

CLIMATE

India has a tropical monsoon type of climate because India lies in the tropical belt and its climate is influenced by the monsoon winds. The main characteristics of this type of climate are relatively high temperatures and dry winters.

REGIONAL VARIATIONS

Example, the climatic conditions of Bihar and Uttar Pradesh in the north differ from that of Kerala and Tamil Nadu in the south; yet all of these States have a similar monsoon type of climate.

PRECIPITATION

Snowfall occurs in the Himalayas, whereas it only rains over the rest of the country.

1. Cherrapunji and Mawsynram in Meghalaya get about **1100 cm** rains in the year, whereas Jaisalmer in Rajasthan hardly receives **9 cm** of rainfall in a year.

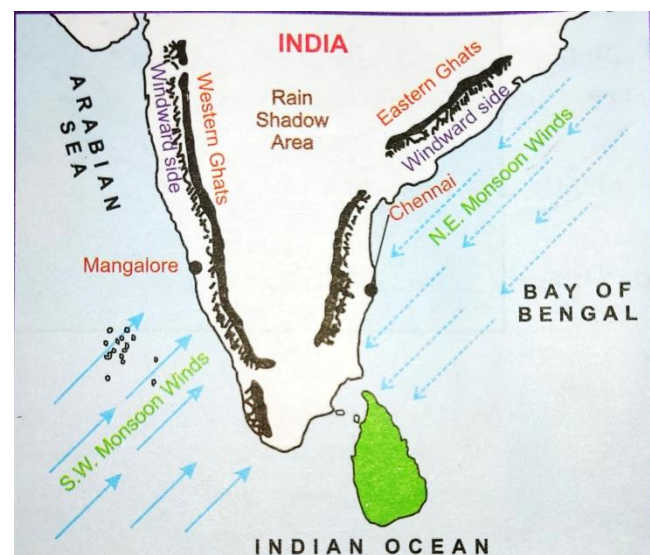
2. Tura in Meghalaya gets an amount of rainfall in a single day which is equal to 10 years of rainfall at Jaisalmer in Rajasthan.

3. Most parts of India receive rainfall during June-September, but the coastal areas of Tamil Nadu get rains in the beginning of the winter season.

TEMPERATURE:

Examples of these variations are:

1. Barmer in Rajasthan may record a temperature of **48°C or 50°C** on a June day, while it hardly reaches 22°C at Pahalgam or Gulmarg in Kashmir on the same day.



2. Kerala has tropical climate with warm and moist air, whereas Punjab has continental climate with severe heat alternating with severe cold.

3. The temperature touches - 40°C in Kargil in the month of December whereas Kerala records 20°C or 22°C in the same month.

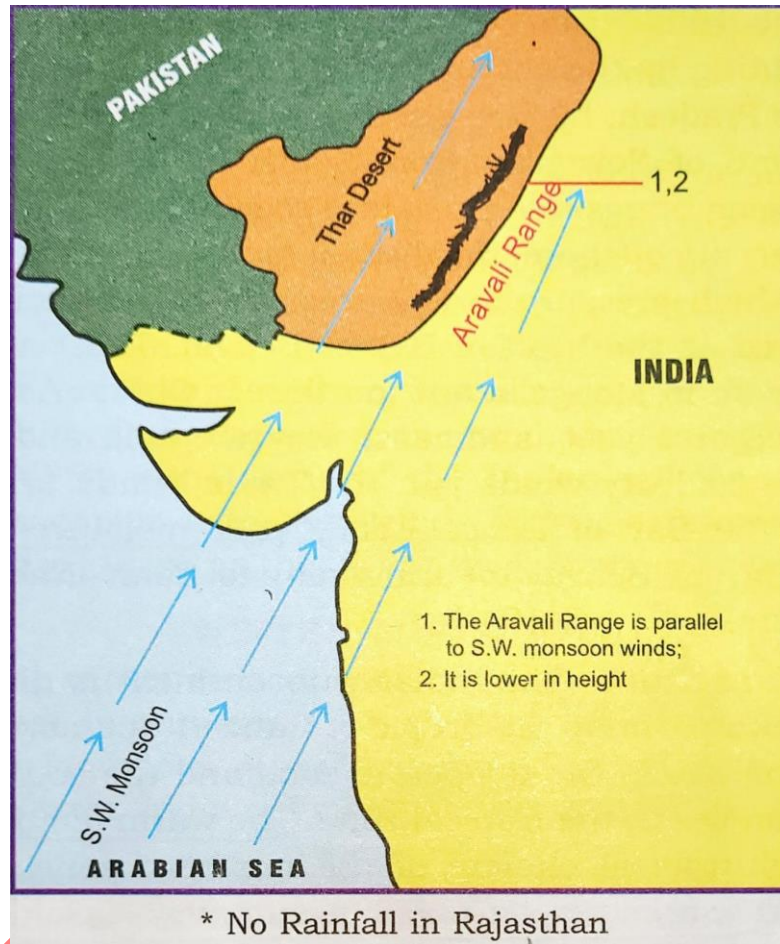
FACTORS AFFECTING THE CLIMATE OF INDIA

1. The Himalayas: The Himalayas form a climatic barrier separating the Indian sub-continent from the rest of Asia. They not only prevent the cold Siberian winds from entering the Indian region and from India becoming a cold desert but they also force the moisture laden South West Monsoon winds to shed rainfall in India or else India would be a dry region.

2. The Monsoon Winds: During summers, the moisture carried by these south-westerly winds from the -Arabian Sea and Bay of Bengal bring rain to the entire subcontinent. Retreating monsoon brings rain in eastern coastal region. During winter, dry offshore, North-East Monsoon winds blow from high pressure to low pressure region. As they blow over a vast landmass, they are cold and dry. They pick moisture from the Bay of Bengal to bring rain to Tamil Nadu in winters.

3. Latitude: The Indian subcontinent is divided into two parts by the Tropic of Cancer. The northern portion lies in the **temperate zone** and the southern portion lies in the **tropical zone**. South India is warmer than the north and does not have a clear-cut winter season. The northern zone does not have the mid-day Sun almost vertically overhead during any part of the year, while the southern zone has the mid-day Sun almost vertically overhead at least twice every year.

4. Varied Relief: Relief plays an important role in the climatic conditions of India. The Western Ghats get heavy rainfall on western side because cause they stand in the way of S W Monsoon winds which come from the Arabian Sea. On the other hand, the Deccan Plateau gets less rainfall as it lies in the rain shadow area of the Western Ghats. In Rajasthan, the Aravali Range is parallel to the direction of the S W Monsoon winds. So it is unable to stop the moisture laden winds. This makes Rajasthan a dry area.



5. Altitude: There is a decrease of 1°C for every 166 m rise in height, because temperature decreases as you move to higher altitudes. So, the mountains are cooler than the plains. Ex: Ooty has lower temperature than Kochi.

6. Influence of the Surrounding Areas: Nearness to the sea that these areas have a moderate climate.



7. Western Disturbances: In the winter season due to the shifting of the pressure belts. These cyclones rising from the Mediterranean Sea bring rain to Northern Plains and snow in Jammu and Kashmir in India.

8. Jet Streams: Jet streams are cold fast blowing winds that develop in the upper layers of the atmosphere. They influence the climate of India. Westerly jet blow over north while Easterly low over South causing depression. These depressions play a very significant role in the distribution pattern of the monsoon rainfall in the subcontinent. The highest rainfall occurs along the track of these depressions.

9. Distance from the Sea: Areas in the interiors of India have extreme type of climate or continental climate whereas coastal areas have equable or maritime climate! The effect of land breeze and sea breeze caused by differential rate of heating and cooling of land and sea are responsible for moderate climate in coastal areas.

10. El-Nino Effect: El-Nino is a warm ocean current which sometimes appears off the coast of **Peru** in South America during the month of December. It increases the surface temperature of the sea and affects the movement of monsoon winds in the Indian Ocean and causes weak drought-like situation in the Indian sub-continent.

MONSOON PHENOMENA AND ITS MECHANISM

Monsoons are periodic or seasonal winds. They develop because of differential heating as well as cooling of the land and sea. They are divided into two wind systems-the Summer Monsoon and the Winter Monsoon.

SUMMER MONSOONS

In summer, the land gets heated more than the sea. Hence there develops a centre of low pressure on the land. Over the adjoining sea, the air is comparatively cool, and a high pressure develops there. This causes the winds to blow from the sea to the land. It is the **'Summer Monsoon.'**

In May, June and July, the plains of the Indian subcontinent are heated by the vertical rays of the sun. The intense heat develops a low pressure. During these months, over the Indian Ocean, a high pressure area develops. So, the winds blow from the Indian Ocean northward and north-westward into Asia. As they blow from the sea to the land, they bring heavy rainfall in some parts of the Indian subcontinent. The summer monsoon winds blow south-west; so they are known as the **'South-West Summer Monsoon.'**

WINTER MONSOONS

During winter season, the conditions are just reverse of those in summers. A high pressure develops over a big landmass stretching from Central Asia upto north-west Indian plains. At the same time a low pressure zone develops in the Indian Ocean. As the winds blow from the land to the sea, they bring cold dry weather. They are incapable of producing rain.

When these winds blow over seas and pass over the adjoining land, they bring some rainfall. The Southern Coromandel Coast (Tamil Nadu and southern tip of Andhra Pradesh) in India get rain from winter monsoons. The winter monsoon winds blow north-east; so the monsoon is known as the **'North-East Winter Monsoon.'**

FOUR SEASONS:

The year may be divided into four principal seasons on the basis of monsoon variations:

1. The Hot and Dry summer (March to May).
2. The Hot and Wet or Rainy Season or the South-West Monsoon (June to September).
3. The Retreating South-West Monsoon (October-November).
4. The Cold and Dry Winter Season or North East Monsoon (December-February).

1. THE HOT DRY SUMMER

In India, the hot season begins in March and lasts until June. The vertical rays of the Sun fall directly over the Tropic of Cancer during this period.

TEMPERATURE

From March to May, due to the northward movement of the path of the Sun's vertical rays, the length of the day increases. It results in the **increase in solar radiation** which moves northward over the tropical areas of South Asia and the temperature starts rising.

In north-western part of India, temperatures around 48°C are not uncommon.

In south India, the hot weather is not as intense as in north India. The moderating influence of the oceans together with the Peninsular situation of south India keeps the temperatures lower than that in north India. The temperatures, therefore, remain between 26°C and 32°C in south India.

PRESSURE CONDITIONS

The warmest area slowly shifts from the Deccan to northwest India. The high temperature in the subcontinent causes a low pressure between Thar Desert and Chota Nagpur Plateau. The surrounding

seas are cooler and develop high pressure conditions in the Indian Ocean.

STORMS AND RAINFALL

The hot-dry weather is marked by weak winds and dryness over the area. The low pressure over the Northern plains draws winds from the surrounding areas and gives rise to thunderstorms with strong dusty winds.

LOCAL WINDS:

(a) A striking feature of the hot weather season is the strong and dusty winds, called **loo**, which blow during day time over northern and north-western India. These winds have temperature range between 45°C and 50°C which is hot enough to cause heatstrokes.

(b) There are occasional tornado-like dust storms in Punjab and Haryana and Uttar Pradesh.

(c) The thunderstorms accompanied with strong winds and heavy rainfall occur in Assam and West Bengal. These local winds are known as **Kalbaisakhi** which means the calamity of the month of Baisakh'.

In Assam, these storms are known as **Bardoli Chheerha**. They originate over the Chotanagpur Plateau and are carried eastward by westerly winds. They bring rainfall in Assam, West Bengal and Odisha. This rainfall is quite beneficial for growing **jute and rice** in West Bengal and tea in Assam.

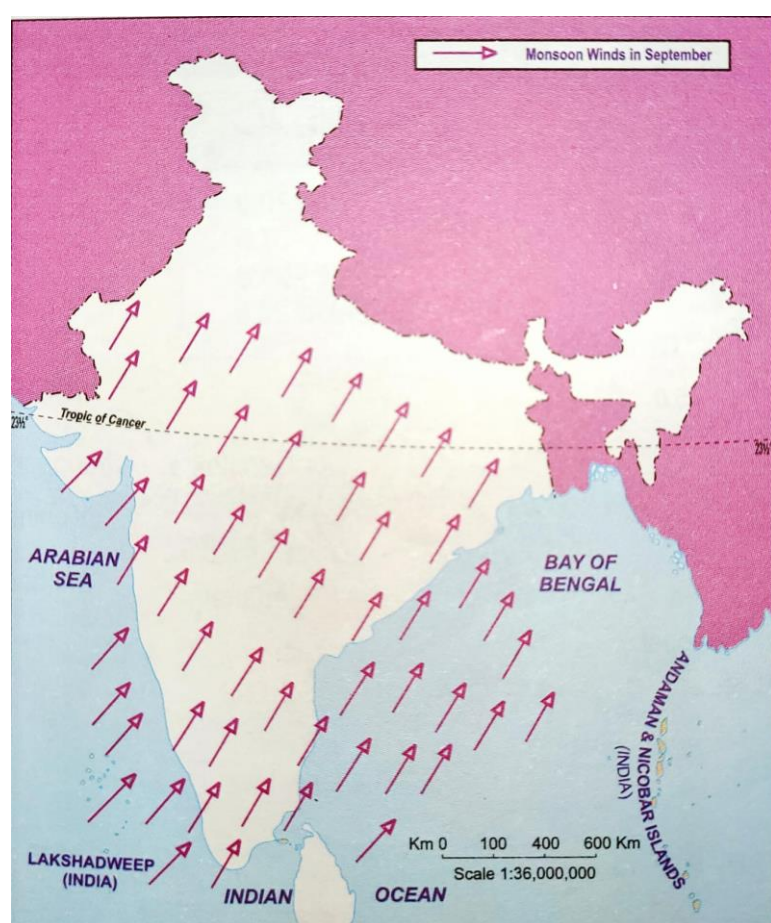
(d) Thunderstorms cause rainfall along the Kerala and Karnataka coasts. The little rainfall that they bring is important for mango, tea and coffee plants. Such rains are called **mango showers** as they help in the early ripening of the mango crop. They are also called **cherry blossoms** in Karnataka.

2. THE SOUTH-WEST MONSOON SEASON

These winds bring heavy rainfall accompanied by violent thunder and lightning. This sudden violent onset of rainfall in the first week of June is termed as the **Burst of the Monsoon**.

However, when the South-West Monsoon fails to bring rainfall for two or more weeks and there is a dry period in the rainy season it is called the **Break of Monsoon**.

The first State to receive the monsoon showers is **Kerala** and also the last to see its withdrawal.



As a result of the tapering topography of peninsular India the South-West Monsoon winds divides into two branches:

- (a) The Arabian Sea Branch; and
- (b) The Bay of Bengal Branch

THE ARABIAN SEA BRANCH

The monsoon winds originating over the Arabian Sea further split into three branches:

- (a) Its one branch is obstructed by the Western Ghats. These winds go up the slopes of the Western Ghats, become cool and bring heavy rains in the windward side of the



Sahyadris and the Western Coastal Plains.

(b) The second branch of the Arabian Sea monsoon winds strikes the coast north of Mumbai.

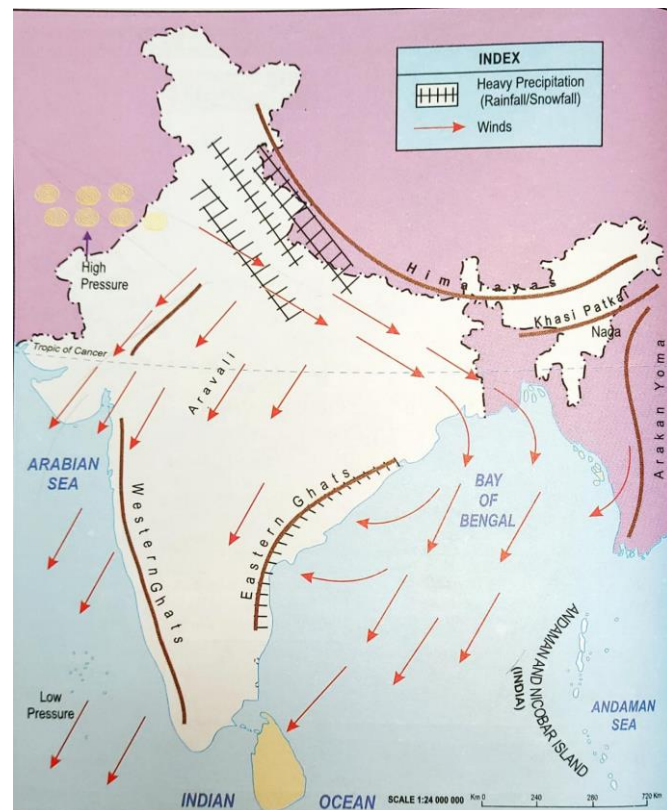
(c) The third branch strikes the Saurashtra Peninsula and the Kutch.

THE BAY OF BENGAL BRANCH

The Bay of Bengal branch is directed towards the coast of Myanmar and part of south-east Bangladesh. However, due to the presence of the Arakan Hills along the coast of Myanmar, a large part of this branch of monsoon is deflected towards the Indian subcontinent. The monsoons, therefore, enter West Bengal and Bangladesh from south and south-east instead of the south westerly direction. Cherrapunji and Mawsynram, located on the crest of the southern range of Khasi Hills, receive the highest average annual rainfall in the world.

3. The Retreating Monsoon

The South-West Monsoon starts retreating from northern India in early October. Hence, the months of October and November are known for the retreating monsoon. The combination of high temperature and humidity gives rise to an oppressive weather. This is commonly known as 'October heat'. Day temperature rises due to clear skies. October is marked by clear cloudless sky, high temperature and high humidity.



TROPICAL CYCLONES

There are tropical depressions (low-pressure systems) originating in the Bay of Bengal caused by local variations of heat and moisture. They lead to tropical cyclones in November and December. Such cyclones generally originate in the neighbourhood of the Andaman Islands between 12°N and 17°N and travel west or northwest over the Bay of Bengal. Whenever they occur, they cause great loss of life and property due to heavy rains on the eastern coastal regions of India.

4. THE NORTH-EAST MONSOON SEASON

The cold weather season commences at the end of November and continues till March. The skies are relatively clear with dry weather. Night temperatures are low, specially in northern India, but the days are pleasantly warm.

TEMPERATURE

In winter season, January is usually the coldest month. The temperature remains quite low during the winter months over the Indian sub- continent. The temperatures decrease from south to north.

Dras Valley in Kashmir near Kargil records minimum temperature of -45°C. It is the coldest place in India).

The excessive cold in north India during this season is due to the following reasons:

(a) In the month of February, the cold winds from the Caspian Sea and Turkmenistan bring cold wave over the northwestern parts of India;

(b) Punjab, Haryana and Rajasthan experience continental type of climates as they are located far away from the sea to experience its moderating influence; and

(c) The **snowfall** in the nearby Himalayan ranges creates cold wave situation.

PRESSURE

The weather in this season is characterised by weak high pressure conditions over the north-western part of the plain. This is because of the oblique rays of the Sun .

When these winds pass over Bay of Bengal they pick up some moisture and cause some amount of rainfall on the Coromandel Coast. As these winds blow from north-east to south-west, they are called the **North-East Monsoon Winds**.

TEMPERATE CYCLONES (Western Disturbances)

A characteristic feature of the cold weather season is the inflow of depressions from the west and the north-west. These low pressure systems, called the **western disturbances**, originate in West Asia and the regions near the Mediterranean Sea. They travel eastwards across Iran and Pakistan and reach India during the winter season. They bring the much-needed winter rains over the plains and snowfall in the mountains.

RAINFALL:

Most parts of India do not receive rainfall in the winter season. This is because the winter monsoons have little humidity and due to anti-cyclonic circulation on land, the possibility of rain from them decreases.

Distribution of Rainfall:

India can be divided into four rainfall regions:

- 1) Heavy Rainfall Region: more than 200 cm.
- 2) Moderate Rainfall Region: 100 cm to 200 cm.

3) Low Rainfall Region: 50 to 100 cm.

4) Scanty Rainfall Region: less than 50 cm.

Features of the Rainfall:

Main features of the Rainfall in India are:

1. There is rainfall over three months and the rest of the year is mostly dry. Seventy per cent of annual rainfall occurs in the rainy season.
2. The rains are mainly of relief type. The windward slopes of the mountains get more rainfall than the leeward side.
3. Only a small portion of the rainfall is received from sources other than the monsoon like cyclonic rainfall and convectional rainfall.
4. The quantity and the time of occurrence of rainfall cannot be predicted as the rainfall is erratic.
5. India has an agrarian economy dependent on rainfall. As such rainfall affects the economy of the country.