Climatic regions

A climatic region is characterized by similarities in the various climatic elements, like precipitation (rainfall, snowfall, hail), temperature, air pressure, wind, etc. of which the two most frequently used to help define climatic regions are temperature and precipitation. In Pakistan dry and humid climates have been determined on the basis of precipitation, while the subgroups have been determined on the basis of temperature. The Northern Highlands with their distinct climate, constitute a separate climatic region and are dealt with accordingly.

The following climatic regions are found in Pakistan:

Arid

1. with warm summer and mild winter
2. with hot summer and mild winter
3. with warm summer and cool winter

Semi-arid

4. with hot summer and mild winter
5. with warm summer and cool winter

Humid

6. with hot summer and mild winter
7. with warm summer and cool winter
8. highland climate

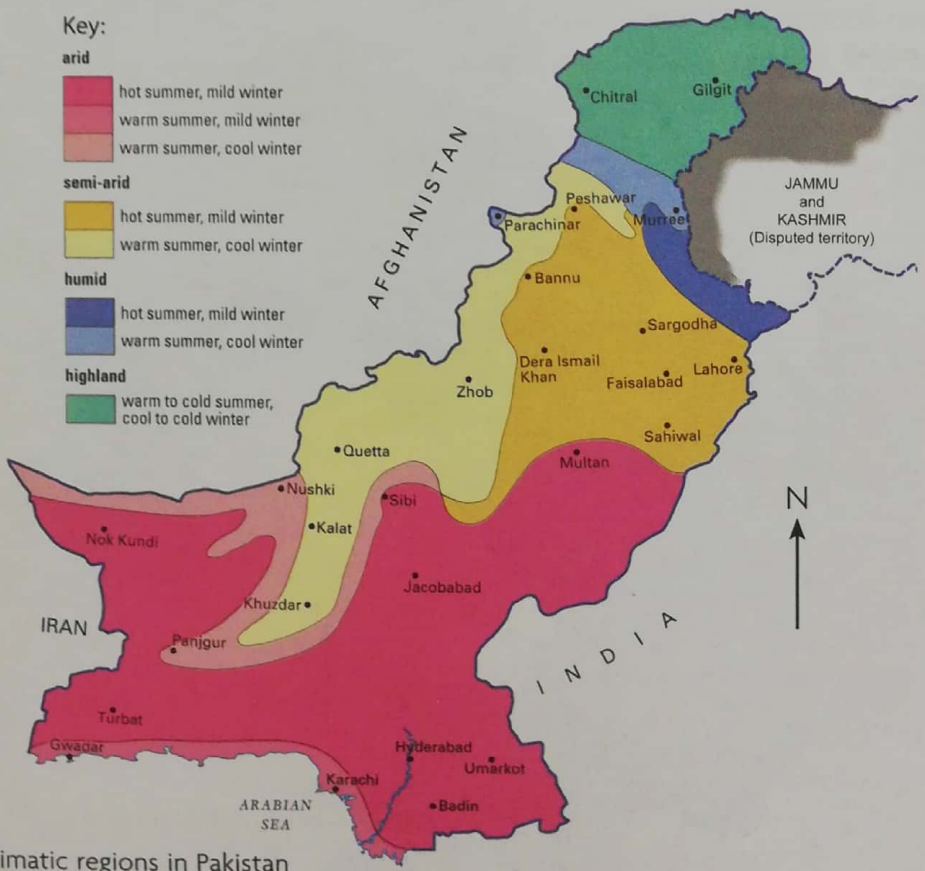


Figure 4.7: Climatic regions in Pakistan

The tables and graphs with the definition of each region show the monthly mean temperatures and rainfall as well as the annual average temperature and total rainfall of selected places.

1. **Arid with warm summer and mild winter:** These conditions are found in Pakistan in a narrow coastal strip where the moderating influence of the ocean keeps summer temperatures lower and winter temperatures higher than those found further inland. The temperature in June, the hottest month, remains between 31° and 32°C, whereas temperatures in the interior rise above 32°C (Table 4). The temperature in January, the coolest month, varies from 18° to 19°C, whereas in the interior it drops below 15.5°C.

Uniformity of temperature is a unique characteristic of the coastal region. Chilly winds from the Balochistan Plateau bring brief cold spells, but the winters are generally pleasant though very short, extending from December to February. Aridity prevails all over the coastal region: the annual rainfall is less than 250 mm and is slightly higher towards the east than to the west. The main sources of rainfall are the monsoons to the east and the Western Disturbances to the west.

Table 3: Arid with warm summer and mild winter

	Karachi		Jiwani	
	Temperature °C	Precipitation (mm)	Temperature °C	Precipitation (mm)
January	18.1	6.0	19.0	27.3
February	20.2	9.8	20.0	33.4
March	24.5	11.7	23.6	9.9
April	28.3	4.4	26.8	6.0
May	30.5	0	29.5	0.2
June	31.4	5.5	30.7	0.6
July	30.3	85.5	30.0	7.7
August	28.9	67.4	28.6	3.6
September	28.9	19.9	27.9	0.2
October	27.9	1.0	27.2	0.2
November	23.9	1.8	23.9	4.5
December	19.5	4.4	20.4	20.3
Annual	**26.0**	**217.3**	**25.6**	**113.9**

2. **Arid with hot summer and mild winter:** This is the climate of a large area covering most of the Indus Plains and westward into Balochistan up to the Iran border. Daytime is particularly hot; the mean maximum temperature in the hottest month rises to over 38°C at all stations and even crosses beyond 43°C. The region between Sibi and Jacobabad becomes unbearably hot, and extreme temperatures have been recorded here—Jacobabad: 53°C and Sibi: 52°C. However, temperatures decrease northward inland and southward towards the coastal areas. Summer in this region is also longer, lasting for nine months from March to November in the south, and for seven months, from April to October in central Punjab and western Balochistan. Winters are mild with temperatures between 10°C and 21°C. Although the mean monthly temperature never drops to freezing point at any station, very

low temperatures have been recorded on very cold days. In the south, winter lasts three months, from December to February, and five months in central Punjab and western Balochistan, from November to March.

The annual rainfall is less than 250 mm, although some parts of central Punjab get between 250 and 375 mm of rain annually. Rainfall is concentrated in two seasons: from July to September and from December to March. The Indus Plains receive the maximum rainfall from the summer monsoons; maximum rain in the Balochistan Plateau is in winter from the Western Disturbances. However, rainfall is inadequate for agriculture throughout this region so crops are grown with the help of irrigation. Rain-fed farming is practised only in years of good rainfall, while dry farming takes place in some areas.

Table 4: Arid with hot summer and mild winter

Month	Jacobabad		Sibi	
	Temperature °C	Precipitation (mm)	Temperature °C	Precipitation (mm)
January	15.1	3.1	14.0	6.9
February	17.9	7.1	16.9	9.9
March	23.8	10.3	22.9	24.7
April	30.2	2.0	29.8	14.9
May	34.9	1.7	35.4	2.4
June	36.9	4.7	38.5	6.0
July	34.9	36.8	36.7	35.6
August	33.2	26.3	35.0	30.3
September	31.4	11.2	33.3	7.7
October	27.8	2.3	28.1	1.1
November	22.1	1.2	21.2	1.5
December	16.4	3.7	15.6	3.3
Annual	**27.0**	**110.4**	**27.3**	**144.4**

3. Arid with warm summer and cool winter: These conditions prevail over the central and north-western Balochistan Plateau. The mean monthly temperature in summer crosses 32°C but rarely exceeds 38°C. July and August are the hottest months with 32°C in Panjgur in July, and 33.2°C in Nushki in August. Summer in this region is from May to September, while winter is from October to April. The mean monthly temperature in January, the coolest month, is about 10°C, with 10.8°C at Nushki and 10.5°C at Panjgur, but sometimes the temperature drops below freezing point and nights are very chilly. The severe winter cold is more daunting than the summer heat, so most educational institutions have longer holidays in winter.

There is severe aridity in this region. The annual rainfall is less than 250 mm with more rain in winter than in summer.

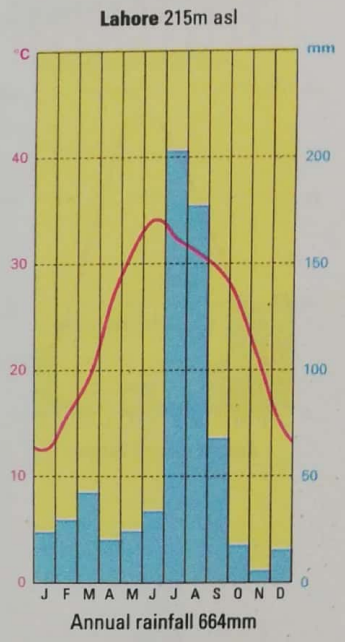
Table 5: Arid with warm summer and cool winter

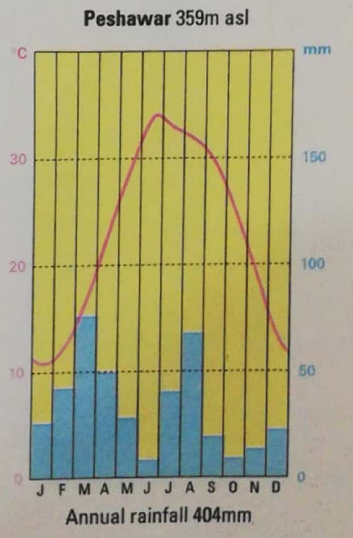
Month	Nushki		Panjgur	
	Temperature °C	Precipitation (mm)	Temperature °C	Precipitation (mm)
January	10.8	39.6	10.5	16.3
February	13.6	28.7	12.8	16.2
March	18.2	23.8	18.2	15.6
April	24.5	7.4	23.7	7.4
May	29.5	2.8	28.5	3.1
June	27.6	0.3	31.7	3.3
July	24.7	4.06	31.7	25.0
August	33.2	1.27	30.7	9.2
September	28.5	0.25	27.2	1.5
October	23.3	0	22.1	0.8
November	16.8	2.3	16.6	0.8
December	11.7	16.2	12.1	9.5
Annual	23.2	126.7	22.1	108.7

4. Semi-arid with hot summer and mild winter: These conditions are found over a large area of northern Punjab, extending into the adjoining areas of Khyber Pakhtunkhwa. Summers are hot, with the mean monthly temperature in June, the hottest month, going above 32°C in the region. The scorching heat forces much outdoor work to be suspended during the hottest part of the day. Summer lasts from April to October. The annual winter temperature remains above 10°C in the coolest month; the January temperature is 12.8°C at Lahore and 11.2°C at Peshawar. Frost is rare but not unknown. Annual rainfall ranges between 250 and 750 mm. Except for a narrow strip in the west, the region receives more rainfall in the summer and considerable rainfall in the winter as well.

Table 6: Semi-arid with hot summer and mild winter

Month	Lahore		Peshawar	
	Temperature °C	Precipitation (mm)	Temperature °C	Precipitation (mm)
January	12.8	23.0	11.2	26.0
February	15.4	28.6	12.9	42.7
March	20.5	41.2	17.4	78.4
April	26.8	19.7	23.2	48.9
May	31.2	22.4	28.6	27.0
June	33.9	36.3	33.1	7.7
July	31.5	202.1	32.2	42.3
August	30.7	163.9	30.7	67.7
September	29.7	61.1	28.9	17.9
October	25.6	12.4	23.7	9.7
November	19.5	4.2	17.6	12.3
December	14.2	13.9	12.5	23.3
Annual	24.3	628.8	22.7	403.9





5. Semi-arid with warm summer and cool winter: This climate is found in the northern part of the Balochistan Plateau and the adjoining highlands of FATA and Khyber Pakhtunkhwa. Summers are warm with temperatures ranging from 21°C to 32°C; the mean maximum July temperature exceeds 32°C but not beyond 38°C. Winters are cool and the mean monthly temperature of January, the coolest month, drops below 10°C but not below 0°C. The temperature often goes down to freezing point, mainly because of the elevation, and frost is common. The precipitation in this area is low, ranging from 250 to 500 mm, with an annual rainfall of 261 mm in Quetta and 334 mm in Wana. The maximum precipitation is in winter from the Western Disturbances and a considerable amount of it is in the form of snowfall.

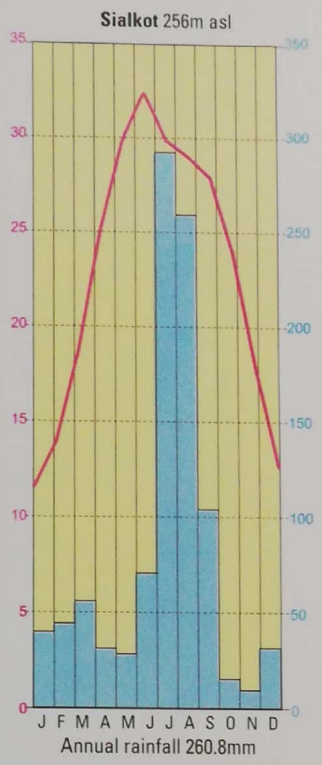
Table 7: Semi-arid with warm summer and cool winter

Month	Quetta		Wana	
	Temperature °C	Precipitation (mm)	Temperature °C	Precipitation (mm)
January	3.7	56.7	4.7	44.0
February	6.0	49.0	7.8	41.0
March	11.1	55.0	12.8	50.0
April	16.6	28.3	17.9	36.8
May	21.0	6.0	23.8	23.8
June	25.6	1.1	27.5	13.0
July	27.9	12.7	27.7	52.5
August	26.4	12.1	27.1	30.5
September	21.1	0.3	24.3	9.8
October	14.6	3.9	17.8	2.8
November	9.2	5.3	12.5	5.5
December	5.1	30.5	7.3	24.0
Annual	**15.7**	**260.8**	**17.6**	**333.7**

6. Humid with hot summer and mild winter: This climate is experienced over a small part of northern Pakistan. In June, the hottest month, the temperature at Sialkot is 32.5°C and at Jhelum, 33.2°C. The temperature in the coolest month is between 18°C to 10°C. At Sialkot, the winter temperature is 11.6°C, and at Jhelum, 12.3°C. Northern Pakistan, with annual precipitation over 750mm, enjoys more rainfall than the rest of the country. Summers are wetter, with 979 mm rainfall at Sialkot and 853 mm rainfall at Jhelum, annually.

Table 8: Humid with hot summer and mild winter

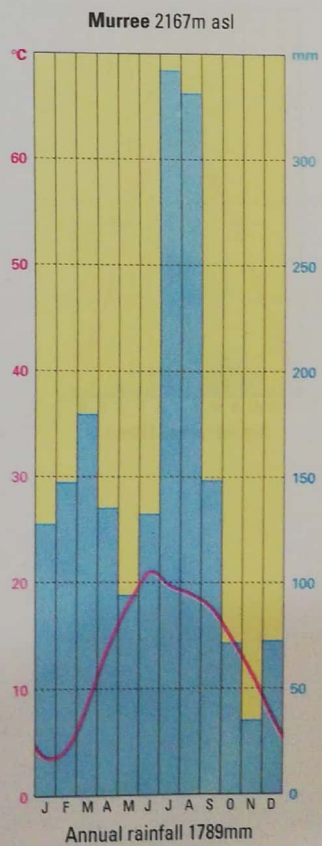
Month	Sialkot		Jhelum	
	Temperature °C	Precipitation (mm)	Temperature °C	Precipitation (mm)
January	11.6	39.4	12.3	33.8
February	14.0	43.9	14.7	50.0
March	18.8	55.5	19.5	60.5
April	25.2	30.7	25.4	36.6
May	29.9	27.9	30.1	31.8
June	32.5	70.4	33.2	51.9
July	30.0	292.1	30.9	273.3
August	29.1	259.1	29.9	221.2
September	28.0	103.6	29.0	77.7
October	24.0	15.0	25.9	12.2
November	17.9	9.1	18.7	9.9
December	12.7	31.4	13.6	30.4
Annual	**22.8**	**978.8**	**23.5**	**853.2**



7. Humid with warm summer and cool winter: These conditions are experienced over an area extending north-west from Murree. The temperature of the warmest month at Murree is 20.6°C and 25.3°C at Dir. In the coolest month, the temperature on many winter days falls below freezing point although the mean January temperature remains above 0°C. At Murree, it is 3.7°C and at Dir, 4.4°C. Murree is the wettest station in Pakistan. It receives an annual precipitation of 1789 mm, half of it coming from the monsoons. The annual precipitation at Dir is 1416 mm and most of it falls in the winter as snow.

Table 9: Humid with warm summer and cool winter

Month	Murree		Dir	
	Temperature °C	Precipitation (mm)	Temperature °C	Precipitation (mm)
January	3.7	126.5	4.4	111.4
February	4.0	145.0	5.4	172.6
March	8.0	176.8	9.6	242.2
April	13.2	133.0	15.0	167.9
May	17.3	91.9	19.6	88.0
June	20.6	130.3	24.1	51.3
July	19.1	339.9	25.3	145.8
August	18.4	326.3	24.4	159.8
September	17.2	146.5	21.3	81.8
October	14.3	70.2	16.3	53.7
November	10.3	32.5	11.2	50.7
December	6.3	70.3	6.5	90.7
Annual	**12.7**	**1789.3**	**15.3**	**1415.9**



8. Highland climate: This type of climate is determined by altitude. Northern Pakistan
dominated by high mountain ranges interspersed with narrow river valleys, the bases
which are at a height of about 2000 metres, while the surrounding mountains range fro
4500 to 6000 metres in altitude. The climate, therefore, changes with elevation.

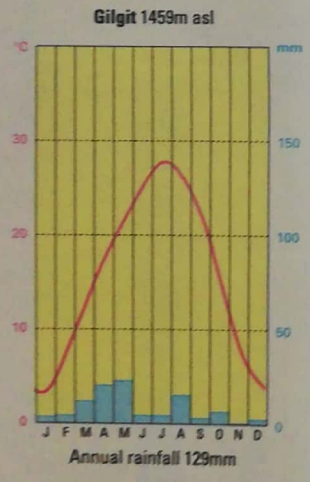
While the valleys may have mild summers and cool winters, the mountain peaks are classifie
as having an Arctic climate, with mean monthly temperatures below freezing poi
throughout the year. In January, the coolest month, the mean temperature ranges from 0°
at the snowline (4500 metres) to 5°C at the base of the valleys (2000 metres) and the nigh
time temperature usually falls to below 0°C. In June, the hottest month, the mean month
temperature rises to above 10°C but does not reach 30°C. The insolation (or exposure
the Sun's rays) is intense.

At an altitude of 1150 metres, the January temperature at Chitral remains 4°C. Gilgit, at 146
metres, and Gupis, at 2156 metres, have mean January temperatures of 3.3°C and −0.5°
respectively. The July temperature is 28.1°C at Chitral, 27.5°C at Gilgit, and 25.4°C at Gupi

The entire region lies in the rain shadow of the Hindu Kush, Karakoram, and Himalaya
Ranges. In general, precipitation in this region is low, with 250 to 500 mm in the souther
western, and northern areas. In the central and eastern areas, it falls further to 125 m
Most of the rainfall comes from the monsoons in the east and from the Western Disturbanc
in the west. Annual precipitation at Chitral is 443 mm, 129 mm at Gilgit, and 19 mm at Gupi

Table 10: Highland climate

Month	Chitral		Gilgit	
	Temperature °C	Precipitation (mm)	Temperature °C	Precipitation (mm)
January	4.1	36.8	3.3	4.0
February	5.4	63.4	6.1	6.0
March	9.6	106.7	11.7	12.6
April	15.2	88.5	16.6	23.0
May	20.2	44.6	20.0	25.3
June	26.2	5.5	24.8	6.1
July	28.1	6.2	27.5	15.6
August	26.8	6.5	26.7	15.5
September	22.3	7.7	22.1	6.5
October	16.2	16.1	15.9	8.4
November	10.7	19.5	9.2	1.8
December	5.7	41.4	4.3	4.1
Annual	**15.9**	**442.8**	**15.7**	**129.0**



Climate and human life

Climate has a direct impact on human life, particularly on agriculture, industry, and the overall economy. In Pakistan, the climate of the lowlands differs from that of the highlands. As a result, the impact of climate on these two regions differs as well.

Figure 4.8: Sheep farming in Balochistan's arid region

The Lowlands

The lowlands constitute about 40 per cent of the land area of Pakistan and most of the population is concentrated here. It is also very important economically because the agricultural activities in the region constitute the backbone of the Pakistani economy.

Of all of the economic sectors, agriculture is most affected by climate as it determines the types of crops grown in particular regions. Throughout the lowlands, there is enough sunshine and the right temperature conditions to grow certain crops, but the main problem is insufficient rainfall. Except for a narrow strip in the north, the entire area is arid or semi-arid. Rainfall is not reliable as its variability is high: it is 30 to 40 per cent in humid areas and 40 to 70 per cent in arid and semi-arid areas. The number of rainy days in Pakistan is low; in most of the northern half, there are 20 to 40 rainy days per year, but more in some hilly areas. Murree has 93 rainy days, the most, while the number is less than 20 in the southern half.

Rainfall spread over a long period is more useful for agriculture than four days of heavy showers. Fortunately, irrigational facilities are available over large areas, and where there are no such facilities, rain-fed agriculture is practised. The Thar, Thal, and Cholistan Deserts cover a vast but sparsely populated area where animal herding is practised.

Climate not only determines the types of crops and the location for their cultivation bu also the seasons when these crops are harvested. Cotton and rice are summer crops which need much heat and sunshine. Wheat, on the other hand, is grown in winter because the cooler temperatures and lower rainfall are more conducive to its growth. In Pakistan, there are two categories of crops: summer crops (like cotton, rice, and maize) are called *kharif* crops and winter crops (like wheat, gram, and mustard) are called *rabi* crops.

Flooding is a natural hazard which occurs in Pakistan once every seven or eight years during the monsoon season, affecting both the old and active flood plains. Floods cause a lot of damage to life, property, and crops. They also damage roads and railways, so traffic has to be suspended or diverted. At the same time, floods lay down fresh alluvium which increases soil fertility.

Figure 4.9: A village in Punjab, submerged by the floods

Figure 4.10: Early morning fog in Lahore

Occasionally, thunderstorms also cause damage to property in localized areas. Pakistan is rarely affected by cyclones but when they do strike, they inflict extensive damage to life and property, particularly near the coast. On early winter mornings, the fog is sometimes so thick in Punjab that air traffic and even road transport are affected. At times, heat waves strike parts of Sindh and Punjab, causing work to come to a virtual standstill.

The Highlands

The summer climate in the highlands remains pleasant except at altitudes of 1500 metres or higher where it is quite cold. Winter is fairly chilly, with snowfall and cold winds. Crops can only be grown in the summer season and that, too, on a limited scale. Maize is widely grown and does not require particularly fertile soil. Tree crops, like apples and apricots, are also grown in the highlands.

Climate adversely affects transport in the highlands, particularly by air, with excessive snowfall, rainfall, fog, and cloud coverage leading to cancelled flights and even crashes. Flights between Islamabad and Gilgit, Skardu, Chitral, and also Peshawar are often delayed or sometimes cancelled because of weather conditions. Snowfall sometimes blocks road transport in Khyber Pakhtunkhwa and Gilgit–Baltistan. The road link between Chitral and