

CLIMATE NOTES

Climate refers to the sum total of weather conditions and variations over a large area for a long period of time (more than thirty years).

Weather refers to the state of the atmosphere over an area at any point of time.

The elements of weather and climate are the same, i.e. temperature, atmospheric pressure, wind, humidity and precipitation. On the basis of the monthly atmospheric conditions, the year is divided into seasons such as:

- Winter
- Summer
- Rainy Seasons

Climatic Controls

The climate of any place depends on the following factors:

1) Latitude

The amount of solar energy received varies according to latitude due to the curvature of the earth. That's why air temperature generally decreases from the equator towards the poles.

2) Altitude

The atmosphere becomes less dense and temperature decreases when we go to the higher altitude from the earth surface. This is the reason why hills are cooler during summers.

3) Pressure and wind system

The pressure and wind system of any area depends on the latitude and altitude of the place. It influences the temperature and rainfall pattern.

4) Distance from the sea

The sea exerts a moderating influence on the climate. As the distance from the sea increases, its moderating influence decreases and people experience extreme weather conditions. This condition is known as **continentality** i.e. very hot during summers and very cold during winters.

5) Ocean currents

Ocean currents along with onshore winds affect the climate of the coastal areas. For example, any coastal area with warm or cold currents flowing past it, will be warmed or cooled if the winds are onshore.

6) Relief features

Relief plays a major role in determining the climate of a place. High mountains act as barriers for cold or hot winds. They may also cause precipitation if they are high enough and lie in the path of rain-bearing winds. Precipitation is any form of moisture which falls to the earth. It includes rain, snow, hail and sleet.

Factors Affecting India's Climate

Latitude

The Tropic of Cancer passes through the middle of the country from the Rann of Kachchh in the west to Mizoram in the east. India's climate has characteristics of tropical as well as subtropical climates.

Altitude

India has mountains to the north and also has a vast coastal area where the maximum elevation is about 30 metres. Owing to the mountains, subcontinent experiences comparatively milder winters as compared to central Asia.

Pressure and Winds

The climate and weather conditions in India are governed by the following atmospheric conditions:

- Pressure and surface winds
- Upper air circulation
- Western cyclonic disturbances and tropical cyclones

Air moves from the high-pressure area over the southern Indian Ocean, in a south-easterly direction, crosses the equator and turns right towards the low-pressure areas over the Indian subcontinent. These are known as the **Southwest Monsoon winds**. These winds blow over the warm oceans, gather moisture and bring widespread rainfall over the territories of India.

Jet streams are fast flowing, narrow, meandering air currents in the atmosphere.

The Indian Monsoon

The climate of India is strongly influenced by monsoon winds. The seasonal reversal of the

wind system is known as "**monsoon**". The monsoons are experienced in the tropical area roughly between 20° N and 20° S. Go through the following facts to understand the mechanism of the monsoons in a better way:

1. The **differential heating and cooling of land and water** creates low pressure on the landmass of India while the seas around experience comparatively high pressure.
2. The **shift of the position of Inter-Tropical Convergence Zone (ITCZ)** in summer, over the Ganga plain, is also known as the monsoon-trough during the monsoon season.
3. The presence of the **high-pressure area, east of Madagascar**, approximately at 20°S over the Indian Ocean affects the Indian Monsoon.
4. The **Tibetan plateau gets intensely heated** during summer, which results in strong vertical air currents and the formation of low pressure over the plateau at about 9 km above sea level.

5. The **movement of the westerly jet stream to the north of the Himalayas** and the **presence of the tropical easterly jet stream over the Indian peninsula** during summer also impact the Indian Monsoon.

The changes in the pressure conditions over the southern oceans also affect the monsoons. The irregularly periodic variation in winds and sea surface temperatures over the tropical eastern Pacific Ocean that affects the climate of the tropics and subtropics is known as **Southern Oscillation or SO**.

The Onset of the Monsoon and Withdrawal

The duration of the monsoon is between 100-120 days from early June to mid-September. Around the time of its arrival, the normal rainfall increases suddenly and continues constantly for several days, which is known as the “**burst**” of the monsoon.

Arrival of the Monsoon in different parts of India

The monsoon arrives at the southern tip of the Indian peninsula generally by the 1st week of June. Subsequently, it proceeds into two – the Arabian Sea branch and the Bay of Bengal branch.

- The Arabian Sea branch reaches Mumbai on approximately the 10th of June.
- The Bay of Bengal branch arrives in Assam in the 1st week of June.
- By mid-June, the Arabian Sea branch of the monsoon arrives over Saurashtra-Kuchchh and the central part of the country.
- The Arabian Sea and the Bay of Bengal branches of the monsoon merge over the northwestern part of the Ganga plains.
- Delhi receives the monsoon showers from the Bay of Bengal branch by the end of June.
- By the first week of July, western Uttar Pradesh, Punjab, Haryana and eastern Rajasthan experience the monsoon.
- By mid-July, the monsoon reaches Himachal Pradesh and the rest of the country.

Withdrawal of the Monsoon

The withdrawal of the monsoon begins in northwestern states of India by early September. By mid-October, it withdraws completely from the northern half of the peninsula. From north to the south, withdrawal of monsoon takes place from the first week of December to the first week of January. By early December, the monsoon has withdrawn from the rest of the country.

The Seasons

4 main seasons can be identified in India:

1. The cold weather season (Winter)
2. The hot weather season (Summer)
3. The advancing monsoon (Rainy Season)
4. The retreating monsoon with some regional variations (Transition Season)

Let's discuss each of them in detail:

The Cold Weather Season (Winter)

Winter begins from mid-November in northern India and stays till February.

- December and January are the coldest months in the northern part of India.
- The temperature decreases from south to the north.
- Days are warm and nights are cold.
- The weather is marked by clear sky, low temperatures and low humidity and feeble, variable winds.
- This season is extremely important for the cultivation of 'rabi' crops.

The Hot Weather Season (Summer)

From March to May, hot weather season is observed in India. The summer months experience rising temperature and falling air pressure in the northern part of the country. A striking feature of the hot weather season is the 'loo'. Loo is the strong, gusty, hot, dry winds blowing during the day over the north and northwestern India.

Towards the close of the summer season, pre-monsoon showers come which help in the early

ripening of mangoes, and are often referred to as '**mango showers**'.

Advancing Monsoon (The Rainy Season)

South-east trade winds originate over the warm subtropical areas of the southern oceans. They cross the equator and blow in a southwesterly direction entering the Indian peninsula as the south-west monsoon. The monsoon winds cover the country in about a month. Mawsynram in the southern ranges of the Khasi Hills receives the highest average rainfall in the world.

A phenomenon associated with the monsoon is its tendency to have 'breaks' in rainfall. These breaks in monsoon are related to the movement of the monsoon trough. The trough and its axis keep on moving northward or southward and determine the spatial distribution of rainfall. The

frequency and intensity of tropical depressions also determine the amount and duration of monsoon rains. The monsoon is known for its uncertainties. The alternation of dry and wet spells vary in intensity, frequency and duration.

Retreating/Post Monsoons (The Transition Season)

The months of October-November form a period of transition from hot rainy season to dry winter conditions. The retreat of the monsoon is marked by clear skies and rise in temperature. While day temperatures are high, nights are cool and pleasant. Owing to the conditions of high temperature and humidity, the weather becomes rather oppressive during the day. This is commonly known as '**October heat**'. In the second half of October, the mercury begins to fall rapidly in northern India.

Distribution of Rainfall

1. Parts of the western coast and northeastern India receive over about 400 cm of rainfall annually.
2. Rainfall is less than 60 cm in western Rajasthan and adjoining parts of Gujarat, Haryana and Punjab.
3. Rainfall is low in the interior of the Deccan plateau, and east of the Sahyadris.
4. Snowfall is restricted to the Himalayan region.
5. The annual rainfall is highly variable from year to year.

Monsoon as a Unifying Bond

The unifying influence of the monsoon on the Indian subcontinent is quite noticeable. The seasonal alteration of the wind systems and the associated weather conditions provide a rhythmic cycle of seasons. The uncertainties of rain and uneven distribution are very much typical of the monsoons. Year after year, people of India from north to south and from east to west, eagerly await the arrival of the monsoon. These monsoon winds bind the whole country by providing water to set the agricultural activities in motion.