Southwest Monsoon Withdrawal Begins in 2026 Amid Widespread Rainfall Deficit and Developing Bay of Bengal Weather System

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Recent Developments:

- The **Southwest Monsoon began withdrawing from some parts of West Rajasthan on 19 September 2026** , close to the newer climatological normal withdrawal date of **17 September**, while nearly **43% of India's geographical area remained rain-deficient**. The withdrawal line passed through **Ramgarh, Mohangarh, Phalodi and Khajuwala** in Rajasthan.
- The India Meteorological Department expects the monsoon to withdraw from more parts of **Rajasthan, Punjab and Saurashtra-Kutch** during the following three to four days, indicating the beginning of the seasonal transition from the southwest monsoon regime.
- As of **19 September 2026**, cumulative all-India monsoon rainfall stood at **695.6 mm against the normal 817.2 mm**, representing a deficit of about **15%**. Eighteen of the 36 meteorological subdivisions recorded normal rainfall, while the remaining 18 were deficient.
- Major rainfall deficits were reported in **Meghalaya, Andhra Pradesh, Arunachal Pradesh, Bihar, Goa, Karnataka, Kerala, Assam, Tamil Nadu, Haryana and Telangana**, while Rajasthan and Punjab were also expected to end the season with substantial deficits.
- At the same time, a **low-pressure system over the North Andaman Sea** is expected to move west-north-westwards, intensify into a **depression around 21 September** and a **deep depression around 22 September** , before approaching the **south Odisha–north Andhra Pradesh coast around 23 September**.
- The developing system is expected to produce significant rainfall over **Odisha, Gangetic West Bengal, Jharkhand, Chhattisgarh, Sikkim and coastal Andhra Pradesh**, demonstrating that withdrawal from north-western India does not imply an immediate end to rainfall across the country. IMD warnings for Odisha and coastal Andhra Pradesh indicate heavy to very heavy rainfall during the coming days.

Understanding the Indian Monsoon:

Meaning and Characteristics:

- The word **monsoon** is derived from the Arabic word *mausim*, meaning **season**, and refers to a periodic reversal of winds accompanied by major seasonal changes in rainfall.
- The Indian monsoon is a complex interaction between **land, ocean and atmosphere**, rather than merely a seasonal period of heavy rainfall.
- India experiences two principal monsoon systems, namely the **Southwest Monsoon from June to September** and the **Northeast Monsoon from October to December**.
- The Southwest Monsoon is the principal rainy season of India and provides roughly **three-fourths of the country's annual rainfall**, making its timing, spatial distribution and intensity crucial for agriculture, water resources and the wider economy.

Socio-Economic Importance:

- The monsoon strongly influences **agriculture, irrigation, reservoirs, groundwater recharge, hydropower generation, food prices and rural incomes**, particularly because a substantial part of Indian agriculture remains dependent on rainfall.
- A deficient monsoon can increase **water stress, crop losses, rural distress and inflationary pressures**, while excessive rainfall can produce floods, landslides, infrastructure damage and crop destruction.
- Monsoon variability therefore creates both **drought risk and flood risk**, making rainfall distribution as important as aggregate seasonal rainfall.

Southwest Monsoon:

Onset and Progress:

- The Southwest Monsoon normally reaches **Kerala around 1 June** and advances northward in stages before covering the country; under the newer IMD normal, the monsoon generally covers the entire country around **8 July**.
- IMD uses multiple atmospheric indicators for declaring monsoon onset over Kerala, including **rainfall, lower- and middle-tropospheric winds and outgoing longwave radiation**.
- The monsoon current is driven by the seasonal reversal of wind circulation, with moisture-laden winds from the **Indian Ocean and adjoining seas** reaching the Indian subcontinent.

Mechanism of Southwest Monsoon:

- Strong summer heating over the Indian subcontinent creates a broad **low-pressure region**, while relatively higher pressure over the southern Indian Ocean contributes to the pressure gradient that drives moist south-westerly winds towards India.
- The **Inter-Tropical Convergence Zone**, or ITCZ, shifts northward during the Northern Hemisphere summer and becomes an important component of the monsoon circulation.
- The **Tibetan Plateau** acts as a major elevated heat source during summer and influences upper-air circulation, while the Himalayas prevent the penetration of cold continental air into the Indian subcontinent.
- The **Somali Jet**, a strong low-level cross-equatorial flow over the western Indian Ocean and Arabian Sea, transports substantial moisture towards the Indian subcontinent.
- Orography strongly modifies rainfall, producing heavy precipitation along the **Western Ghats and north-eastern hills**, while rain-shadow regions such as parts of the Deccan Platearereceive comparatively less rainfall.

Monsoon Withdrawal:

Meaning and Process:

- **Monsoon withdrawal** refers to the gradual retreat of the Southwest Monsoon circulation from India as the atmospheric pressure and wind regime changes after the summer season.
- The withdrawal generally begins from **northwestern India**, particularly West Rajasthan, and subsequently progresses southward and eastward before the Southwest Monsoon completely retreats from the country.
- According to the newer IMD climatology, withdrawal from northwest India normally begins around **17 September**, rather than the older operational normal of 1 September.
- IMD research indicates that the Southwest Monsoon season has lengthened over 1971–2020 at approximately **1.6 days per decade**, mainly because withdrawal dates have tended to become later, while the Kerala onset date has not shown a significant long-term change.

Criteria Used by IMD:

- IMD does not determine withdrawal solely from the absence of rainfall; it considers a combination of **rainfall cessation, lower-tropospheric anticyclonic circulation and reduction in atmospheric moisture**.

- Withdrawal from the extreme northwestern parts is not attempted before **1 September**, and after that date the first withdrawal requires approximately **five consecutive days of cessation of rainfall**, establishment of an anticyclone at 850 hPa and below, and a considerable reduction in moisture.
- Further withdrawal is assessed using **spatial continuity, reduced moisture and persistent dry weather**, ensuring that a temporary break in rainfall is not incorrectly interpreted as monsoon withdrawal.

Northeast Monsoon and Retreating Monsoon:

Seasonal Transition:

- The **Northeast Monsoon** develops after the Southwest Monsoon retreats and is particularly important for **Tamil Nadu, coastal Andhra Pradesh, Rayalaseema, South Interior Karnataka and parts of Kerala**.
- During the post-monsoon transition, the withdrawal of the Southwest Monsoon is accompanied by a change towards **north-easterly winds**, which can transport moisture towards the south-eastern coast.
- Tamil Nadreceives comparatively less rainfall during the Southwest Monsoon because parts of the state lie in the **rain-shadow region of the Western Ghats**, making the Northeast Monsoon its principal rainy season.
- The Northeast Monsoon therefore has major significance for **paddy cultivation, reservoir storage, groundwater recharge and water security** in southern India.

Factors Affecting the Indian Monsoon:

Atmospheric and Geographical Factors:

- **Inter-Tropical Convergence Zone:** Its seasonal northward and southward migration influences the location of convective activity and the monsoon trough.
- **Tibetan Plateau:** Its elevated heating and topographical influence affect upper-air circulation and the development of monsoon circulation.
- **Jet Streams:** Seasonal shifts in the subtropical westerly jet and the development of the tropical easterly jet influence monsoon onset, progression and withdrawal.
- **Somali Jet:** This low-level cross-equatorial flow transports moisture from the Indian Ocean towards the Arabian Sea and Indian landmass.
- **Himalayas:** The Himalayan mountain system acts as a barrier to cold continental air and contributes to the maintenance of the monsoon circulation over the subcontinent.
- **Western Ghats and Northeast Hills:** These mountain systems cause **orographic rainfall** and create strong regional contrasts in precipitation.

Ocean-Atmosphere Teleconnections:

- **El Niño:** Abnormal warming of the central and eastern tropical Pacific Ocean can weaken the Indian monsoon circulation and is historically associated with an increased probability of deficient monsoon rainfall, although the relationship is not deterministic.
- **La Niña:** Abnormal cooling of the tropical Pacific can favour stronger Indian monsoon conditions, but its influence varies according to other atmospheric and oceanic factors.
- **Indian Ocean Dipole:** Differences in sea-surface temperatures between the western and eastern tropical Indian Ocean can modify monsoon rainfall and may sometimes offset or reinforce ENSO-related influences.
- **Madden-Julian Oscillation:** Intraseasonal movement of tropical convection can influence active and suppressed phases of rainfall over the Indian region.

2026 Rainfall Deficit and Regional Implications:

Spatial Variation:

- The 2026 monsoon demonstrates that **national rainfall totals can conceal significant regional disparities**, because nearly half of India's geographical area remains deficient despite some regions receiving normal or above-normal rainfall.
- As of 19 September, **18 of 36 meteorological subdivisions** had normal rainfall, while 18 remained deficient, highlighting the uneven spatial distribution of monsoon rainfall.
- Such spatial variability has direct implications for **cropping patterns, irrigation demand, reservoir levels, drinking-water availability and rural livelihoods**.

Implications of the Deficit:

- Rainfall deficiency can increase dependence on **groundwater and irrigation**, particularly in rain-fed agricultural regions.
- Reduced rainfall during critical crop stages can affect **yield, sowing decisions and farm incomes**, while delayed or uneven rainfall can create difficulties even when seasonal totals appear adequate.
- Water-intensive sectors and cities may face greater pressure on **reservoirs, aquifers and municipal water supplies** when rainfall deficits persist.

Bay of Bengal Weather System and Monsoon Dynamics:

Formation and Movement:

- The developing low-pressure system over the **North Andaman Sea** illustrates the continuing role of the Bay of Bengal in generating weather systems during the latter part of the monsoon season.
- The system is forecast to move **west-northwestwards**, intensify into a depression around 21 September and deepen further around 22 September before approaching the Odisha–Andhra Pradesh coast around 23 September.
- Such systems can temporarily enhance rainfall over central and eastern India even while the Southwest Monsoon begins withdrawing from northwestern India.

UPSC Significance:

- The simultaneous occurrence of **monsoon withdrawal in the northwest and a developing low-pressure system in the Bay of Bengal** demonstrates that monsoon withdrawal is a gradual spatial process rather than a single nationwide event.
- The event also highlights the importance of **regional weather systems, ocean-atmosphere interactions and monsoon circulation** in determining short-term rainfall variability.

Impacts of the Indian Monsoon:

Agriculture and Food Security:

- Monsoon rainfall determines **sowing, crop choice, irrigation requirements and yields**, particularly for rain-fed crops such as rice, pulses, millets and oilseeds.
- Deficient rainfall can reduce production and increase food-price pressures, while excessive rainfall can cause waterlogging, crop damage and soil erosion.

Water Resources and Energy:

- Monsoon rainfall replenishes **rivers, reservoirs, lakes and groundwater**, supporting drinking water, irrigation and industrial requirements.
- Hydroelectric generation depends significantly on reservoir inflows, making rainfall variability important for **India's energy security**.

Economy:

- Rural demand, agricultural incomes and several agro-based industries are sensitive to monsoon performance.
- A deficient monsoon can increase agricultural stress and food inflation, while a well-distributed monsoon can support **rural consumption, farm incomes and macroeconomic stability**.

Health:

- Adequate rainfall supports water availability, but stagnant water following heavy rainfall can increase the risk of **vector-borne and water-borne diseases**, including dengue, malaria and cholera.
- Public-health preparedness therefore needs to address both **drought-related water scarcity and flood-related disease risks**.

Infrastructure and Environment:

- Excessive rainfall can damage **roads, bridges, drainage systems, urban infrastructure and agricultural land**, particularly where floodplain management and storm-water drainage are inadequate.
- Monsoon rainfall also supports **soil moisture, wetlands, forests, groundwater recharge and ecosystem productivity**, although intense rainfall can increase erosion, landslides and habitat degradation.

Challenges in Monsoon Management:

Rainfall Variability:

- The key challenge is not only the total amount of seasonal rainfall but also its **timing, intensity, duration and spatial distribution**.
- Short periods of extreme rainfall separated by prolonged dry spells can produce simultaneous **flood and drought-like conditions** within the same season.

Climate Change:

- Long-term observations indicate changes in the **length and withdrawal characteristics of the Southwest Monsoon**, while increasing climate variability can complicate rainfall prediction and water-resource planning.
- Greater frequency or intensity of extreme rainfall events can increase risks to **urban infrastructure, agriculture, ecosystems and disaster management systems**.

Way Forward:

Building Monsoon Resilience:

- India needs to strengthen **district-level weather forecasting, impact-based forecasting and early-warning systems** so that forecasts translate into actionable information for farmers, fishermen, urban authorities and disaster-management agencies.
- Agricultural planning should promote **climate-resilient crops, micro-irrigation, rainwater harvesting, soil-moisture conservation and diversified cropping systems**.
- Water management should integrate **reservoir operations, groundwater regulation, watershed development and urban rainwater harvesting** rather than treating each component separately.
- Cities should adopt **sponge-city principles, improved drainage, floodplain zoning and wetland conservation** to manage intense rainfall.
- Monsoon forecasting should increasingly integrate **ENSO, IOD, intraseasonal oscillations, ocean conditions and high-resolution climate models** to improve seasonal and extended-range predictions.

UPSC Relevance:

Essay and Interdisciplinary Linkages:

- The Indian monsoon demonstrates the close relationship between **physical geography and economic development**, because atmospheric variability directly affects livelihoods, food security, water availability and macroeconomic stability.

Value Addition for UPSC:

Key Facts:

- **Normal Southwest Monsoon onset over Kerala:** Around 1 June.
- **New normal date for withdrawal from northwest India:** Around 17 September.
- **Southwest Monsoon withdrawal in 2026 began:** 19 September.
- **Cumulative rainfall by 19 September 2026:** 695.6 mm against a normal 817.2 mm.
- **All-India rainfall deficit:** About 15%.
- **Rain-deficient geographical area:** Nearly 43%.
- **Normal Northeast Monsoon season:** October–December.
- **Key Northeast Monsoon beneficiaries:** Tamil Nadu, coastal Andhra Pradesh, Rayalaseema, South Interior Karnataka and parts of Kerala.
- **Major 2026 weather system:** Low-pressure area over the North Andaman Sea, expected to intensify into a depression around 21 September and a deep depression around 22 September.
- **Expected coastal approach:** South Odisha–north Andhra Pradesh around 23 September.

Key Conceptual Linkages:

- **Monsoon variability ? Agricultural output ? Rural income ? Food prices ? Inflation**
- **Rainfall deficit ? Groundwater dependence ? Water stress ? Agricultural vulnerability**
- **Extreme rainfall ? Urban flooding ? Infrastructure damage ? Economic losses**
- **Climate change ? Rainfall variability ? Extreme events ? Need for climate-resilient development**
- **Monsoon withdrawal ? Change in wind regime ? Northeast Monsoon ? Rainfall over southeastern India**

Mains Answer Enrichment:

- The **2026 Southwest Monsoon withdrawal** illustrates the spatial and temporal complexity of India's monsoon system, where withdrawal from north-western India can occur simultaneously with active weather systems over the Bay of Bengal.
- For India, the policy challenge is therefore not merely to predict the total monsoon rainfall but to build resilience against **regional rainfall deficits, extreme precipitation, intra-seasonal variability and changing monsoon characteristics** through climate-resilient agriculture, integrated water management, early-warning systems and disaster-resilient infrastructure.