Climate | Easy and detailed Notes for class 9th

- Introduction:
- Climate in India:
  - Variations in India's Climate:
- Climate Influences:
  - Factors Affecting India's Climate:
- The Indian Monsoon:
  - Monsoon Arrival and Withdrawal:
- Seasons in India:
  - Rainfall Distribution in India:
- Monsoon as a Unifying Bond:

Introduction:

In the previous chapters, we explored India's land-forms and its rivers. Now, it's time to delve into the third key element of our natural environment: the climate. We'll uncover why we wear warm clothes in December, experience scorching heat in May, and welcome the rains in June and July. All these mysteries can be unraveled by studying India's climate.

Climate	Weather
1. Climate refers to the *long-term patterns* and average conditions of the atmosphere in a particular region over a period of more than thirty years.	1. Weather refers to the *short-term*, day-to-day conditions of the atmosphere in a specific area.
2. It tells us what the *weather* is generally like in a place *over a long time*.	2. It describes what's happening in the atmosphere right now or on a *particular day*.
3. Climate helps us understand if a place is typically *hot, cold, rainy, or dry*.	3. Weather can change quickly and is what we experience each day, such as *sunny, rainy, windy, or cloudy days.*

Climate in India:

India experiences a monsoon climate marked by seasonal shifts in wind direction and rainfall patterns. The term "monsoon" originates from the Arabic word 'mausim,' which translates to 'season.' It symbolizes the **annual reversal in wind flow**, bringing distinct wet and dry seasons to the region.

Variations in India's Climate:

- **Temperature Differences:**
  - India's climate varies by region and season.
  - In summer, Rajasthan's desert sizzles at 50°C, while Pahalgam in Jammu and Kashmir

maintains a cooler 20°C.
    - During winter, Drass in Jammu and Kashmir can plummet to a bone-chilling -45°C, while Thiruvananthapuram in Kerala enjoys a pleasant 22°C.
    - Some areas, like the Thar Desert, experience scorching days and cooler nights, whereas others, like the Andaman and Nicobar Islands and Kerala, remain relatively stable.
- **Precipitation Variations:**
    - Himalayan regions receive snowfall, while the rest of India welcomes rain.
    - Annual rainfall varies from over 400 cm in Meghalaya to under 10 cm in Ladakh and western Rajasthan.
    - Rain primarily falls from June to September, except for the Tamil Nadu coast, which receives its share in October and November.
- **Coastal vs. Inland:**
    - Coastal regions experience milder temperature changes compared to the interior.
    - Rainfall decreases from east to west in the Northern Plains.
    - These variations influence people's lifestyles, including their choices of food, clothing, and housing.
- **Geographic Influence:**
    - Geography shapes India's climate.
    - High mountains, such as the Himalayas, block winds and bring rain.
    - The opposite side of mountains remains drier.

Climate Influences:

Six key factors determine a region's climate:

1. **Latitude:** Temperature changes from the equator to the poles due to sunlight variations.
2. **Altitude:** Higher elevations have cooler temperatures due to thinner air.
3. **Pressure and Winds:** Climate depends on location's altitude and latitude, impacting temperature and rainfall.
4. **Distance from the Sea:** Proximity to the sea moderates climate; inland areas have more extreme weather.
5. **Ocean Currents:** Coastal climates are affected by onshore winds and nearby warm or cold ocean currents.
6. **Geography and Relief:** Land features, such as mountains and valleys, shape climate by blocking winds and affecting rainfall. High mountains may bring rain if tall and in the wind path, while the leeward side stays dry, impacting temperature and wind patterns.

These six factors collectively shape regional climates, making each area unique in its weather patterns.

Factors Affecting India's Climate:

1. **Latitude:**
    - India spans from the Tropic of Cancer in the south to the subtropics in the north, resulting in a blend of tropical and subtropical climates.
2. **Altitude:**
    - Varying altitudes, from high northern mountains to low coastal areas, affect temperature.

The Himalayas shield India from cold Central Asian winds.

3. **Pressure and Winds:**
    - India's climate is shaped by winter north easterly winds and summer Southwest Monsoon winds, driven by pressure variations.
    - Upper air circulation, including subtropical westerly and easterly jet streams, influences weather patterns and cyclonic disturbances.

These factors create India's diverse climate conditions, from arid regions to those receiving heavy monsoon rains.

Jet Streams: They are narrow, high-speed air currents in the Earth's atmosphere, typically found in the upper levels of the troposphere. **Coriolis force:** It is an apparent force caused by the Earth's rotation, which deflects moving objects to the right in the northern hemisphere and to the left in the southern hemisphere. **Western Cyclonic Disturbances:** Western cyclonic disturbances are weather patterns in India during winter. They come from westerly winds from the Mediterranean and affect the north and northwest regions, causing changes in temperature and rainfall. **Tropical cyclones:** These are intense storms that form over warm ocean waters, typically occurring during the monsoon season and in October-November. They affect coastal regions and can lead to severe weather events, including heavy rainfall and strong winds.

The Indian Monsoon:

India's climate is heavily influenced by monsoon winds, a phenomenon noticed by early sailors and traders. Monsoons occur in the tropical area, roughly between 20° N and 20° S. To understand monsoons, consider these key factors:

1. **Heating and Cooling:** Land heats and cools faster than water, causing low pressure over India's landmass and high pressure over the seas.
2. **ITCZ Shift:** The *Inter Tropical Convergence Zone (ITCZ)*, or monsoon trough during monsoon season, moves over the Ganga plain, impacting monsoons.
3. **Indian Ocean High-Pressure Area:** A high-pressure area east of Madagascar (around 20°S) affects the Indian Monsoon.
4. **Tibetan Plateau Heating:** In summer, intense heating of the Tibetan plateau creates strong vertical air currents and low pressure above the plateau.
5. **Jet Streams:** The westerly jet stream shifts north of the Himalayas, while the tropical easterly jet stream influences summer weather.
6. **SO and ENSO:** Pressure changes over southern oceans, especially the difference between the eastern South Pacific Ocean and the eastern Indian Ocean, influence monsoons. Negative pressure differences lead to below-average and delayed monsoons.

Monsoons result from these factors, shaping India's climate, seasons, and weather patterns.

Monsoon Arrival and Withdrawal:

India experiences a monsoon season that spans about 100-120 days, from early June to mid-September.

- **Monsoon "Burst":** At the beginning of the monsoon, there's a sudden and heavy rainfall that lasts for days.
- **Arrival:** The monsoon starts in southern India in early June, splitting into branches from the Arabian Sea and Bay of Bengal.
- **Spread:** By mid-June, it reaches central India and covers most of the country by July.
- **Withdrawal:** The monsoon gradually retreats from northwestern India by early September and departs from the rest of the country by early December.
- **Islands and Winter Monsoon:** Islands receive the monsoon from late April to early May and experience withdrawal from early December to early January, coinciding with the start of the winter monsoon in the rest of India.

Seasons in India:

India experiences four distinct seasons:

1. Cold Weather Season (Winter):

- Occurs from mid-November to February.
- Northern regions have colder temperatures.
- Dry conditions prevail due to northeast trade winds.
- Winter rains brought by cyclonic disturbances from the west and northwest.

2. Hot Weather Season (Summer):

- Takes place from March to May.
- Temperatures rise significantly with falling air pressure.
- Characterized by the scorching "loo" winds and dust storms, especially in northern India.
- Pre-monsoon "mango showers" benefit certain regions.

3. Advancing Monsoon (Rainy Season):

- Commences in early June with intensified low-pressure conditions.
- South-southeast trade winds usher in heavy rainfall.
- Rainfall patterns vary with intermittent "breaks" influenced by the monsoon trough.

4. Retreating Monsoon (Transition Season):

- Occurs in October-November.
- Marks the shift to dry winter conditions.
- South-west monsoon winds gradually withdraw.
- Cyclonic depressions originating from the Andaman Sea bring heavy rain to the east coast.

India's climate is characterized by its unpredictable nature, impacting agriculture and daily life.

Rainfall Distribution in India:

India’s annual rainfall varies:

1. **High Rainfall Regions:**

- Western coast and northeastern India: >400 cm.
- Abundant monsoon rainfall.

1. **Low Rainfall Regions:**

- The Western Rajasthan, Gujarat, Haryana, Punjab: <60 cm.
- Interior Deccan plateau, areas east of Sahyadris, Leh in Jammu and Kashmir.
- Limited rainfall due to location and monsoon nature.

1. **Moderate Rainfall Regions:**

- Rest of India: Moderate Rainfall, varying yearly.
- Himalayan region: Snowfall.

1. **Rainfall Variability:**

- Monsoon-driven; annual variation.
- Low-rainfall Regions are prone to drought; high-rainfall Regions are prone to floods.

Monsoon as a Unifying Bond:

1. The Himalayas shield India from freezing Central Asian winds, ensuring warmer temperatures in the north.
2. The surrounding seas have moderate temperatures on the plateau.
3. The monsoon unifies India’s climate, impacting its land, agriculture, and culture.
4. The monsoon’s significance extends to India’s rivers, which sustain its people.

Category

1. Class 9th

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