Changing Monsoonal Rainfall across India

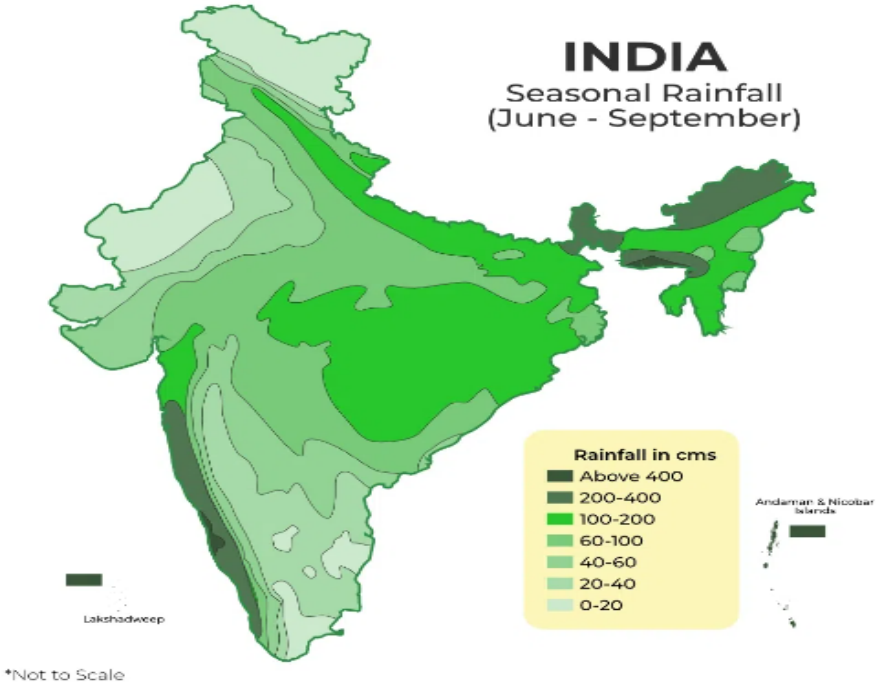
Why in News?

Currently, multiple favourable weather systems have kept the monsoon either active or vigorous (with respect to rainfall events) over southern peninsular, east, northeast, and central India regions.

What is monsoon?

- **Monsoon** – It is a seasonal change in the direction of the prevailing, or strongest, winds of a region.
- **Features** – It causes wet and dry seasons throughout much of the tropics.
- It always blow from cold to warm regions.
- The summer monsoon and the winter monsoon determine the climate for most of India and Southeast Asia.
- **In India** – There are three prominent seasons influencing rainfall which are
    - **Southwest Monsoon** – June to September
    - **Northeast Monsoon** – October to December
    - **Summer Monsoon** – march to May
- **Rainfall in India** - India experienced on an average 1,257 millimeters (125 cm) of rainfall in 2022.
- **Southwest monsoon**- It brings *about 70-90% of India's annual* precipitation.
- Regions like the Western Ghats and northeastern areas receive heavy rainfall during this season.
- **Northeast monsoon**- It is also known as the *retreating monsoon* and affects peninsular India.
- It isn't as intense as the southwest monsoon.

Rainfall Distribution in India	
Annual Precipitation Levels	**Regions**
Extreme (>400cm)	Northeastern India and windward side of Western Ghats.
Heavy (200-300 cm)	Eastern Areas and Sub-Himalayan belts
Moderate (100-200 cm)	Leeward side of Western Ghats and Parts of Central and Eastern India
Scanty (50-100 cm)	Parts of Gujarat, Maharashtra, Punjab, Haryana, Western UP, TamilNadu, Andhra Pradesh
Very less (<50 cm)	Majorly in Rajasthan, Gujarat, some parts of Jammu & Kashmir



How climate change impacts rainfall pattern in India?

- **Altered cyclonic activity**- Climate change has altered the frequency and intensity of cyclones in the Indian Ocean, *impacting coastal regions* with intense rainfall and storms.
- **Increased variability**- Climate change has led to increased variability in rainfall patterns, resulting in *unpredictable monsoon seasons* and *irregular distribution of rain* across the country.
- **Intensified monsoon**- The intensity of the monsoon has increased, with *heavier rainfall over shorter periods*, causing *flash floods* and waterlogging in various regions.
- **Increase in Northeast monsoon rainfall**- In the past 10 years, retreating monsoon rainfall *increased by over 10%* in about 80% of tehsils in Tamil Nadu, 44% in Telangana, and 39% in Andhra Pradesh.
- Odisha, West Bengal, Maharashtra, and Goa also experienced a rise in rainfall during this period.
- **Extended droughts and dry spells**- It have become more common due to the shifting monsoon patterns, adversely *affecting agriculture and water resources*.
- **Regional disparities**- Recent study reveals over 30% increase in southwest monsoon *rainfall in traditionally dry areas* like Rajasthan, Gujarat, Konkan, central Maharashtra, and parts of Tamil Nadu since 1981–2011 baseline.
- While traditionally high rainfall areas like Assam and Meghalaya experienced a 30% reduction in rainfall.

Impacts of Changing Rainfall Patterns in India
• Extreme rainfall events increased the frequency of *flash floods*. • Uneven distribution of rainfall give rise to *pest attacks and diseases*. • Changing rainfall pattern makes it *difficult for forecasting* the monsoon pattern. • Heavy rainfall in growing and harvesting season can *reduce the yield of crops.* • Irregular rainfall can *affect the supply of drinking water* and also can have implication in electricity production.

What are the factors causing widespread monsoonal rainfall across India in recent times?

- **Continuous westerly winds –** Continuous incoming of *moisture-laden* strong westerly winds *from the Arabian Sea.*

  ***Monsoon trough** is a semi-permanent, low-pressure area extending between Pakistan and the Bay of Bengal during the monsoon season which usually oscillates between north and south within the season.*

- **Presence of monsoon trough in south** – It gives *more rainfall* can take place *in central, eastern and peninsular India*.
- When it shifts towards the north, the Himalayan foothills are likely to receive more rainfall but the rest of India sees a drop in rainfall.
- **Persistence of an off-shore trough** - A *shallow trough of low pressure* developed along India's coast during the monsoon *between south Gujarat and north Kerala* for more than a week now.
- **Intermittent development of a wind shear zone** – It causes the winds to move in different velocities and directions along latitudes 20 ° N between central and peninsular India.
- **Development of a low-pressure system** – It is present over the west-central Bay of Bengal, off the Odisha coast.

What lies ahead?

- **Improve forecasting** – *Satellite monitoring* and sophisticated climate models are developed to better predict rainfall patterns and prepare for extreme weather events.
  - *National Monsoon Mission (NMM)* aims to improve monsoon prediction capabilities through research and development of weather forecasting technologies.
- **Proper implementation of MGNREGA projects** – Develop water conservation projects, such as check dams and ponds, to improve water availability and resilience against erratic rainfall.
- **Follow CRZ notifications** – It is to regulate developments along India's coastline to protect coastal ecosystems & communities from the impacts of climate change related cyclonic activities.
- **Promote climate resilient activities** – Initiatives like rainwater harvesting, sustainable agricultural practices, and afforestation projects, to adapt to changing rainfall patterns are encouraged.

References

1. The Indian Express| Factors causing Widespread Rainfall Across India
2. The Indian Express| Climate Change Impacting Monsoonal Rainfall

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