Monsoon & Rainfall in India

These notes are your ultimate revision weapon to revise Monsoon & Rainfall in India. We've distilled years of previous exam questions (PYQs) into one powerful, concise resource. Everything you need to know, nothing you don't.

- **PYQs, Decoded:** All key concepts from past exams, organized and simplified.
- **Revise in Record Time:** Short, precise, and designed for last-minute review.
- **Focus on What Matters:** Master high-probability topics and boost your confidence.

Climatology of India: A Structured Overview

1. Origin and Meaning of 'Monsoon'

- **Etymology:** The term originates from the Arabic word 'mausim', meaning 'season'.
- **Historical Reference:** It refers to the seasonal reversal of wind direction.

2. Classification of India's Climate

- **Overall Climate Type:** India has a **tropical Monsoon type climate**.
    - This is due to dominant monsoon characteristics, not because it lies entirely within the Tropics.
- **Koppen's Climate Classification:**
    - **Cwg (Humid sub-tropical with dry winter):** Classifies the climate of North-East India (including North Bengal and **North Bihar**).
- **Tropical/Subtropical Division:** The **18°C January isotherm** is used to divide India into tropical and subtropical zones.

3. Mechanism and Causes of Monsoon

- **Primary Cause: Differential heating of land and sea**, leading to seasonal displacement of pressure belts.
- **Driving Force (Summer): High temperature and low pressure** over the subcontinent draws moisture-laden air from the Indian Ocean.
- **Seasonal Winds:**
    - **South-West Monsoon:** Brings the summer monsoon. These are essentially the Southeast Trade Winds that cross the equator and deflect towards India.
    - **North-East Monsoon:** Brings the retreating monsoon in winter.
- **Key Influencers:**
    - The northward shift of the **Inter Tropical Convergence Zone (ITCZ)** influences the onset.
    - The **Indian Ocean Dipole (IOD)**, a difference in sea surface temperature between the western and eastern tropical Indian Ocean (also known as the 'Indian Nino'), can influence the impact of El Niño on the monsoon.

4. Characteristics and Progression of the Monsoon

- **South-West Monsoon (Primary Rainy Season):**
    - **Arrival:** Arrives first in **Kerala**.
    - **Direction:** Flows from the **South-West to the North-East**.
    - **Branches:**
        - **Bay of Bengal Branch:** Brings rainfall to Northern India.
        - **Arabian Sea Branch:** Brings rainfall to the West Coast of India.
    - **Duration:** Decreases from southern India to northern India.
    - **Rainfall Pattern:**
        - The amount of annual rainfall in the northern plains **decreases from east to west** (as winds become less humid inland).

        - In 2019, it contributed to over 110% of India's annual rainfall.
- **North-East Monsoon (Retreating Monsoon):**
    - A secondary season that affects specific regions.
    - **Tamil Nadu** receives the maximum rainfall from this monsoon (about 50% of its annual total).
- **Retreat Indicators:** Clear skies, rising land temperature, and pressure conditions in the Bay of Bengal.

5. Rainfall Distribution and Regional Variations

- **High Rainfall Areas:**
    - **Highest in India:** Western Ghats, Himalayan Region, and Meghalaya.
    - **World's Highest: Mawsynram** and **Cherrapunji** (Meghalaya).
    - **City Example (2019): Kochi (Ernakulam)** received the highest (3380.6 mm), followed by Kolkata, Patna, and Delhi.
- **Low Rainfall Areas:**
    - **Lowest in India: Leh** (65.5 mm in 2019).
    - **Lowest in Rajasthan: Jaisalmer** (261.3 mm).
    - **Other Dry Areas:** Northern part of the Zaskar range (Jammu & Kashmir) and western Rajasthan (~20 cm/year).
    - **City Example:** During the South-West Monsoon, **Chennai** receives the least rainfall among major cities.
- **Regional Variations:**
    - **Tamil Nadu** receives most of its rainfall during the North-East monsoon.
    - The **Chhattisgarh Basin** is not significantly affected by the Arabian Sea branch.
    - **Contrast Example: Ajmer** (423.4 mm) and **Shillong** (5065.8 mm), on the same latitude, have vastly different rainfall.

6. Other Seasonal Rains and Climatic Factors

- **Pre-Monsoon Showers: Mango showers** (April rains) in Karnataka and Kerala aid mango ripening.

- **Winter Rains in North-Western India:** Caused by **moist air masses associated with the Westerlies**, influenced by the Westerlies Jet Stream. **Western depressions** cause winter rain in the Sutlej-Ganga plains.
- **Factors Influencing Local Climate:**
    - **Altitude:** e.g., Shimla is cooler than Amritsar (same latitude).
    - **Humidity:** High-rainfall places like **Kochi** and **Tezpur** are humid, unlike Ahmedabad and Ludhiana.
    - **Temperature Range:** The **daily range of temperature is highest in the desert areas of Rajasthan**.
    - **Distance from the sea** is a key reason for rainfall variation.

7. Climate of Specific Locations

- **Chennai (Tamil Nadu):** Average annual temperature ~26°C, annual rainfall ~63 cm, small annual temperature range of ~9°C. Receives most rain from the North-East Monsoon.
- **Chhattisgarh:** Has a **Humid South-East** type of climate.
- **Cherrapunji:** Located in **Meghalaya**.

8. Water Management and Hydrology

- **Water Scarcity:** India is a "thirsty land" despite high rainfall due to rapid runoff, quick evaporation, and rainfall concentrated in the monsoon months.
- **Strategy: Rainwater Harvesting** is a cost-effective strategy. **Tamil Nadu** is a leading state in its implementation.
- **Floods:** Heavy rainfall in the **Pushkar hills** can cause floods in **Balotra**, Rajasthan.

9. Meteorological Definitions

- **Rainy Day (IMD):** A day with rainfall of **2.5 mm or more** within 24 hours.

10. Traditional Indian Seasonal Calendar (Hindu Ritus)

- The year is divided into six bimonthly seasons. The chronological order is:

    1. **Vasant (Spring):** March - April
    2. **Grishma (Summer):** May - June
    3. **Varsha (Rainy):** July - August
    4. **Sharad (Autumn):** September - October
    5. **Hemant** (Pre-winter)
    6. **Shishira** (Winter)

Know More About Monsoon & Rainfall in India:

- Monsoon & Rainfall in India – Old Year Questions
- Monsoon & Rainfall in India One Liner Questions & Answers