



The Climate of India

1. Introduction to Indian Climate

India experiences a tropical monsoon type of climate, which is mainly influenced by the monsoon winds, the Himalayan mountain range, and the subtropical latitudinal location. This unique climate is marked by seasonal reversal of winds, diverse weather patterns, and distinct seasons across various parts of the country.

- India lies entirely in the Northern Hemisphere and is broadly divided by the Tropic of Cancer (23.5° N latitude).
 - Due to this, the country shows diverse climatic conditions:
 - The northern part (north of Tropic of Cancer) has a subtropical climate with extreme seasonal variations — hot summers and cold winters.
 - The southern part (south of Tropic of Cancer) lies in the tropical zone with warmer and more stable weather and no clear winter.
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2. Role of the Himalayas

The Himalayas play a major role in shaping the Indian climate:

- They block the cold and dry winds from Central Asia, preventing North India from becoming as cold as Central Asia.
- They force the southwest monsoon winds to rise, causing orographic rainfall on the Indian side.
- They act as a barrier to the monsoon winds, ensuring that rainfall is concentrated within the subcontinent.

3. Climatic Zones of India

India is divided into multiple climatic regions based on temperature and rainfall patterns:

a. Tropical Rainforest Climate

- **Regions:** Western Ghats, West Coastal Plains, parts of Assam and Tripura.
- **Features:**
 - High temperature throughout the year.
 - Very heavy seasonal rainfall, mostly from May to November.
 - Annual rainfall exceeds 200 cm.
 - Found in evergreen forest zones.

b. Tropical Savanna Climate

- **Regions:** Most of the Peninsular India (except the leeward side of Western Ghats).
- **Features:**
 - Distinct wet and dry seasons.



- **Dry winters, moderate rainfall during monsoons.**
- **Annual rainfall ranges between 76 cm to 150 cm.**

c. Tropical Semi-Arid Steppe Climate

- **Regions: Rain-shadow region from central Maharashtra to Tamil Nadu.**
- **Features:**
 - **Moderate temperatures between 20°C to 30°C.**
 - **Low rainfall, around 38–80 cm annually.**
 - **Dry conditions and sparse vegetation.**

d. Tropical and Subtropical Steppe Climate

- **Regions: Punjab, Haryana, Kutch region.**
- **Features:**
 - **Temperature range from 12°C to 35°C.**
 - **Moderate rainfall and semi-arid vegetation.**



e. Tropical Desert Climate

- **Regions:** Western Rajasthan – Barmer, Jaisalmer, Bikaner; parts of Kutch.
- **Features:**
 - Very scanty rainfall, often in the form of cloud bursts.
 - High temperature throughout the year.
 - Arid land, sand dunes and extreme diurnal temperature variation.

f. Humid Sub-Tropical Climate with Dry Winters

- **Regions:** South of the Himalayas.
- **Features:**
 - Mild winters and extremely hot summers.
 - Rainfall mostly during summer monsoon.

g. Mountain Climate

- **Regions:** Himalayan mountain ranges, above 6000 meters altitude.

- **Features:**

- Temperature decreases with altitude.
- Rainfall varies from 63.5 cm to 254 cm, mainly during southwest monsoon.
- Snowfall common in upper altitudes.

4. Major Factors Influencing Indian Climate

Several natural and geographical factors influence the climate of India:

i. Latitudinal Location

- The Tropic of Cancer divides India into tropical and subtropical zones.
- Southern India: Tropical climate — hot and humid.
- Northern India: Subtropical climate — hot summers, cold winters.

ii. Distance from the Sea

- Coastal areas: Have moderate maritime climate with lesser temperature variation.
- Interior areas: Experience extreme continental climate with high temperature differences between summer and winter.

iii. Northern Mountains



- **Himalayas protect India from cold Siberian winds.**
- **They trap monsoon winds, causing heavy rainfall in Northern and North-Eastern India.**

iv. Physiography

- **The physical features like mountains, plateaus, plains affect temperature, wind, and rainfall patterns.**
- **Example: Western Ghats cause orographic rainfall on windward side and create rain-shadow regions on leeward side.**

v. Monsoon Winds

- **Southwest Monsoon (June–September) brings most of India's rainfall.**
- **Northeast Monsoon (October–December) affects Tamil Nadu, Andhra Pradesh, and parts of Kerala.**

vi. Upper Air Circulation

- **Convection currents and jet streams affect weather patterns.**
- **Advection (horizontal movement of air) also impacts rainfall and wind speed.**

vii. Tropical Cyclones and Western Disturbances

- **Tropical Cyclones: Form in Bay of Bengal and Arabian Sea during monsoon/retreating monsoon season, affecting coastal regions.**

- **Western Disturbances:**
 - **Originate in Mediterranean region.**
 - **Move eastward via Iran, Afghanistan, and Pakistan.**
 - **Cause winter rain in Northern India and snowfall in Himalayas.**

viii. El Niño and La Niña

- **El Niño: Warm ocean current near Peru; weakens Indian monsoon.**
- **La Niña: Cooling of Pacific waters; enhances monsoon rainfall.**
- **Affects global wind and pressure systems, including Indian Ocean.**

ix. Southern Oscillation (SO)

- **A seesaw pattern of pressure between Indian Ocean and Pacific Ocean.**
- **Related to strength and timing of monsoon rains in India.**

5. Seasons of India (As per IMD Classification)



India experiences four distinct seasons, based on temperature, rainfall, and atmospheric conditions:

a. Winter Season (November – February)

- **Features:**
 - Clear skies, cool dry winds, low humidity.
 - Large variation between day and night temperatures.
- **Rainfall:**
 - Light rain in Western Himalayas.
 - Northeast monsoon rains in Tamil Nadu and Kerala.

b. Summer Season (March – May)

- **Features:**
 - Temperatures rise quickly (often 35°C to 40°C or more).
 - Hot and dry winds called loo blow in North India.
- **Rainfall:**



- **Very limited; about 1% of annual rainfall occurs, mostly due to local convectional storms.**

c. Rainy Season (June – September)

- **Onset of Southwest Monsoon.**
- **High temperature and humidity, cloud cover increases.**
- **Rainfall varies:**
 - **Western Ghats and North-East: Heavy rainfall.**
 - **Leeward side (Tamil Nadu, Deccan plateau): Less rainfall.**
- **Monsoon advances in two branches:**
 - **Arabian Sea Branch.**
 - **Bay of Bengal Branch.**

d. Autumn / Retreating Monsoon Season (Mid-September – November)

- **Monsoon starts withdrawing from North-West India.**



- **Clear skies, decrease in humidity and temperature.**
- **Tropical cyclones affect coastal areas.**
- **Rainfall in Tamil Nadu and Andhra Pradesh due to retreating monsoon and Northeast winds picking moisture from Bay of Bengal.**

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