26
July	35.6	25.9	45.6	1954 Jul 01	18.2	1987 Jul 08	75	57
August	34.2	25.3	40.7	1964 Aug 04	19.2	1988 Aug 30	82	65
September	34.4	23.3	40.6	1949 Sep 13	15.5	1982 Sep 29	76	53
October	31.9	16.6	38.3	1951 Oct 06	8.3	1953 Oct 31	74	45
November	26.5	8.8	34.2	1965 Nov 01	-0.6	1949 Nov 24	79	45
December	21.4	5.0	27.7	1958 Dec 03	-3.3	1984 Dec 25	88	54
Annual	30.5	15.9					71	44

★ Hours IST.

TABLE - 4

Mean Wind Speed in Km/hr.

(A M R I T S A R)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
6.9	7.6	9.8	10.1	12.1	12.3	11.5	9.1	6.9	6.6	5.2	5.4	8.6

TABLE - 5

Special Weather Phenomena

(A M R I T S A R)

Mean No.of Days With ⋆	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.8	2	4	5	4	6	10	9	5	1.7	0.6	0.6	50
Hail	0.3	0.2	0.2	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.9
Dust-storm	0.0	0.0	0.2	1.0	3	4	0.9	0.4	0.5	0.2	0.0	0.0	10
Squall	0.2	0.2	0.1	0.4	0.1	0.5	0.2	0.6	0.5	0.0	0.2	0.0	3
Fog	2	0.7	0.0	0.2	0.2	0.0	0.0	0.0	0.2	0.2	0.4	1.9	6

⋆ No. of days two and above are given in whole numbers.

BHATINDA DISTRICT

The climate of this district is on the whole dry and is characterised by a very hot summer, a short rainy season and bracing cold season. The year may be divided into four seasons. The cold season from November to March is followed by the summer season which lasts upto the end of June. The period from July to the middle of September constitutes the southwest monsoon season. The latter half of September and October may be termed as the post monsoon season.

RAINFALL

Records of rainfall in the district are available for fifteen stations for sufficiently long period. The details of the rainfall at these stations and for the district as a whole are given in table 1. The average annual rainfall in the district is 429.8 mm. About 74% of the annual rainfall in the district is received during the monsoon months July to September, August being the rainiest month generally. There is some rain in June and the post monsoon and winter season. The rainfall in the district in general increases from the southwest towards the northeast. From the available data it is seen that the annual rainfall in the district was highest in 1917 being about 220% of the normal while in 1915 it was lowest i.e. 33% of the normal. The annual rainfall in the district is between 201 and 500 mm in 54 out of these 78 years, which can be seen from table 2.

On an average there are about 20 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 14 at Phul to 24 at Bhatinda and Jawahrke.

The heaviest rainfall in 24 hours recorded at any station in the district was 377.2 mm at Jawahrke on 4th October, 1955.

TEMPERATURE

There is a meteorological observatory at Bhatinda. The data of this observatory may be taken as representative of the climate of the district as a whole. From about the end of March the temperatures increase rapidly till the beginning of July. June is the hottest month having mean daily maximum temperature at about 42°C and the mean daily minimum about 28°C. It is intensely hot during the summer. Scorching dust-laden winds which blow on many days make the weather very trying. On individual days the maximum temperature rises upto about 48°C. With the onset of the southwest monsoon by about the end of June or beginning of July there is appreciable drop in day temperature. However, the weather becomes very oppressive due to increase,in the day temperatures on account of breaks in the monsoon rains. By about

the middle of September when the monsoon withdraws both the day and night temperatures begin to decrease. The drop in the night temperature even in October is much more than the drop in the day temperature. It is only after October that both the day and night temperatures begin to decrease rapidly. January is generally the coldest month with the mean daily maximum temperature at about 21°C and the mean daily minimum at about 4°C. In the cold season the district is affected by cold waves in the rear of passing western disturbances and the minimum temperature on such occasions may reach the freezing point or even a degree or two below.

The highest maximum temperature recorded at Bhatinda was 48.5°C on 26th May, 1984. The lowest minimum temperature was -3.4°C on 4th January, 1975.

HUMIDITY

Relative humidities in the mornings throughout the year are more than 50% and during the monsoon months about 75%. Afternoons are comparatively drier.

CLOUDINESS

Skies are moderately to heavily clouded during the monsoon season and for the short spells of a day or two during the cold season in association with the passing of western disturbances. During the rest of the year the skies are mostly clear or lightly clouded.

WINDS

Winds are generally light. During the period May to September winds are mostly from directions between south and west. In the period October to March, the morning winds are light and variable while in the afternoons they are from directions between northwest and northeast. In April also the morning winds are light and variable and in the afternoons blow from directions between southwest and north.

SPECIAL WEATHER PHENOMENA

Western disturbances affect the district during the cold season when thunderstorms sometimes accompanied by hail occur. Thunderstorms and more frequently duststorms occur during the hot season. Rain during the monsoon season is also occasionally associated with thunder.

Tables 3, 4 and 5 give the temperature and humidity, mean wind speed and frequency of special weather phenomena respectively for Bhatinda.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Bhatinda (Obsy)	14	a	9.2	10.4	23.2	5.7	10.1	24.6	116.5	132.5	63.6	4.5	2.7	6.7	409.7	175 (1975)	64 (1969)	181.4	1964 Aug 18
		b	1.1	1.2	1.8	0.9	0.9	1.8	5.5	5.2	2.6	0.4	0.4	0.7	22.5				
Bhatinda	25	a	13.2	12.6	13.6	5.4	9.3	38.8	140.3	128.2	78.1	14.5	4.7	5.7	464.4	151 (1958)	63 (1965)	256.1	1964 Aug 18
		b	1.3	1.3	1.3	0.8	0.9	1.9	6.6	5.2	3.1	0.5	0.5	0.7	24.1				
Mansa	19	a	14.3	18.9	11.1	5.3	9.5	34.2	161.9	121.5	101.2	9.5	1.2	5.7	494.3	181 (1955)	44 (1965)	332.7	1955 Oct 04
		b	0.9	1.4	0.9	0.4	0.8	1.8	5.3	5.5	3.5	0.6	0.2	0.5	21.8				
Phul	16	a	13.0	10.1	4.7	0.9	3.0	23.0	137.2	91.3	40.2	4.2	0.5	8.1	336.2	185 (1975)	18 (1961)	151.0	1968 Jul 19
		b	0.8	0.9	0.4	0.1	0.1	1.4	4.5	3.1	1.9	0.3	0.1	0.5	14.1				
Nathana	60	a	15.4	13.7	11.0	4.5	4.0	24.7	90.5	90.8	52.1	9.9	2.1	4.8	323.5	232 (1908)	11 (1915)	229.9	1955 Oct 04
		b	1.1	1.0	0.8	0.4	0.4	1.5	4.1	4.0	1.8	0.2	0.1	0.5	15.9				
Jodhpur	68	a	13.3	15.1	9.9	5.8	10.3	29.9	93.8	106.1	65.2	15.5	1.9	6.2	373.6	302 (1917)	17 (1915)	223.5	1917 Sep 04
		b	1.0	1.1	1.0	0.5	0.7	1.8	4.6	4.8	2.8	0.5	0.1	0.6	19.5				
Kotbakthu	19	a	11.1	22.7	19.8	1.5	12.6	23.9	121.8	128.0	78.5	6.8	2.3	11.3	440.3	146 (1976)	68 (1962)	166.4	1955 Oct 04
		b	0.7	1.2	1.3	0.1	0.9	1.5	4.4	5.9	2.5	0.5	0.2	0.6	19.8				
Joga	18	a	5.3	14.9	13.5	5.3	10.2	29.0	128.2	174.2	94.3	36.3	1.8	8.6	521.6	186 (1956)	25 (1969)	190.0	1976 Aug 01
		b	0.7	1.3	1.1	0.5	0.8	1.7	4.6	6.8	2.9	1.0	0.2	0.7	22.3				
Bhiki	19	a	12.5	22.9	15.0	4.0	9.1	24.4	100.1	160.4	88.1	22.6	0.8	5.6	465.5	175 (1964)	54 (1963)	175.0	1962 Sep 22
		b	1.3	1.3	1.7	0.5	0.8	1.8	4.6	6.0	3.4	1.0	0.2	0.7	23.3				
Jawahrke	18	a	17.5	17.8	11.1	1.7	7.1	23.1	144.3	133.7	84.4	50.0	2.5	7.1	500.3	213 (1955)	34 (1965)	377.2	1955 Oct 04
		b	1.2	1.3	1.2	0.2	0.8	1.8	5.5	6.4	3.5	1.2	0.2	0.8	24.1				
Talwandi	19	a	11.6	15.9	12.1	0.8	6.4	13.0	120.8	126.8	68.1	32.4	0.6	7.7	416.2	180 (1963)	56 (1970)	198.1	1955 Oct 04
		b	0.8	1.1	1.1	0.2	0.7	1.2	5.0	5.1	3.2	0.9	0.1	0.6	20.0				
Ramnagar	19	a	5.9	15.0	9.5	1.8	7.8	19.6	110.5	145.1	90.9	51.8	1.5	8.0	467.4	195 (1955)	71 (1959)	279.4	1955 Oct 04
		b	0.6	0.6	0.9	0.1	0.5	0.9	3.8	5.1	2.6	0.8	0.2	0.5	16.6				

Contd....

TABLE - I (Contd)

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Raman	18	a	8.5	15.9	13.8	1.5	8.6	16.6	119.5	110.8	84.2	31.2	1.1	5.0	416.7	177 (1958)	56 (1969)	154.9	1955 Oct 04
		b	0.7	1.0	0.8	0.2	0.7	1.1	4.4	5.0	2.8	0.8	0.1	0.4	18.0				
Hingina	14	a	21.7	11.5	4.8	0.0	8.1	26.7	113.9	91.9	65.5	56.2	0.0	4.3	404.6	230 1955)	51 (1963)	190.5	1955 Oct 05
		b	1.2	0.7	0.5	0.0	0.9	1.7	4.2	4.4	2.3	1.0	0.0	0.5	17.4				
Kotra	64	a	12.8	17.5	11.5	6.2	7.7	29.2	120.0	106.4	73.9	16.3	0.6	8.6	410.9	235 (1917)	27 (1940)	184.9	1945 Sep 26
		b	1.2	1.3	1.2	0.7	0.8	2.2	5.8	5.1	2.9	0.6	0.1	0.7	22.6				
Bhatinda (District)		a	12.4	15.7	12.3	3.4	8.3	25.4	121.3	123.2	75.2	24.1	1.6	6.9	429.8	220 (1917)	33 (1915)		
		b	1.0	1.1	1.1	0.4	0.7	1.6	4.9	5.2	2.8	0.7	0.2	0.6	20.3				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2
Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(B H A T I N D A)

Range in mm	No. of years	Range in mm	No. of years
101 - 200	6	601 - 700	7
201 - 300	19	701 - 800	1
301 - 400	25	801 - 900	-
401 - 500	10	901 - 1000	1
501 - 600	9		

(Data available for 78 years only).

TABLE - 3
Period Averages of Temperature and Relative Humidity
(B H A T I N D A)

MONTH	Mean Daily Maximum Temperature °C	Mean Daily Minimum Temperature °C	Highest ever °C	Maximum recorded Date	Lowest ever °C	Minimum recorded Date	Relative Humidity 0830 %	Relative Humidity 1730★ %
January	21.2	3.9	27.4	1965 Jan 18, 19	-3.4	1975 Jan 04	68	52
February	24.2	8.3	31.8	1985 Feb 28	-0.9	1964 Feb 01, 03	66	47
March	29.4	12.6	36.9	1964 Mar 04 days	4.6	1979 Mar 08	62	43
April	35.1	18.3	45.4	1979 Apr 23	8.5	1986 Apr 04	52	39
May	39.6	22.4	48.5	1984 May 26	14.0	1986 May 21	51	40
June	42.0	27.6	47.4	1987 Jun 08	17.2	1976 Jun 14	53	36
July	37.9	27.0	47.7	1982 Jul 12	18.4	1979 Jul 04, 05	71	58
August	35.9	25.8	46.3	1982 Aug 05	19.3	1979 Aug 09	77	65
September	35.4	23.2	41.5	1980 Sep 27	15.5	1984 Sep 29	72	58
October	34.1	16.7	38.7	1961 Oct 01	7.9	1964 Oct 31	61	47
November	27.9	9.4	38.4	1965 Nov 01	0.3	1976 Nov 18	62	49
December	22.5	4.4	28.9	1977 Dec 09, 11	-1.0	1986 Dec 19	67	53
Annual	32.1	17.5					64	49

★ Hours IST.

TABLE - 4

Mean Wind Speed in Km/hr.

(B H A T I N D A)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
3.1	4.0	5.1	5.7	5.8	7.0	8.0	5.8	4.1	3.4	2.5	2.9	4.8

TABLE - 5

Special Weather Phenomena

(B H A T I N D A)

Mean No.of Days With ⋆	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.3	0.4	1.6	1.0	1.7	1.1	1.6	0.4	0.4	0	0.1	0.4	9
Hail	0	0	0.2	0.1	0	0	0	0	0	0.7	0	0	1.0
Dust-storm	0	0	0.1	0.6	1.2	1.3	0.7	0	0.2	0	0	0.1	4
Fog	2	0	0	0	0	0.3	0	0	0	0	0	0.7	3

⋆ No. of days two and above are given in whole numbers.

FARIDKOT DISTRICT

The climate of this district is on the whole dry and is characterised by a very hot summer, a short rainy season and a bracing winter. The year may be divided into four seasons. The cold season is from November to March. This is followed by the summer season which lasts upto about the end of June. The period from July to the middle of September constitutes the southwest monsoon season. The later half of September and October may be termed as the post monsoon or transition period.

RAINFALL

Records of rainfall in the district are available for only three stations. The details of rainfall at these three stations and for the district as a whole are given in tables 1 and 2. The average annual rainfall in the district is 433.0 mm. About 71% of the annual normal rainfall in the district is received during the monsoon months July to September, July/August being the rainiest months. Some rainfall occurs during the premonsoon months, mostly in the form of thundershowers. In the cold season, in association with passing western disturnces some rainfall occurs. The variation in the annual rainfall from year to year is large. In the 80 year period 1901 to 1980, the highest annual rainfall which was 212% of the normal was recorded in 1917. The lowest annual rainfall which was only 44% of the normal was recorded in 1968. In this 80 year period annual rainfall in the district was less than 80% of the normal in 22 years. Two and three consecutive years of rainfall less than 80% of the normal occurred thrice and twice respectively in this period. It will be seen from table 2 that the annual rainfall in the district was between 201 and 700 mm in 66 years out of 72.

On an average there are 24 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 22 at Muktesar to 27 at Moga.

The heaviest rainfall in 24 hours recorded at any station in the district was 335.0 mm at Moga on 5th October 1955.

TEMPERATURE

There is no meteorological observatory in the district. The description which follows is based on the records of the observatories in the neighbouring districts where similar climatic conditions prevail. From about the end of March temperatures increase rapidly till June which is generally the hottest month with the mean daily maximum around 41.0°C and the mean daily minimum around 26.3°C. It is intensely hot during the summer, and the dust-laden winds which blow especially in the sandy parts of the district are very trying. On individual days the maximum temperature may reach above 45°C. With the onset of the monsoon by about the end of June or early in July there is appreciable drop in the day temperatures. However due to breaks in the monsoon in July and sometimes in August, the weather becomes oppressive due to increase

in day temperatures. By about the second week of September when the monsoon withdraws from the district both the day and night temperatures begin to decrease. The drop in the night temperatures even in October is much more than the fall in the day temperatures. After October both the day and night temperatures decrease rapidly till January which is the coldest month. The mean daily maximum temperature in January is 19.3°C and the mean daily minimum is 5.1°C. In the cold season the district is affected by cold waves in the wake of passing western disturbances and the minimum temperatures occasionally drops down to about a degree or two below the freezing point.

HUMIDITY

Except in the brief southwest monsoon season when the air is fairly humid, the atmosphere is generally dry. The driest part of the year is the summer season when the relative humidities in the afternoons are about 30 percent or less.

CLOUDINESS

Skies are moderately to heavily clouded during the monsoon season and for short spells of a day or two during the cold season in association with the passing western disturbances. During the rest of the year the skies are mostly clear or lightly clouded.

WINDS

Winds are generally light in the district and are westerly to northwesterly throughout the year. But in the summer and monsoon season winds from directions between northeast and southeast also blow on many days.

SPECIAL WEATHER PHENOMENA

In the cold season western disturbances affect the district causing occasional thunderstorms sometimes accompanied with hail and squalls. Thunderstorms and more frequently dust-storms occur during the hot season. Rain during the monsoon season is also sometimes accompanied with thunder. Occasional fogs occur in the cold season.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Moga	73	a	22.5	20.0	17.2	11.5	12.4	27.8	132.9	131.7	80.6	16.7	3.1	9.7	486.1	231	23	335.0	1955 Oct 05
		b	1.8	1.7	1.8	1.0	1.2	2.1	6.3	6.4	3.1	0.6	0.3	0.8	27.1	(1962)	(1968)		
Muktesar	73	a	16.8	13.0	17.6	7.8	8.0	27.3	103.3	95.9	61.0	8.0	2.2	7.9	368.8	254	32	207.0	1916 Jul 14
		b	1.4	1.3	1.5	0.8	0.9	1.7	5.3	5.0	2.7	0.4	0.2	0.7	21.9	(1950)	(1947)		
Faridkot	23	a	14.4	11.8	18.8	3.6	11.9	36.8	120.7	108.5	90.1	14.3	3.9	9.4	444.2	174	56	182.0	1964 Aug 18
		b	1.1	1.2	1.4	0.4	1.1	1.8	5.5	5.9	3.6	0.7	0.3	0.8	23.8	(1961)	(1965)		
Faridkot (District)		a	17.9	14.9	17.9	7.6	10.8	30.6	119.0	112.0	77.2	13.0	3.1	9.0	433.0	212	44		
		b	1.4	1.4	1.6	0.7	1.1	1.9	5.7	5.8	3.1	0.6	0.3	0.8	24.4	(1917)	(1968)		

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2

Frequency of Annual Rainfall in the District

(Data 1901 - 1980)

(F A R I D K O T)

Range in mm	No. of years	Range in mm	No. of years
101 - 200	2	601 - 700	7
201 - 300	14	701 - 800	2
301 - 400	20	801 - 900	1
401 - 500	17	901 - 1000	1
501 - 600	8		

(Data available for 72 years only).

FEROZPUR DISTRICT

The climate of this district is on the whole dry and is characterised by a very hot summer, a short rainy season and a bracing winter. The year may be divided into four seasons. The cold season is from November of March. This is followed by the summer season which lasts upto the end of June. The period from July to the middle of September constitutes the southwest monsoon season. The latter half of September and October may be termed the post monsoon or transition period.

RAINFALL

Records of rainfall in the district are available for nine stations for sufficiently long periods. The details of the rainfall at these stations and for the district as a whole are given in tables 1 and 2. The average rainfall in the district is 388.6 mm. The rainfall in the district in general increases from southwest towards the northeast and varies from 256.8 mm at Abohar to 556.8 mm at Ferozpur (obsy). About 71% of the annual rainfall in the district is received during the monsoon months July to September, July being the rainiest month. Some rainfall occurs during the premonsoon months, mostly in the form of thundershowers. In the cold season, in association with passing western disturbances some rainfall occurs. The variation in the annual rainfall from year to year is large. During the 80 year period, 1901-80, the highest annual rainfall, 258% of the normal, was recorded in 1980. The lowest annual rainfall, only 38% of the normal, was in 1946. During this period, annual rainfall was less than 80% of the normal in 26 years. Two consecutive years of rainfall less than 80% of the normal occurred six times. Annual rainfall was between 201 mm and 500 mm in 61 years out of 79 years (Table 2).

There are 21 rainy days in a year on an average. This number varies from 15 at Abohar to 27 at Ferozpur (obsy).

The heaviest rainfall in 24 hours recorded at any station in the district was 301.7 mm at Zira on 17th September, 1950.

TEMPERATURE

There is a meteorological observatory in the district at Ferozpur. The records of this observatory may be taken as representative of the meteorological conditions in the district in general. From about the end of March temperatures increase rapidly till June which is generally the hottest month with the mean daily maximum temperature at 41.1°C and the mean daily minimum at 26.3°C. It is intensely hot during the summer, the dust-laden winds which blow especially in the

sandy parts of the district round about Abohar are very trying. On individual days the maximum temperature may go beyond 47.0°C. With the onset of the monsoon by about the end of June or early in July there is appreciable drop in the day temperatures. However due to breaks in the monsoon in July, and in August, the weather becomes oppressive due to the increase in day temperatures By about the second week of September when the monsoon withdraws from the district both the day and night temperatures begin to decrease. The drop in the night temperatures even in October is much more than the fall in the day temperatures. After October both the day and night temperatures decrease rapidly till January which is the coldest month. The mean daily maximum temperature in January is 19.3°C and the mean daily minimum is 5.1°C. In the cold season the district is affected by cold waves in the wake of passing western disturbances and the minimum temperature occasionally drops down to about a degree or two below the freezing point.

The highest maximum temperature recorded at Ferozpur was 47.2°C on 31st May, 1954. The lowest minimum was -2.9°C on 29th January, 1964.

HUMIDITY

Except in the brief southwest monsoon season when the relative humidities in the air varies from 65 percent to 70 percent the atmosphere is generally dry. The driest part of the year is the summer season when the relative humidities in the afternoons are about 30 percent or less. Generally morning is more humid than afternoon.

CLOUDINESS

Skies are moderately to heavily clouded during the monsoon season and for short spells of a day or two during the cold season in association with the passing western disturbances. During the rest of the year the skies are mostly clear or lightly clouded.

WINDS

Winds are generally light in the district, and are westerly to northwesterly throughout the year. But in the summer and monsoon seasons winds from directions between northeast and southeast also blow on many days.

SPECIAL WEATHER PHENOMENA

In the cold season western disturbances affect the district causing occasional thunderstorms sometimes accompanied with hail and squall. Thunderstorms and more frequently dust-storms

occur during the hot season. Rain during the monsoon season is also sometimes accompanied with thunder. Occasional fogs occur in the cold season particularly in the wake of passing western disturbances.

Tables 3, 4 and 5 give the temperature and humidity, mean wind speed and special weather phenomena respectively for Ferozpur.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS**	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS**	HEAVIEST RAINFALL in 24 HOURS * Amount (mm)	HEAVIEST RAINFALL in 24 HOURS * Date
Ferozpur (Obsy)	31	a	19.3	15.1	21.0	6.5	14.9	36.5	180.4	141.5	91.2	14.1	5.2	11.1	556.8	211 (1976)	45 (1975)	240.0	1976 Aug 01
		b	1.7	1.3	1.6	0.7	1.2	2.1	7.0	5.9	3.2	0.8	0.4	0.7	26.6				
Zira	73	a	23.0	21.5	20.7	11.8	9.0	30.3	127.4	136.8	74.1	12.9	2.7	12.0	482.2	226 (1917)	24 (1921)	301.7	950 Sep 17
		b	1.9	1.8	1.6	1.1	0.9	2.1	6.0	5.7	2.8	0.7	0.3	0.9	25.8				
Ferozpur Sadar	73	a	21.3	18.5	20.1	9.7	10.2	33.0	126.8	121.9	67.1	7.8	3.0	10.8	450.2	211 (1917)	45 (1943)	282.7	1964 Aug 18
		b	1.9	1.8	1.7	0.9	1.1	2.1	5.7	5.4	2.6	0.6	0.2	0.9	24.9				
Ferozpur City	64	a	21.5	18.4	18.9	9.6	7.9	30.4	110.5	114.0	60.7	7.0	2.6	0.9	411.4	211 (1908)	45 (1946)	275.8	1894 Jun 19
		b	1.5	1.6	1.5	0.7	0.8	1.8	4.7	4.7	2.2	0.4	0.2	0.8	20.9				
Fazilka	73	a	13.1	11.2	12.2	7.9	6.7	23.7	87.3	79.3	51.3	2.9	1.7	6.9	304.2	278 (1908)	30 (1946)	182.9	1908 Aug 31
		b	1.3	1.2	1.2	0.8	0.8	1.6	4.0	4.0	2.2	0.3	0.2	0.7	18.3				
Jalalabad	60	a	5.5	13.0	10.9	10.1	6.3	21.4	83.2	73.7	53.5	5.7	0.7	7.7	301.7	271 (1908)	18 (1949)	160.1	1958 Sep 03
		b	1.1	1.2	0.8	0.6	0.5	1.3	3.6	3.3	1.8	0.3	0.1	0.6	15.1				
Abohar	57	a	11.0	8.4	7.7	5.6	4.6	22.8	76.5	68.8	43.1	3.3	1.3	3.6	256.8	290 (1956)	20 (1963)	175.8	1958 Sep 02
		b	1.0	0.8	0.8	0.6	0.5	1.4	3.5	3.5	1.8	0.3	0.1	0.4	14.7				
Gobindgarh	61	a	13.0	8.7	9.8	5.1	5.7	25.3	76.7	86.8	45.5	4.3	0.8	5.7	287.3	350 (1908)	28 (1951)	152.4	1898 Aug 23
		b	1.3	1.0	1.0	0.6	0.7	2.0	4.3	4.2	2.1	0.3	0.1	0.5	18.1				
Jaimalwala	28	a	20.1	14.6	16.1	6.5	5.5	30.2	120.7	100.9	100.4	20.5	2.4	8.6	446.5	264 (1958)	18 (1967)	208.3	1955 Oct 05
		b	1.7	1.1	1.3	0.6	0.5	1.8	4.6	4.6	2.5	0.5	0.1	0.7	20.0				
Ferozpur (District)		a	17.5	14.4	15.3	8.1	7.9	28.2	109.9	102.6	65.2	8.7	2.3	8.5	388.6	258 (1980)	38 (1946)		
		b	1.5	1.3	1.3	0.7	0.8	1.8	4.8	4.6	2.4	0.5	0.2	0.7	20.6				

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 1980.*
** *Years of occurrence given in brackets.*

TABLE - 2
Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(F E R O Z P U R)

Range in mm	No. of years	Range in mm	No. of years
101 - 200	3	601 - 700	3
201 - 300	22	701 - 800	2
301 - 400	24	801 - 900	1
401 - 500	15	901 - 1000	1
501 - 600	7	1001- 1100	1

(Data available for 79 years only).

TABLE - 3
Period Averages of Temperature and Relative Humidity
(F E R O Z P U R)

MONTH	Mean Daily Maximum Temperature °C	Mean Daily Minimum Temperature °C	Highest ever °C	Maximum recorded Date	Lowest ever °C	Minimum recorded Date	Relative Humidity 0830 %	Relative Humidity 1730★ %
January	19.3	5.1	27.2	1952 Jan 23	-2.9	1964 Jan 29	89	55
February	23.4	7.6	33.3	1953 Feb 28	0.0	1974 Feb 07	80	43
March	28.2	12.6	37.2	1955 Mar 30	1.3	1983 Mar 21	71	45
April	34.8	17.4	45.4	1979 Apr 23	7.0	1983 Apr 18	55	31
May	39.5	22.4	47.2	1954 May 31	13.1	1977 May 04	48	28
June	41.1	26.3	46.7	1954 Jun 01	15.5	1958 Jun 01	53	31
July	36.6	26.6	45.1	1957 Jul 08	17.0	1983 Jul 03	73	56
August	35.3	26.1	40.5	1979 Aug 08	16.0	1985 Aug 06	79	65
September	34.6	23.4	40.1	1979 Sep 01	16.2	1962 Sep 30	73	56
October	32.9	16.9	39.4	1952 Oct 04	8.3	1952 Oct 29	70	46
November	27.5	9.7	35.0	1951 Nov 02	2.1	1962 Nov 30	79	50
December	21.9	6.2	28.3	1953 Dec 02	-1.7	1950 Dec 22	89	59
Annual	31.3	16.7					72	47

★ Hours IST.

TABLE - 4
Mean Wind Speed in Km/hr.
(F E R O Z P U R)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1.8	2.6	3.3	3.3	3.5	3.2	2.8	2.2	2.0	1.5	1.4	1.3	2.4

TABLE - 5
Special Weather Phenomena
(F E R O Z P U R)

Mean No.of Days With ⋆	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.0	0.7	1.5	2	3	3	2	3	1.8	0.7	0.4	0.1	19
Hail	0	0.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Dust-storm	0	0	0.3	0.7	1.3	3	0.1	0.3	0.7	0.2	0	0	7
Squall	0	0	0.1	0	0	0.5	0	0.1	0.5	0	0	0	1.2
Fog	0	0.6	0	0	0	0	0	0	0	0	0.3	0.3	1.2

⋆ No. of days two and above are given in whole numbers.

GURDASPUR DISTRICT

The climate of this submontane district is somewhat milder than that of the neighbouring districts to the south. The year may be divided into four seasons. The cold season is from November to March. The period from April to June is the summer season. The southwest monsoon season which follows continues upto about the first week of September. The succeeding period till the begining of November is the post monsoon or transition season.

RAINFALL

Records of rainfall in the district are available for eight stations for sufficiently long periods. The details of the rainfall at these stations and for the district as a whole are given in tables 1 and 2. The average annual rainfall in the district is 1106.0 mm. The rainfall in the district is greater in the submontane northeastern parts of the district and decreases rapidly towards the southwest. In the plains the rainfall varies from 1590.0 mm at Malikpur near the northeastern border to 729.6 mm at Batala near the southwestern border. About 70 percent of the annual rainfall in the district is received during the period July to September. The district receives some rainfall in June mostly in the form of thundershowers and during the cold seasons in association with passing of western disturbances. The variation in the rainfall from year to year is appreciable. In the 80 year period, 1901-80, the highest annual rainfall amounting to 153 percent of the normal occurred in 1955. The lowest annual rainfall which was 42 percent of the normal occurred in 1902. In the same period, the annual rainfall in the district was less than 80 percent of the normal in 28 years, two consecutive years of such low rainfall occurred five times and three consecutive years occurred once in this period. It will be seen from table 2 that the annual rainfall in the district was between 701 and 1200 mm in 52 years out of 80.

On an average there are 48 rainy days (i.e. days with rainfall of 2.5 mm or more). This number varies from 35 at Batala to 58 at Malikpur.

The heaviest rainfall in 24 hours recorded at any station in the district was 495.3 mm at Aliwal on 5th October, 1955.

TEMPERATURE

There is a meteorological observatory in the district at Pathankot.The records of this observatory may be taken as representative of the conditions in the district. From about the beginning of March there is steady increase in the temperatures till June which is generally the hottest month. The mean daily maximum temperature in June is 40.2°C and the mean daily minimum 26.1°C. On individual days during the summer the day temperatures reach over 46°C. With the onset

of the southwest monsoon in the district early in July there is appreciable drop in the day temperature but the nights continue to be as warm as nights in the latter part of the summer. When the southwest monsoon withdraws early in September there is a slight increase in the day temperature in September but the nights become progressively cooler. After October both day and night temperatures decrease rapidly. January is generally the coldest month with the mean daily maximum at 18.4°C and the mean daily minimum at 5.6°C. In association with the passage of western disturbances during the winter, cold waves affect the district and the minimum temperatures on suchoccasions may go down upto the freezing point.

The highest maximum temperature recorded at Pathankot during the brief period of about a decade for which records are available was 46.1°C on 11th June 1960 and the lowest minimum 0°C on 21st January, 1956.

HUMIDITY

Except during the brief southwest monsoon season when the relative humidities are over 70 percent the air is generally dry. The driest part of the year is the summer season when in the plains the relative humdities in the afternoons are less than about 30 percent.

CLOUDINESS

The skies are partly to heavily clouded and occasionally overcast during the southwest monsoon season and for brief spells of two or three days in the cold season in association with passing western dis turbances. During the rest of the year the skies are generally clear or lightly clouded.

WINDS

Winds are generally light with some strengthening in force in summer and the early part of the monsoon season. In the post monsoon and cold seasons winds are light and variable in direction in the mornings and mostly from the west or northwest in the afternoons. Winds are mainly from directions between northwest and northeast in the mornings and between west and northeast in the afternoons in April and May. By June easterlies and southeasterlies begin to blow and in the southwest monsoon season winds are commonly from directions between northeast and southeast.

SPECIAL WEATHER PHENOMENA

Western disturbances affect the weather over the district during the cold season, causing widespread rain and gusty winds. Thunderstoms occur in the summer and monsoon seasons.

Dust storms occur in the latter part of the summer season. Occasional fogs occur in the cold season, their frequency being more in the hills and valleys in the northern part of the district.

Tables 3, 4 and 5 give the temperature and humidity, mean wind speed and special weather phenomena for Pathankot.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Batala	73	a	38.6	31.3	34.9	14.8	12.1	44.6	210.7	200.5	96.9	23.2	4.7	17.3	729.6	209 (1976)	29 (1965)	474.5	1955 Oct 05
		b	2.5	2.4	2.6	1.4	1.3	2.7	8.2	8.1	3.3	0.7	0.4	1.2	34.8				
Tibri	72	a	53.9	43.0	48.8	22.9	16.3	55.6	286.7	260.1	117.4	27.3	6.5	24.2	962.7	228 (1950)	49 (1918)	385.6	1950 Sep 04
		b	3.0	2.9	2.9	1.6	1.5	3.1	9.9	9.7	4.0	0.9	0.5	1.5	41.5				
Pathankot	67	a	65.1	62.6	50.9	25.1	18.5	56.8	351.9	358.6	152.4	28.5	5.9	29.2	1205.5	163 (1917)	43 (1902)	294.1	1894 Jun 19
		b	3.8	3.6	3.3	2.1	1.6	3.8	12.5	13.1	5.4	1.3	0.5	1.9	52.9				
Malikpur	23	a	100.2	71.3	78.8	36.1	28.1	71.3	444.9	436.1	210.0	57.5	14.3	41.4	1590.0	184 (1967)	50 (1952)	298.4	1963 Aug 20
		b	4.7	3.8	4.3	2.8	2.0	3.5	12.8	12.7	6.7	2.2	0.9	1.9	58.3				
Pathankot (Aero obsy)	23	a	54.0	51.8	55.9	19.3	22.5	84.5	425.1	395.3	140.0	15.1	13.7	39.0	1316.2	148 (1959)	55 (1965)	355.0	1980 Jul 14
		b	3.3	3.4	3.7	2.0	1.8	4.6	12.8	12.7	6.4	1.0	1.1	2.1	54.9				
Aliwal	63	a	40.7	32.6	36.2	16.1	12.5	41.1	223.5	213.2	100.6	25.7	6.4	21.1	769.7	211 (1961)	44 (1902)	495.3	1955 Oct 05
		b	2.9	2.7	2.8	1.7	1.2	3.0	8.7	8.3	3.5	0.8	0.5	1.5	37.6				
Gurdaspur	73	a	49.3	42.7	44.5	20.0	16.1	59.8	269.4	256.5	116.2	26.4	5.3	22.8	929.0	167 (1955)	43 (1918)	370.3	1955 Oct 05
		b	3.1	3.1	3.1	1.7	1.5	3.3	10.3	9.9	4.3	1.0	0.6	1.6	43.5				
Madhopur	71	a	73.4	67.1	57.6	28.7	22.8	57.7	388.0	420.2	156.1	27.2	8.5	37.4	1344.7	165 (1917)	44 (1902)	351.0	1955 Oct 05
		b	4.2	3.8	3.8	2.5	2.0	3.8	13.4	14.3	5.8	1.3	0.7	2.1	57.7				
Gurdaspur (District)		a	59.4	50.3	50.9	22.9	18.6	58.9	325.0	317.6	136.2	28.9	8.2	29.1	1106.0	153 (1955)	42 (1902)		
		b	3.4	3.2	3.3	2.0	1.6	3.5	11.1	11.1	4.9	1.1	0.7	1.7	47.6				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2
Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(G U R D A S P U R)

Range in mm	No. of years	Range in mm	No. of years
401 - 500	1	1101 -1200	8
501 - 600	1	1201 - 1300	4
601 - 700	6	1301 - 1400	4
701 - 800	12	1401 - 1500	3
801 - 900	9	1501 - 1600	4
901 - 1000	13	1601 - 1700	5
1001 - 1100	10		

TABLE - 3
Period Averages of Temperature and Relative Humidity
(P A T H A N K O T)

MONTH	Mean Daily Maximum Temperature °C	Mean Daily Minimum Temperature °C	Highest ever °C	Maximum recorded Date	Lowest ever °C	Minimum recorded Date	Relative Humidity 0830 %	Relative Humidity 1730★ %
January	18.4	5.6	26.1	1952 Jan 23	0.0	1956 Jan 21	84	61
February	22.2	8.4	29.4	1956 Feb 28	3.3	1959 Feb 06	74	46
March	27.1	13.5	35.2	1958 Mar 28	6.1	1954 Mar 05	56	40
April	33.5	17.9	41.7	1958 Apr 27	7.2	1955 Apr 17	34	24
May	39.0	23.2	44.4	1952 May 28	12.2	1955 May 12	25	19
June	40.2	26.1	46.1	1960 Jun 11	18.3	1957 Jun 04	35	28
July	34.1	25.0	43.4	1957 Jul 05	17.2	1955 Jul 20	75	61
August	32.5	24.0	36.2	1957 Aug 24	18.9	1952 Aug 28	82	70
September	32.8	22.4	36.7	1952 Sep 12	15.6	1953 Sep 17	74	63
October	30.8	16.9	36.7	1952 Oct 02	10.6	1955 Oct - 4 days	60	52
November	25.9	9.8	32.2	1952 Nov 01	5.6	1955 Nov 08	60	49
December	21.1	6.9	27.2	1959 Dec 05	1.1	1955 Dec 24	75	58
Annual	29.8	16.6					61	48

★ Hours IST.

TABLE - 4
Mean Wind Speed in Km/hr.
(P A T H A N K O T)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
5.7	6.4	8.8	9.9	11.8	10.9	9.0	6.8	6.9	5.7	6.1	5.1	7.8

TABLE - 5
Special Weather Phenomena
(P A T H A N K O T)

Mean No.of Days With ⋆	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.3	0.7	2	3	3	3	5	5	3	0.7	0.3	1	28
Hail	0.1	0.1	0	0.1	0	0.1	0	0	0	0	0	0.1	0.5
Dust-storm	0.1	0.1	0.8	0.7	3	3	0.1	0	0.2	0.2	0.1	0	8
Squall	0	0	0.4	0	0.1	0.1	0.1	0.2	0	0	0	0	0.9
Fog	0.5	0	0	0	0	0	0	0	0	0	0	0.1	0.6

⋆ No. of days two and above are given in whole numbers.

HOSHIARPUR DISTRICT

The climate of this submontane district with a hilly terrain in the major part is on the whole somewhat milder than that of the adjoining districts to the south. But in the valleys and the terrain strip to the southwest of the Siwalik range it is more like that of the plains of the Punjab. The cold season is from November of March. The period from April to June is the hot season. The southwest monsoon season is from about the beginning of July to the first week of September. The succeeding period lasting till the beginning of November is the post monsoon or transition period.

RAINFALL

Records of rainfall in the district are available for four stations for sufficiently long periods. The details of the rainfall at these stations and for the district as a whole are given in tables 1 and 2. The average annual rainfall in the district is 818.8 mm. About 71% of the annual rainfall in the district is received during the short monsoon season July to September. Rainfall amounting to about 16% of the normal is received during the cold season in association with passing western disturbances. The rainfall in the district in general increases from the southwest towards the northeast and varies from 676.1 mm at Tanda to 894.0 mm at Hoshiarpur. The variation in the rainfall from year to year in the district is appreciable. During the 80 year period 1901-1980, the highest annual rainfall amounting to 227% of the normal occurred in 1976 while the lowest annual rainfall which was 51% in 1918. The annual rainfall in the district was less than 80% of the normal in 19 years, in this 80 year period. Two consecutive years of rainfall less than 80% of the normal occurred four times. It will be seen from table 2 that the annual rainfall in the district was between 501 and 1000 mm in 51 years out of 71.

On an average there are 38 rainy days (i.e. days with rainfall of 2.5 mm or more) in the district. This number varies from 30 at Tanda to 42 at Hoshiarpur.

The heaviest rainfall in 24 hours recorded at any station in the district was 470.0 mm at Garshankar on 31st July, 1976.

TEMPERATURE

There is no meteorlogical observatory in the district. The description which follows is mainly based on the records of the observatories in the neighbouring districts. After about the middle of March temperatures begin to rise steadily till June which is usually the hottest month of the year with the mean daily maximum temperature at about 39°C and the mean daily minimum at

about 24°C. In May and June the maximum temperatures on individual days may exceed 45°C. With the advance of the southwest monsoon over the district, early in July, the day temperartures decrease appreciably while the nights are nearly as warm as the nights in the summer season. With the increase in the moisture in the air during the southwest monsoon season the weather is often sultry in between the rains. From the middle of September temperatures begin to decrease, the fall in night temperatures being more rapid. January is the coldest part of the year withthe mean daily maximum temperature at about 19°C and the mean daily minimumat about 5°C. Cold waves affect the district in the wake of passing western disturbances in the winter season and the minimum temperature may go down to a degree to two below the freezing point and frosts may occur.

HUMIDITY

Humidities are high during the southwest monsoon season. During the rest of the year the air is comparatively drier. The driest part of the year is the summer season when in the afternoons the relative humidities are less than 25%.

CLOUDINESS

During the monsoon season and for short spells of a day or two in association with passing western disturbances the skies are partly to heavily clouded and occasionally overcast. During the rest of the year the skies are mostly clear or lightly clouded.

WINDS

Winds are generally light with some increase in wind force during the late summer and monsoon seasons. In the post monsoon and winter seasons winds are light and variable in direction in the mornings and mainly from the west to north- west in the afternoons. In April and May winds are mostly from directions between northwest and northeast. By June easterlies and southeasterlies also blow and in the southwest monsoon season winds are more commonly from directions between northeast and southeast.

SPECIAL WEATHER PHENOMENA

Western disturbances affect the district during the cold season causing widespread rain. Duststorms and thunderstorms occur in the latter part of the summer season. Thunderstorms also occur in the cold season. Rain in the monsoon is often associated with thunder. Occasional fog occurs in the cold season.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS★ Date
Hoshiarpur	73	a	40.5	39.7	33.7	15.3	15.1	59.8	267.1	239.9	124.7	29.1	6.9	22.2	894.0	225 (1917)	66 (1965)	360.7	1878 Aug 19
		b	2.9	2.7	2.5	1.5	1.4	3.5	10.3	9.6	4.7	1.1	0.6	1.6	42.4				
Dasuya	72	a	41.6	40.3	38.9	16.3	15.6	58.9	241.8	237.3	113.8	23.3	5.0	22.4	855.2	170 (1917)	46 (1934)	278.6	1894 Jun 19
		b	3.1	2.7	2.6	1.6	1.2	3.2	9.9	9.3	4.2	0.9	0.4	1.5	40.6				
Garhsankar	72	a	43.7	38.3	34.8	14.3	15.4	64.9	258.1	210.7	123.	322.6	4.3	19.8	850.2	219 (1976)	32 (1918)	470.0	1976 Jul 31
		b	2.8	2.7	2.5	1.3	1.3	3.8	9.8	9.0	4.4	0.9	0.4	1.6	40.5				
Tanda	55	a	29.7	32.7	24.0	9.4	12.8	36.3	223.6	167.8	102.3	18.4	4.2	14.9	676.1	197 (1914)	45 (1916)	186.4	1960 Jul 12
		b	2.1	2.3	1.7	0.9	1.0	2.2	8.1	6.4	3.5	0.6	0.3	1.1	30.2				
Hoshiarpur (District)		a	38.9	37.7	32.9	13.8	14.7	55.0	247.7	213.9	116.0	23.3	5.1	19.8	818.8	227 (1976)	51 (1918)		
		b	2.7	2.6	2.3	1.3	1.2	3.2	9.5	8.6	4.2	0.9	0.4	1.5	38.4				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2

Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(H O S H I A R P U R)

Range in mm	No. of years	Range in mm	No. of years
401 - 500	3	1201 - 1300	2
501 - 600	10	1301 - 1400	3
601 - 700	13	1401 - 1500	1
701 - 800	9	1501 - 1600	-
801 - 900	10	1601 - 1700	-
901 - 1000	9	1701 - 1800	-
1001 - 1100	6	1801 - 1900	1
1101 - 1200	4		

(Data available for 71 years only).

JULLUNDAR DISTRICT

The climate of this district is on the whole dry except during the brief southwest monsoon season. The year may be divided into four seasons.The cold season is from the middle of November to the early part of March. The succeeding period upto the end of June is the summer season. July, August and the first half of September constitute the southwest monsoon season. The period from mid-September to the middle of November is the post monsoon or transition period. Although the Tahsil Phagwara is in the Kapurthala district, for the description of the climate, the same has been included in the Jullundar district.

RAINFALL

Records of rainfall in the district are available for 6 stations for sufficiently long period. The details of the rainfall at these stations and for the district in general are given in tables 1 and 2. The average annual rainfall in the district is 703.0 mm. The rainfall in the district in general increases from the southwest towards the northeast and varies from 551.3 mm at Nakodar to 892.3 mm at Adampur (Aerodrome). About 70 percent of the annual normal rainfall in the district is received during the period July to September, July being the rainiest month. Some rainfall is received mostly as thundershowers in June and in association with passing western disturbances in the cold season. The variation in the rainfall from year to year in the district is appreciable. In the 80 yearperiod 1901 to 1980, the highest annual rainfall amounting to 181 percent of the normal occurred in 1917. The lowest annual rainfall which was 55 percent of the normal occurred in the year 1905. In the same period the annual rainfall in the district was less than 80 percent of the normal in 22 years. Two consecutive years of such low rainfall occurred twice and three consecutive years twice in this period. It will be seen from table 2 that the annual rainfall in the district was between 501 and 900 mm in 58 years out of 79.

On an average there are 36 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 30 at Phagwara to 45 at Adampur (Aerodrome).

The heaviest rainfall in 24 hours recorded at any station in the district was 304.8 mm at Jullundar on 18th August 1878.

TEMPERATURE

There is a meteorological observatory in the district at Jullundar, which has started functioning very recently. Hence the description which follows is based on the records of the observatories in the neighbouring districts where similar climatic conditions prevail. After February temperatures

begin to rise rapidly. June is generally the hottest month with the mean daily maximum temperature at about 41°C and the mean daily minimum at about 27°C. Scorching dustladen winds blow on many days in summer season and the day temperatures on individual days may exceed above 45°C. Afternoon thundershowers which occur on some days during the summer bring welcome relief though only temporarily. With the onset of the monsoon by about the end of June or early in July, the day temperatures drop down appreciably. But the nights continue to be as warm as nights during the summer. Due to the increased moisture of the monsoon air, the weather is often sultry and uncomfortable, in between the rains. After about mid-September when the monsoon withdraws, temperatures decrease, the drop in the night temperatures being rapid. January is generally the coldest month with the mean daily maximum temperature at about 19C and the mean daily minimum at about 6°C. During the winter season cold waves affect the district in the rear of western disturbances and the minimum temperature occasionally drops down below the freezing point.

HUMIDITY

During the brief southwest monsoon months and for spells of a day or two in association with the passing western disturbances high humidity prevails in the district. In the rest of the year the humidity is low. The driest part of the year is the summer season when in the afternoons therelative humidity is 30 percent or less.

CLOUDINESS

The skies are heavily clouded and overcast on a few days during the southwest monsoon and for spells of a day or two in association with passing western disturbances during the cold season. During the rest of the year the skies are mostly clear or lightly clouded.

WINDS

Winds are generally light in the district. In the southwest monsoon season winds from directions between northeast and southeast are common but on many days in the afternoons westerly to northwesterly winds also blow. In the rest of the year westerly to northwesterly winds predominate except in the latter half of summer when easterlies and southeasterlies blow on some days.

SPECIAL WEATHER PHENOMENA

During the cold season western disturbances affect the weather over the district when thunderstorms occur. Duststorms and thunderstorms occur in the summer season and rain during the monsoon season is often associated with thunder.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Jullundar	73	a	33.3	32.6	28.6	13.7	14.5	40.8	197.3	190.2	98.2	22.2	4.5	18.3	694.2	181 (1950)	43 (1972)	304.8	1878 Aug 18
		b	2.5	2.5	2.4	1.3	1.3	2.7	8.5	8.0	4.0	0.9	0.4	1.2	35.7				
Nakodar	73	a	26.2	29.6	22.5	11.1	11.6	33.2	156.1	139.7	87.7	15.5	3.6	14.5	551.3	203 (1950)	43 (1905)	287.0	1880 Jul 05
		b	2.1	2.3	2.0	1.1	1.1	2.3	7.7	6.8	3.6	0.7	0.4	1.0	31.1				
Phillaur	73	a	30.7	30.5	27.1	12.2	11.8	45.7	190.0	170.3	105.0	20.5	4.1	17.6	665.5	186 (1917)	39 (1969)	292.9	1955 Oct 04
		b	2.4	2.4	2.1	1.1	1.1	3.0	7.9	7.2	3.7	0.9	0.4	1.4	33.6				
Nawanshahr	73	a	39.4	36.7	32.1	12.9	11.4	56.1	238.9	202.9	118.2	23.0	4.1	19.4	795.1	196 (1917)	39 (1918)	240.0	1892 Sep 14
		b	2.8	2.8	2.5	1.2	1.3	3.4	9.1	8.3	4.1	0.9	0.4	1.5	38.3				
Adampur (Aero IAF Obsy)	20	a	23.8	40.0	33.8	12.7	24.3	89.7	283.3	242.7	99.7	13.7	9.6	19.0	892.3	136 (1962)	52 (1974)	205.8	1970 Aug 23
		b	2.3	2.9	2.7	1.5	1.8	4.6	10.6	10.5	4.6	0.9	0.8	1.3	44.5				
Phagwara	19	a	25.9	23.3	32.1	5.2	11.2	42.5	174.6	157.4	97.3	36.8	4.7	9.1	620.1	158 (1957)	34 (1963)	137.9	1955 Oct 04
		b	2.1	1.5	2.1	0.8	0.9	2.7	7.4	6.6	4.1	0.9	0.3	0.7	30.1				
Jullundar (District)		a	29.9	32.1	29.4	11.3	14.1	51.3	206.7	183.9	101.0	21.9	5.1	16.3	703.0	181 (1917)	55 (1905)		
		b	2.4	2.4	2.3	1.2	1.3	3.1	8.5	7.9	4.0	0.9	0.5	1.2	35.7				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2

Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(J U L L U N D A R)

Range in mm	No. of years	Range in mm	No. of years
301 - 400	4	801 - 900	11
401 - 500	8	901 - 1000	4
501 - 600	14	1001 - 1100	3
601 - 700	21	1101 - 1200	1
701 - 800	12	1201 - 1300	1

(Data available for 79 years only)

KAPURTHALA DISTRICT

The climate of this district is characterised by dryness except in the brief monsoon season, a very hot summer and a bracing winter. The year may be divided into four seasons. The cold season from about the middle of November to the early part of March is followed by the hot season which lasts till about the end of June. July, August and the first half of September constitute the southwest monsoon season. The period from mid September to about the middle of November may be termed as post monsoon or transition period. Although the Tahsil Phagwara is in the Kapurthala district, for the description of the climate, the same has been included in Jullundur district.

RAINFALL

Records of rainfall in the district are available for one station for sufficiently long period. The details of the rainfall at this station is given in table 1. The average annual rainfall is 778.9 mm. About 71% of the annual rainfall in the district is received during the monsoon months July to September, July being the rainiest month. There is also some rainfall during the period December to March in association with passing western disturbances and this amounts to about 12% of the annual rainfall. The variation in the rainfall from year to year is large. In 80 year period, the highest annual rainfall which was in 1955, amounted to 163% of the average while the lowest annual rainfall was 57% of the normal in 1963. In this period annual rainfall less than 80% of the normal occurred in three years only.

There are on the average about 33 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year.

The heaviest rainfall in 24 hours recorded was 339.1 mm on 5th October 1955.

TEMPERATURE

The meteorological observatory at Kapurthala started functioning recently. Hence the description which follows is based on the records of the observatories in the neighbouring districts where similar climatic conditions prevail. After February there is a steady increase in temperatures. June is generally the hottest month with the mean daily maximum temperature at about 41°C and the mean daily minimum at about 27°C. The hot scorching dust-laden westerly winds blow during the summer season and on individual days the day temperature may exceed above 45°C. With the onset of the southwest monsoon in the district by about the beginning of July there is appreciable drop in the day temperature. The nights however are as warm as the nights in the summer season. On account of the increased moisture in the monsoon air the weather is often sultry and uncomfortable even in the monsoon season in between the rains. With the

withdrawal of the monsoon by about the middle of September there is a rapid drop in the temperatures, specially night tempera- tures. January is usually the coldest month with the mean daily maximum temperature at about 19°C and the mean daily minimum at about 6°C. During the winter season, cold waves affect the district in the rear of passing western disturbances and the minimum temperature drops down to about a degree or so below the freezing point.

HUMIDITY

Relative humidity is generally high in the southwest monsoon season. During the rest of the year the air is dry, the driest part of the year being the summer season.

CLOUDINESS

The skies are generally moderately to heavily clouded during the monsoon season and for brief spells of a day or two during the cold season in association with passing western disturbances. During the rest of the year the skies are mostly clear or lightly clouded.

WINDS

Winds are generally light. During the southwest monsoon season, winds blow generally from directions between southeast and northeast, but on many days in the afternoons, westerly to northwesterly winds also blow. In the rest of the year westerly to northwesterly winds predominate except in the latter half of the summer season when easterlies and southeasterlies blow on some days.

SPECIAL WEATHER PHENOMENA

Western disturbances affect the weather over the district during the cold season. Thunderstorms occur in association with these. Thunderstorms and duststorms occur occasionally during the hot season. Rain during the monsoon season is often associated with thunder.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Kapurthala	13	a	37.8	23.9	24.5	6.3	8.9	23.6	255.9	174.2	122.1	88.3	3.4	10.0	778.9	163 (1955)	57 (1963)	339.1	1955 Oct 05
		b	3.1	1.2	2.3	0.5	0.9	2.1	8.1	7.4	4.3	1.4	0.3	0.9	32.5				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2

Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(K A P U R T H A L A)

Range in mm	No. of years	Range in mm	No. of years
401 - 500	1	901 - 1000	1
501 - 600	1	1001 - 1100	-
601 - 700	3	1101 - 1200	-
701 - 800	-	1201 - 1300	1
801 - 900	2		

(Data available for 9 years only).

LUDHIANA DISTRICT

The climate of this district is characterised by dryness except in the brief monsoon season, a very hot summer and a bracing winter. The cold season is from about the middle of November to the early part of March. The succeeding period upto about the end of June is the hot season. July, August and the first half of September constitute the southwest monsoon season. The period from mid-September to about the middle of November may be termed as the post monsoon or transition period.

RAINFALL

Records of rainfall in the district are available for five stations for sufficiently long period. The details of the rainfall at these stations and for the district as a whole are given in tables 1 and 2. The average annual rainfall in the district is 660.3 mm. The rainfall in the district increases from the southwest towards the northeast. About 71 percent of the annual rainfall is received during the period from July to September. The rainfall during the period December to March accounts for about 15 percent of the annual rainfall. The variation in the annual rainfall in the district from year to year is large. During the 80 year period from 1901 to 1980, the highest annual rainfall in the district amounting to about 198 percent of the normal occurred in 1917 while the lowest annual rainfall amounting to 44 percent of the normal occurred in year 1974. In the same 80 year period the rainfall in the district was less than 80 percent of the normal in 19 years, two consecutive years of such a low rainfall occurring five times. It will be seen from table 2 that the annual rainfall in the district was between 401 to 900 mm in 64 years out of 79.

On an average there are 34 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 31 at Jagraon to 37 at Samrala.

The heaviest rainfall in 24 hours recorded at any station in the district was 433.6 mm at Jagraon on 18 September 1950.

TEMPERATURE

There is a meteorological observatory in the district at Ludhiana and the records of this station may be taken as representative of the meteorological conditions in the district in general. Temperatures increase rapidly after February. May is generally the hottest month with the mean daily maximum temperature at 41.2°C and the mean daily minimum at 24.2°C. Hot scorching dust-laden winds, blow during the summer season and on individual days the day temperature may reach between 45°C and 48°C. Afternoon thundershowers bring welcome relief from the heat though only temporarily. With the onset of the monsoon in the district early in July, there is appreciable drop in the day temperatures. But the night temperatures in the monsoon season

are nearly as high as in the latter part of the summer. On account of the increased moisture in the monsoon air the weather is quite sultry and uncomfortable even in the monsoon season in between the rains. After about mid- September when the monsoon withdraws the night temperatures decrease rapidly. But the drop in the day temperatures is not so rapid. From about November however both the day and night temperatures decrease rapidly till January which is the coldest month. The mean daily maximum temperature in January is 20.2°C and the mean daily minimum is 5.8°C. During the winter season in association with passing western disturbances cold waves affect the district and the minimum temperature drops down below the freezing point.

The highest maximum temperature recorded at Ludhiana was 48.3°C on 29th May, 1944. The lowest minimum temperature was -3.4°C on 18th November, 1976.

HUMIDITY

Relative humidity is generally high during the monsoon season. In the rest of the year humidity is low, the driest part of the year being the summer season.

CLOUDINESS

During the monsoon season and for spells of a day or two in association with passing western disturbances the skies are moderately to heavily clouded and overcast occasionally. During the rest of the year the skies are mostly clear or lightly clouded.

WINDS

Winds are generally light in the district. In the southwest monsoon season winds from directions between northeast and southeast are common but on many days particularly in the afternoons westerly or northwesterly winds also blow. In the rest of the year westerly to northwesterly winds predominate except in the latter half of the summer season when easterlies and southeasterlies blow on some days.

SPECIAL WEATHER PHENOMENA

During the cold season western disturbances affect the weather over the district. Thunderstorms sometimes occur in association with these. Thunderstorms also occur during the summer and to a lesser extent in the monsoon season. Duststorms affect the district during the summer season.

Tables 3, 4 and 5 give the temperature and humidity, mean wind speed and special weather phenomena respectively for Ludhiana.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Ludhiana (Obsy)	80	a	30.8	33.5	28.1	13.4	14.1	54.0	200.8	174.4	108.8	21.2	4.7	16.3	700.1	198 (1917)	34 (1974)	354.3	1955 Oct 04
		b	2.3	2.5	2.0	1.2	1.5	3.4	8.6	7.8	4.0	1.0	0.5	1.4	36.2				
Samrala	73	a	30.5	29.8	27.1	11.8	11.6	52.1	237.5	180.0	119.1	21.7	3.3	16.5	741.0	178 (1917)	53 (1929)	283.5	1892 Sep 06
		b	2.5	2.4	2.0	1.1	1.1	3.2	9.1	8.0	4.6	0.9	0.4	1.3	36.6				
Ludhiana	73	a	31.0	30.9	27.8	12.0	11.1	49.3	199.6	174.5	113.4	20.4	3.7	13.8	687.5	283 (1963)	45 (1969)	289.6	1955 Oct 04
		b	2.3	2.4	1.9	1.2	1.1	3.2	8.3	7.9	4.0	0.9	0.4	1.2	34.8				
Jagraon	73	a	26.2	22.3	24.0	12.4	12.6	38.8	152.2	146.3	101.5	17.9	3.0	15.5	572.7	225 (1962)	52 (1921)	433.6	1950 Sep 18
		b	2.0	2.1	2.0	1.1	1.2	2.9	7.3	6.9	3.6	0.7	0.3	1.2	31.3				
Halwara Aero obsy	22	a	20.3	29.1	25.3	8.2	20.9	41.8	182.3	184.7	62.1	6.1	6.3	11.8	598.9	189 (1962)	56 (1974)	249.4	1967 Jul 05
		b	1.5	2.3	1.9	1.1	1.5	2.9	7.9	8.1	3.8	0.5	0.7	1.1	33.3				
Ludhiana (District)		a	27.8	29.1	26.5	11.6	14.1	47.2	194.5	172.0	101.0	17.5	4.2	14.8	660.3	198 (1917)	44 (1974)		
		b	2.1	2.3	2.0	1.1	1.3	3.1	8.2	7.7	4.0	0.8	0.5	1.2	34.3				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2
Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(L U D H I A N A)

Range in mm	No. of years	Range in mm	No. of years
201 - 300	1	801 - 900	7
301 - 400	5	901 - 1000	3
401 - 500	11	1001 - 1100	3
501 - 600	15	1101 - 1200	0
601 - 700	15	1201 - 1300	2
701 - 800	16	1301 - 1400	1

(Data available for 79 years only).

TABLE - 3
Period Averages of Temperature and Relative Humidity
(L U D H I A N A)

MONTH	Mean Daily Maximum Temperature °C	Mean Daily Minimum Temperature °C	Highest ever °C	Maximum recorded Date	Lowest ever °C	Minimum recorded Date	Relative Humidity 0830 %	Relative Humidity 1730★ %
January	20.2	5.8	28.9	1910 Jan 15	-2.2	1964 Jan 25	83	53
February	23.3	8.4	33.3	1956 Feb 27	-1.1	1905 Feb 01	78	44
March	29.0	12.9	41.1	1945 Mar 31	1.3	1964 Mar 07	67	38
April	36.0	18.5	46.1	1941 Apr 29	8.9	1905 Apr 04	47	27
May	41.2	24.2	48.3	1944 May 29	11.7	1964 May 01	37	22
June	41.1	27.1	47.9	1958 Jun 17	18.0	1977 Jun 14	49	32
July	36.0	26.7	47.8	1881 Jul 07	17.4	1976 Jul 29, 30	74	60
August	34.7	26.1	44.4	1884 Aug 06	8.6	1975 Aug 13, 14	79	66
September	35.3	23.9	41.7	1905 Sep 05	15.2	1962 Sep 30	74	53
October	33.9	17.5	40.0	1941 Oct 06	9.4	1964 Oct 31	64	39
November	28.8	10.1	35.8	1965 Nov 02	-3.4	1976 Nov 18	64	39
December	22.9	6.2	29.4	1944 Dec 04	-1.1	1930 Dec 24	79	50
Annual	31.9	17.3					66	44

★ Hours IST.

TABLE - 4
Mean Wind Speed in Km/hr.
(L U D H I A N A)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2.6	3.2	3.9	4.0	4.8	4.9	4.2	3.4	2.9	2.2	2.0	1.9	3.3

TABLE - 5
Special Weather Phenomena
(L U D H I A N A)

Mean No.of Days With⋆	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.6	0.3	0.9	0.7	1.5	0.8	1.1	0.9	0.4	0.3	0.1	0.0	8
Hail	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Dust-storm	0.0	0.0	0.0	0.2	0.8	1.0	0.4	0.0	0.1	0.1	0.0	0.0	3
Fog	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.2

⋆ No. of days two and above are given in whole nummbers.

PATIALA DISTRICT

The district is generally dry except during the brief monsoon season. The year may be divided into four seasons. The cold season from November to February is followed by the hot season from March to the end of June. The period from July to about the middle of September constitutes the southwest monsoon season. The latter half of September and October may be termed as the post monsoon or transition period.

RAINFALL

Records of rainfall in the district are available for 12 stations for sufficiently long period. The details of the rainfall at these stations and for the district as a whole are given in tables 1 and 2. The average annual rainfall in the district is 648.1 mm. The rainfall in the district in general increases from southwest towards the northeast and varies from 451.0 mm at Dedhana to 841.8 mm at Rajpura. About 75% of the annual rainfall in the district is received during the southest monsoon period, July to September, July and August being the rainiest months. Some rainfall is also received during June and October in the cold season. The variation in the rainfall from year to year is large. During the period 1901 to 1980 the highest annual rainfall amounting to 182% of the normal occurred in 1933. The lowest annual rainfall which was 17% of the normal occurred in 1978. In the same 80 year period rainfall less than 80% of the normal occurred in 28 years in the district, two consecutive years of annual rainfall less than 80% of the normal occurred three times in the district. Three consecutive years of rainfall less than 80% of the normal occurred two times in the district. Six consecutive years occurred once. It will be seen from table 2 that the annual rainfall in the district was between 401 mm and 900 mm in 65 years out of 78.

On an average there are about 29 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 21 at Dedhana to 35 at Patiala.

The heaviest rainfall in 24 hours recorded at any station in the district was 538.5 mm recorded at Rohti on 28th September, 1958.

TEMPERATURE

There is a meteorological observatory in the district at Patiala and the records of this observatory may be taken as representative of the climatic conditions in the district in general. After February both the day and night temperatures increase rapidly till June which is generally the hottest month. The mean daily maximum temperature during June is 40.4°C and the mean daily minimum is 26.7°C. The summer is intensely hot and on individual days the maximum temperature goes upto about 47°C. The scorching dust laden winds which often blow during

the summer make the weather very trying. Afternoon thunderstorms which occur on some days bring some relief although only temporarily. With the onset of the monsoon in the district by about the beginning of July there is appreciable drop in the day temperatures. Due to increase in moisture in the monsoon air,the weather is uncomfortable in between the rains. The nights during the monsoon season are about as warm as during the latter part of the summer. After the withdrawal of the monsoon by about mid-September there is a drop in the temperatures, the drop in night temperatures being more rapid. After October both the day and night temperatures decrease rapidly and the sharp fall in temperatures after nightfall is particularly trying. January is usually the coldest month with the mean daily maximum temperature at 20.2°C and the mean daily minimum at 7.1°C. In winter cold waves affect the district in the wake of passing western disturbances and the minimum temperature drops occasionally to about the freezing point.

The highest maximum temperature recorded at Patiala was 46.7°C on 27th May, 1954. The lowest minimum was 0°C on 17th January, 1962.

HUMIDITY

Mornings are comparatively more humid than the afternoons. The humidity is high during the monsoon season. Humidities decrease thereafter and by summer which is the driest part of the year, the relative humidities in the afternoons become less than 30 percent.

CLOUDINESS

The skies are generally moderately to heavily clouded during the monsoon season and for brief spells of a day or two in association with passing western disturbances during the cold season. During the rest of the year the skies are mainly clear or lightly clouded.

WINDS

Winds are generally light with some strengthening in force during the period February to June. In the post monsoon and cold season the winds are predominantly from the northwest. In March and April easterly to southeasterly winds also blow on some days especially in the mornings. In the period May to September easterlies and southeasterlies predominate but on many days northwesterlies also blow in the afternoons.

SPECIAL WEATHER PHENOMENA

In the cold season western disturbances affect the district causing occasional heavy rain sometimes associated with thunder. Rain during June and the monsoon season is often associated with thunder. Duststorms occur occasionally in the hot season.

Tables 3, 4 and 5 give the temperature and relative humidity, mean wind speed and special weather phenomena respectively for Patiala.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Patiala (Obsy)	65	a	31.7	29.4	24.3	9.3	15.6	57.6	203.0	198.5	117.9	17.5	5.0	10.9	720.7	176	15	238.0	1949 Jul 14
		b	2.4	2.0	1.9	0.9	1.4	3.1	8.5	8.4	4.5	0.9	0.5	1.0	35.5	(1933)	(1978)		
Patiala	21	a	31.2	23.7	20.7	5.7	12.3	49.5	228.5	253.9	130.1	24.3	1.7	9.9	791.5	153	58	189.2	1969 Sep 11
		b	2.2	2.1	1.9	0.7	1.1	2.6	8.4	9.5	4.6	1.1	0.2	1.0	35.4	(1955)	(1965)		
Nabha	20	a	22.4	27.4	22.7	3.8	7.7	34.5	207.5	178.4	101.3	29.9	1.4	9.7	646.7	150	43	225.0	1969 Jul 16
		b	1.9	2.1	1.9	0.5	1.0	2.0	7.5	8.5	4.3	1.3	0.3	0.9	32.2	(1955)	(1965)		
Sirhind	20	a	28.8	23.8	26.1	6.4	11.8	49.5	266.6	189.9	120.4	39.8	3.0	13.6	779.7	168	67	165.0	1972 Jul 08
		b	2.2	1.9	1.5	0.7	1.0	2.1	8.8	7.5	4.5	1.5	0.3	0.8	32.8	(1955)	(1969)		
Amloh	20	a	19.6	24.3	18.7	1.0	5.7	34.0	195.5	152.1	98.4	17.2	2.4	8.2	577.1	187	37	164.6	1960 Aug 20
		b	1.5	1.7	1.2	0.1	0.3	1.7	6.6	6.3	3.7	0.7	0.3	0.4	24.5	(1960)	(1972)		
Payal Pail	10	a	38.7	14.4	23.1	7.7	7.2	18.5	185.3	151.7	135.0	84.2	4.8	15.5	686.1	169	53	205.7	1960 Aug 22
		b	2.2	1.2	0.9	0.5	0.3	1.3	5.3	5.0	3.6	1.8	0.3	0.5	22.9	(1955)	(1954)		
Rajpura	20	a	33.5	26.8	21.4	3.3	7.8	46.5	266.0	229.9	159.4	33.1	2.0	12.1	841.8	143	62	193.0	1962 Sep 21
		b	2.7	1.9	1.7	0.5	0.9	2.7	8.7	8.2	4.5	1.3	0.2	1.1	34.4	(1962)	(1965)		
Lehal	66	a	29.8	29.2	20.6	10.1	9.2	41.3	161.5	21.1	104.8	16.3	2.2	11.2	457.3	309	10	174.0	1938 Jan 01
		b	2.1	2.0	1.6	0.9	0.9	2.6	7.4	7.7	4.1	0.7	0.3	1.0	31.3	(1933)	(1962)		

Contd.....

TABLE - I (Contd)

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Rohti	15	a	43.5	19.4	17.2	2.2	10.0	25.7	188.9	299.5	152.3	30.6	7.7	5.9	802.9	313 (1958)	38 (1963)	538.5	1958 Sep 28
		b	1.7	1.8	1.3	0.3	1.0	1.3	6.5	7.1	4.3	0.4	0.2	0.5	26.4				
Dhaneta	55	a	21.7	23.1	15.0	9.3	07.2	43.6	113.5	132.5	81.5	18.8	1.6	9.1	476.7	258 (1917)	52 (1938)	177.8	1945 Sep 26
		b	1.6	1.8	1.2	0.7	0.8	2.2	5.5	6.1	3.2	0.8	0.2	0.8	24.9				
Dialpura	17	a	18.9	14.6	17.1	2.8	8.2	19.2	188.2	161.9	85.7	21.9	1.3	6.3	546.1	156 (1964)	62 (1962)	175.0	1965 Jul 17
		b	1.6	1.2	1.3	0.4	0.9	1.3	6.9	6.4	3.4	1.0	0.1	0.5	25.0				
Dedhana	12	a	25.1	14.8	4.7	0.4	4.4	15.9	77.1	104.3	162.2	42.1	0.0	0.0	451.0	181 (1954)	19 (1962)	205.7	1954 Sep 11
		b	2.1	0.7	1.0	0.1	0.5	0.7	4.5	4.9	4.4	1.6	0.0	0.0	20.5				
Patiala (District)		a	28.7	22.6	19.3	5.2	8.9	36.3	190.1	172.8	120.7	31.3	2.8	9.4	648.1	182 (1933)	17 (1978)		
		b	2.0	1.7	1.5	0.5	0.8	2.0	7.1	7.1	4.1	1.1	0.2	0.7	28.8				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2
Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(P A T I A L A)

Range in mm	No. of years	Range in mm	No. of years
101 - 200	1	701 - 800	9
201 - 300	-	801 - 900	10
301 - 400	2	901 - 1000	4
401 - 500	20	1001 - 1100	3
501 - 600	13	1101 - 1200	3
601 - 700	13		

(Data available for 78 years only).

TABLE - 3
Period Averages of Temperature and Relative Humidity
(P A T I A L A)

MONTH	Mean Daily Maximum Temperature °C	Mean Daily Minimum Temperature °C	Highest ever °C	Maximum recorded Date	Lowest ever °C	Minimum recorded Date	Relative Humidity 0830 %	Relative Humidity 1730★ %
January	20.2	7.1	27.8	1952 Jan 24	0.0	1962 Jan 17	81	55
February	24.2	9.3	33.3	1956 Feb 27	0.4	1974 Feb 08	69	41
March	29.4	13.8	37.8	1953 Mar 24	3.5	1979 Mar 09	59	34
April	36.0	19.2	42.8	1958 Apr 27	10.3	1965 Apr 02	40	20
May	40.2	24.0	46.7	1954 May 27	15.8	1987 May 10	36	20
June	40.4	26.7	46.4	1966 Jun 09	18.2	1974 Jun 07	51	31
July	35.2	26.4	45.0	1951 Jul 01	20.7	1974 Jul 04	77	60
August	33.5	25.5	40.4	1962 Aug 07	20.9	1978 Aug 09	83	67
September	34.4	23.8	40.6	1951 Sep 06	16.3	1979 Sep 20	76	58
October	32.4	17.8	38.9	1951 Oct 06	10.0	1982 Oct 31	66	47
November	28.2	10.6	34.4	1965 Nov 02	4.4	1952 Nov 29	62	45
December	23.1	7.3	29.4	1964 Dec 04	0.4	1961 Dec 21	78	53
Annual	31.4	17.6					65	44

★ Hours IST.

TABLE - 4
Mean Wind Speed in Km/hr.
(P A T I A L A)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
7.2	9.3	9.3	9.6	9.8	9.3	7.5	6.1	5.9	6.2	6.5	6.2	7.7

TABLE - 5
Special Weather Phenomena
(P A T I A L A)

Mean No.of Days With ⋆	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	1.6	0.9	1.7	1.5	2	4	4	3	3	0.6	0.0	0.0	22
Hail	0.2	0.1	0.2	0.1	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	0.2	1.9	0.6	0.2	0.0	0.1	0.0	0.0	0.0	3
Squall	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5
Fog	0.3	0.2	0.0	0.0	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.1	1.3

⋆ No. of days two and above are given in whole numbers.

RUPNAGAR DISTRICT

The climate of this district is characterised by general dryness except in the southwest monsoon season, a hot summer and a bracing cold season. The year may be divided into four seasons. The period from about the middle of November to February is the cold season. This is followed by the summer season from March to about the end of June. The southwest monsoon season commences late in June and continues upto about the middle of September. The period from mid-September to the middle of November constitutes, the post monsoon or transition season.

RAINFALL

Records of rainfall in the district are available for two stations for sufficiently long period. The details of the rainfall at these stations and for the district as a whole are given in tables 1 and 2. The average annual rainfall in the district is 801.4 mm. About 78% of the annual normal rainfall is received during the period from June to September. About 12% of the normal rainfall is received in the cold season. The rainfall in the district generally increases from the southwest to northeast and varies from 777.9 mm at Kharar to 824.8 mm at Rupnagar. In the 80 year period 1901 to 1980 the highest annual rainfall amounting to 169% of the normal occurred in 1942. The lowest annual rainfall which was 40% of the normal was received in year 1918. In the same period, the annual rainfall in the district was less than 80% of the normal in 20 years. Of these there are four occasions of two consecutive years and one of four consecutive years when the rainfall was less than 80% of the normal. It will be seen from table 2 that the annual rainfall in the district was between 501 mm and 900 mm in 48 years out of 68.

On an average there are 41 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 40 at Kharar to 41 at Rupnagar.

The heaviest rainfall in 24 hours recorded at any station in the district was 310.4 mm at Rupnagar on 30 July 1951.

TEMPERATURE

There is no meteorological observatory in the district. The account which follows is therefore based on the records of the observations in the neighbouring districts where similar climatic conditions prevail. May and June are generally the hottest months in the year with the mean daily maximum temperature at about 40°C and the mean daily minimum at about 25°C. The heat in summer season is intense. Maximum temperature may often go above 47°C on some days during summer. Scorching dust-laden winds which are a fairly common feature in the latter part of the summer season contribute much to the discomfort. An occasional thunderstorm brings some temporary relief. With the advance of the monsoon into the district by about the

end of June there is some drop in the day temperature but nights still continue to be quite warm. The weather remains oppressive in between the rains due to the moisture in the air during the monsoon season. After the withdrawal of the monsoon by about mid-September there is slight increase in the day temperature. However, the nights become progressively cooler. The decrease in temperature is rapid from November. January is generally the coldest month with the mean daily maximum temperature at about 20°C and the mean daily minimum at about 7°C. During winter season cold waves affect the district in the wake of passing western disturbances and the minimum temperature drops down occasionally to about a degree below the freezing point. On such occasions frosts are likely in the district.

HUMIDITY

Relative humidity is high, about 70% during the monsoon season. During the rest of the year the atmosphere is generally dry. The driest part of the year is the summer season when in the afternoons the relative humidity is as low as 25%.

CLOUDINESS

The skies are generally moderate to heavily clouded and occasionally overcast during the monsoon season and for brief spells of a day or two in association with passing western disturbances during the cold season. The skies are mainly clear or lightly clouded during the rest of the year.

WINDS

Winds are generally light in the district. In the post monsoon and cold seasons winds are predominantly from the northwest. In summer easterly to southeasterly winds also blow on some days. In the southwest monsoon season easterlies and southeasterlies predominate but on many days northwesterly winds blow in the afternoon.

SPECIAL WEATHER PHENOMENA

The district is scarcely affected by monsoon depressions. During the period January to March western disturbances affect the district causing rain often associated with thunder. Rain during the monsoon season is more often associated with thunder. Duststorms occur occasionally in the hot season. Occasional fog occurs in the cold season.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS ★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS ★ Date
Kharar	70	a	39.8	36.3	24.5	10.1	14.2	61.1	228.6	199.6	122.9	21.6	4.6	14.6	777.9	167 (1942)	45 (1918)	261.6	1888 Sep 20
		b	2.9	2.6	2.1	1.0	1.4	3.7	9.9	9.1	4.7	1.0	0.4	1.3	40.1				
Rupnagar	69	a	44.0	38.8	28.6	11.9	15.6	55.8	252.3	215.0	122.3	20.1	4.7	15.7	824.8	171 (1942)	39 (1918)	310.4	1951 Jul 30
		b	3.0	2.9	2.1	1.1	1.3	3.6	9.9	9.7	4.9	1.1	0.4	1.4	41.4				
Rupnagar District		a	41.9	37.5	26.5	11.0	14.9	58.5	240.5	207.3	122.6	20.9	4.7	15.1	801.4	169 (1942)	40 (1918)		
		b	2.9	2.7	2.1	1.1	1.3	3.7	9.9	9.4	4.8	1.1	0.4	1.3	40.7				

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 1980.*
★★ *Years of occurrence given in brackets.*

TABLE - 2

Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(R U P N A G A R)

Range in mm	No. of years	Range in mm	No. of years
301 - 400	1	901 - 1000	7
401 - 500	1	1001 - 1100	8
501 - 600	11	1101 - 1200	0
601 - 700	10	1201 - 1300	1
701 - 800	13	1301 - 1400	2
801 - 900	14		

(Data available for 68 years only).

SANGRUR DISTRICT

The climate of this district is on the whole dry and is characterised by a short monsoon season and extremes of temperature during the year.The year may be divided into four seasons. The cold season from November to March is followed by the hot season lasting upto the end of June. The period from July to mid-September constitutes the southwest monsoon season. The second half of September and October may be termed the post monsoon or transition period.

RAINFALL

Records of rainfall in the district are available for 12 stations for sufficiently long period. The details of the rainfall at these stations and for the district as a whole are given in tables 1 and 2. The average annual rainfall in the district is 557.6 mm. The rainfall in the district increases from the southwest towards the north- east and varies from 447.4 mm at Bandhar to 683.1 mm at Dhubri. About 74% of the annual rainfall in the district is received during the monsoon months July to September, July being the rainiest month. There is some rain mostly as thundershowers during the premonsoon month of June. Some rain is also received during the cold season in association with passing western disturbances. The variation in the annual rainfall from year to year is large. In the 80 years during the period 1901 to 1980, it is seen that the highest annual rainfall in the district amounting to 198% of the normal occurred in 1970. The lowest annual rainfall which was 42% of the normal occurred in 1934. The annual rainfall in the district was less than 80% ofthe normal in 30 years during this period. For the district as a whole two consecutive years of such low rainfall occurred thrice and three consecutive years once, four and five consecutive years occurred once and twice respectively. It will be seen from table 2 that the annual rainfall in the district was between 201 and 600 mm in 53 years out of 70 years.

On an average there are 25 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. This number varies from 16 at Lad Banjara to 30 at Bharthala.

The heaviest rainfall in 24 hours recorded in the district was 331.1 mm at Balad on 12 September 1958.

TEMPERATURE

There is no meteorological observatory in the district. The account which follows is therefore based on the records of the observatories in the neighbouring district where similar climatic conditions prevail. From about the beginning of March temperatures increase rapidly till June which is generally the hottest month. The mean daily maximum temperature during June is around 40°C and the mean daily minimum is around 27°C. The heat in summer is intense. On individual days the day temperature may occasionally exceed 47 or 48°C. Scorching dust

laden winds which blow during the hot season render the weather very trying. Afternoon thundershowers which occur on some days bring some relief although only temporarily. With the onset of the monsoon by about the end of June or beginning of July there is a drop in the day temperatures but the nights are nearly as warm as in June. Due to the increased humidity in the monsoon air, the weather is oppressive in between the rains. After the withdrawal of the monsoon by about the middle of September there is a decrease in temperatures, the drop in the night temperatures being more rapid. After October both the day and night temperatures decrease rapidly and the sharp fall in temperature afternight fall is particularly trying. January is usually the coldest month with the mean daily maximum temperature at about 20°C and the mean daily minimum at about 7°C. In the cold season particularly in January and February, cold waves in the wake of passing western disturbances affect the district and the minimum temperature occasionally drops down below the freezing point.

HUMIDITY

During the southwest monsoon season (July to September) the relative humidty is high, being 75-80% in the mornings and about 55-65% in the afternoons. High humidities of more than 70% also prevail during the winter months and December to February. It is comparatively drier during the rest of the year. April and May contribute the driest part of the year when in the afternoons the relative humidity is 25% or less.

CLOUDINESS

Skies are moderately to heavily clouded mainly in July and August. Cloudiness decreases rapidly by October. In the period November to May the skies are mostly clear or lightly clouded except during the passage of western disturbances in the cold season when the skies become cloudy for brief spells of a day or two. From June onwards cloudiness increases.

WINDS

Winds are generally light, with some strengthening in force during the late summer and early part of the monsoon season. In the southwest monsoon season winds from the southwest and west are more common, with the easterlies and southeasterlies blowing on some days. In the post monsoon and winter seasons, southwesterlies and westerlies are common in the mornings while northerlies and northwesterlies are predominant in the afternoons. In the summer winds are from the west or south- west in the mornings. In the afternoons winds blow from directions between west and north.

SPECIAL WEATHER PHENOMENA

The district is scarcely affected by monsoon depressions. During the cold season passing western disturbances affect the weather over the district causing a few thunderstorms. Rain during June and monsoon season is often associated with thunder. Duststorms occur occasionally in the hot season.

TABLE - I

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS★★	HEAVIEST RAINFALL in 24 HOURS★ Amount (mm)	HEAVIEST RAINFALL in 24 HOURS★ Date
Sangrur	18	a	19.8	12.0	18.5	4.1	13.9	41.0	181.8	148.1	95.7	29.8	3.2	11.8	579.7	171 (1960)	52 (1975)	192.4	1960 Jul 12
		b	1.6	1.0	1.8	0.6	1.4	2.6	6.6	6.9	4.4	1.3	0.4	0.9	29.5				
Sunam	20	a	17.6	14.7	12.1	5.3	12.5	50.5	126.2	153.9	94.1	33.7	2.1	11.7	534.4	172 (1955)	56 (1954)	181.6	1975 Sep 06
		b	1.6	1.3	1.1	0.5	0.9	1.8	5.3	6.1	3.6	1.1	0.3	0.9	24.5				
Barnala	21	a	18.4	16.2	13.1	5.0	6.9	30.5	177.3	135.1	105.6	32.2	4.0	7.6	551.9	177 (1955)	50 (1963)	212.5	1964 Jul 26
		b	1.1	1.1	1.3	0.3	0.7	1.5	5.2	5.7	3.4	0.7	0.5	0.7	22.2				
Dhubri	20	a	21.0	17.8	15.8	4.5	15.3	51.2	217.2	170.0	113.2	38.5	4.7	13.9	683.1	167 (1955)	52 (1954)	175.0	1967 Jul 05
		b	1.5	1.3	1.6	0.5	0.7	1.5	5.2	5.7	3.4	0.7	0.5	0.7	22.2				
Malerkotla	20	a	22.5	19.3	16.8	5.4	30.6	46.5	199.0	145.9	102.3	47.4	4.0	9.9	649.6	201 (1955)	47 (1965)	199.0	1967 Jul 05
		b	1.9	1.5	1.4	0.5	1.1	2.1	7.3	6.9	3.9	1.4	0.4	0.8	29.2				
Ranike	69	a	16.5	19.6	15.5	8.0	10.2	31.2	136.4	126.8	77.9	14.1	2.9	11.7	470.8	231 (1955)	18 (1969)	228.6	1958 Sep 28
		b	1.3	1.5	1.4	0.8	0.8	2.0	5.3	5.4	3.0	0.6	0.3	0.8	23.2				
Bandhar	69	a	15.2	19.2	15.0	5.9	11.3	28.8	114.8	121.9	89.0	14.9	1.5	9.9	447.4	276 (1970)	22 (1912)	266.7	1945 Sep 26
		b	1.3	1.5	1.2	0.7	1.1	2.1	5.4	5.3	3.1	0.4	0.2	0.7	23.0				
Bhartala	33	a	31.6	19.6	22.6	10.6	5.8	40.4	152.0	171.4	114.2	26.9	5.4	11.3	611.8	207 (1945)	52 (1902)	275.6	1945 Sep 26
		b	2.3	1.8	2.0	0.7	0.7	2.2	6.9	7.6	4.0	0.8	0.4	1.0	30.4				

Contd.....

TABLE - I (Contd)

Normals and Extremes of Rainfall

STATION	No. of Years of DATA		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST ANNUAL RAINFALL AS % OF NORMAL & YEARS**	LOWEST ANNUAL RAINFALL AS % OF NORMAL & YEARS**	HEAVIEST RAINFALL in 24 HOURS * Amount (mm)	HEAVIEST RAINFALL in 24 HOURS * Date
Balad	16	a	24.3	15.8	15.1	3.7	10.2	14.4	159.8	160.9	133.7	28.6	0.9	3.9	571.3	216 (1958)	56 (1965)	331.1	1958 Sep 12
		b	1.5	1.3	1.4	0.5	0.6	1.2	6.9	6.6	3.6	1.1	0.1	0.3	25.1				
Gujjran	66	a	18.6	19.2	14.5	10.1	12.1	43.7	140.2	140.0	82.4	17.6	2.3	9.2	509.9	232 (1917)	34 (1903)	248.9	1960 Jul 12
		b	1.7	1.8	1.7	0.9	1.0	2.5	6.7	6.0	3.0	0.6	0.3	0.9	27.1				
Lad Banjara	15	a	18.0	21.6	14.5	1.8	8.1	18.1	195.6	128.6	171.7	9.1	2.1	5.3	594.5	294 (1958)	14 (1962)	330.2	1958 Sep 28
		b	1.0	1.1	0.7	0.1	0.5	0.9	4.7	3.7	2.8	0.5	0.1	0.3	16.4				
Dadahur	66	a	19.4	21.1	18.7	10.2	11.5	35.0	143.9	116.2	86.6	11.0	3.2	12.7	489.5	228 (1917)	33 (1946)	238.0	1955 Oct 04
		b	1.7	1.8	1.7	0.9	1.0	2.5	6.7	6.0	3.0	0.6	0.3	0.9	27.1				
Sangrur (District)		a	20.2	18.0	16.0	6.2	12.4	35.9	162.0	143.2	105.5	25.3	3.0	9.9	557.6	198 (1970)	42 (1934)		
		b	1.5	1.4	1.4	0.6	0.9	2.0	6.0	6.0	3.5	0.9	0.3	0.7	25.2				

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 1980.*
** *Years of occurrence given in brackets.*

TABLE - 2

Frequency of Annual Rainfall in the District
(Data 1901 - 1980)
(S A N G R U R)

Range in mm	No. of years	Range in mm	No. of years
201 - 300	11	701 - 800	5
301 - 400	11	801 - 900	3
401 - 500	20	901 - 1000	1
501 - 600	11	1001 - 1100	2
601 - 700	5	1101 - 1200	1

(Data available for 70 years only).

ERRATA FOR THE PUBLICATION "CLIMATE OF PUNJAB"

S.No.	Page No.	Para No.	Line No.	Printed as	Corrected as
1.	V	Two	5	district	districts
2.	1	Two	3	Bist-Jullundur	Bist-Jalandhar
3.	1	Two	4	Bari	Bari-Doab
4.	1	Three	1	in the	delete 'in the'
5.	1	Five	2	The state is totally free from oceanic influence	delete this sentence
6.	2	Three	2	semi arid	semi-arid
7.	2	Six	9	change over	changeover
8.	2	Six	9	Table-1	Table-I
9.	2	Seven	1	Table-2	Table-II
10.	2	Seven	1	minimum temperatures.	minimum temperatures for six observatory stations.
11.	4	One	1	Table 3	Table III
12.	4	One	1	mean relative humidity	mean monthly and annual relative humidity
13.	4	One	1	for the six individual stations	for the six selected stations
14.	4	Three	2	the sky will remain	the sky remains
15.	4	Four	1	Tables 4 & 4(a)	Tables IV & IV(a)
16.	4	Four	2	Table 4(b)	Table IV(b)
17.	4	Five	1	Table 5	Table V
18.	5	Six	2	tothe	to the
19.	5	Six	8	co-efficient	coefficient
20.	7	One	3	district	districts
21.	8	Last	Last	district	districts
22.	11	Two	1 & 2	in the period	during the period
23.	14	Table I	Amritsar Col. a, Jul	11.7	11.5
24.	14	Table I	Ferozepur Col. a, Oct	1.7	1.5
25.	38	Table I	Faridkot Heaviest rainfall amount	182.0	182.2

S.No.	Page No.	Para No.	Line No.	Printed as	Corrected as
26.	43	Table I	Zira Heaviest rainfall date	950 Sep 17	1950 Sep 17
27.	43	Table I	Jalalabad Col. a, Jan	5.5	15.5
28.	47	One	8	suchoccasions	such occasions
29.	54	Table I	Garhsankar Col. a, Sep	123.	123.3
30.	54	Table I	Garhsankar Col. a, Oct	322.6	22.6
31.	61	One	2	tempera-tures	temperatures
32.	69	Two	5	during the southest	during the southwest
33.	69	Two	7	June and October in the cold season	June and October and in the cold season
34.	69	Last	2	as representative	as a representative
35.	72	Table I (contd)	Dhaneta Col. a, Aug	132.5	132.3
36.	Throughout the text, tables and maps			Ferozpur	Ferozepur
37.	Throughout the text, tables and maps			Jullundar	Jalandhar
37.	Throughout the text, tables and maps			mean daily maximum temperature	monthly mean of daily maximum temperature
38.	Throughout the text, tables, and maps			mean daily minimum temperature	monthly mean of daily minimum temperature

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