EARLY ONSET OF INDIAN MONSOON: GEOGRAPHY

NEWS: Southwest monsoon to reach Kerala on May 27, four days early, says IMD

WHAT'S IN THE NEWS?

The Indian monsoon, driven by factors like land-sea heating, ITCZ, and oceanic patterns (ENSO, IOD), is crucial for agriculture, water resources, and the economy. Recent forecasts predict early onset, and government initiatives aim to improve prediction accuracy and farmer preparedness.

1. Context and Current Status

- The India Meteorological Department (IMD) has predicted the early onset of the southwest monsoon this year.
- The normal onset date of the monsoon over Kerala is June 1.
- It typically takes about 10 days for the southwest monsoon system to travel from the Nicobar Islands to Kerala.

2. Mechanism of the Indian Monsoon: Key Driving Forces

a) Differential Heating of Land and Sea

- During summer, land heats up faster than the surrounding oceans.
- This creates a low-pressure zone over the Indian subcontinent.
- Moisture-laden winds are drawn from the sea to the land, initiating monsoon activity.

b) Inter-Tropical Convergence Zone (ITCZ)

- ITCZ is a low-pressure belt near the equator where trade winds converge.
- In summer, the ITCZ shifts northward, aligning with the Indo-Gangetic plains.

• This intensifies monsoon winds and leads to heavy rainfall in northern India.

c) Tibetan Plateau Heating

- The Tibetan Plateau heats intensely due to its altitude and landmass during summer.
- This creates an upper atmospheric low-pressure zone, enhancing vertical air circulation.
- It pulls in strong monsoon winds from the oceans, strengthening the system.

d) Tropical Easterly Jet (TEJ)

- A high-altitude wind current that develops during summer in the upper troposphere.
- It enhances the monsoon trough, aiding in widespread and intense monsoon rainfall.

e) El Niño-Southern Oscillation (ENSO)

- El Niño: Leads to warming of central/eastern Pacific Ocean waters; generally weakens Indian monsoon.
- La Niña: Involves cooling of Pacific waters; typically strengthens the Indian monsoon.

f) Indian Ocean Dipole (IOD)

- Positive IOD: Warmer western Indian Ocean boosts monsoon winds towards India.
- Negative IOD: Cooler western Indian Ocean suppresses monsoon intensity.

3. Onset, Advancement, and Withdrawal

a) Onset

- Arabian Sea Branch: First reaches Kerala by June 1, progresses northward along the Western Ghats.
- Bay of Bengal Branch: Moves through Northeast India in early June, spreading into eastern and central India.

b) Advancement

• The monsoon gradually covers entire India by mid-July, both branches converging over the Indo-Gangetic plain.

c) Retreat

- Begins in early October from northwest India.
- Residual heat and moisture during retreat cause "October heat"—hot and humid conditions.
- Wind direction reverses, bringing northeast monsoon rains to Tamil Nadu and Andhra Pradesh.

4. Impact of the Monsoon

a) Agriculture

- Vital for Kharif crops (like rice, maize, cotton) which rely on timely rainfall.
- Determines sowing patterns, productivity, and rural income stability.

b) Economy

- Around 55% of India's net sown area is rain-fed.
- A good monsoon boosts GDP, stabilizes food prices, and improves rural consumption.
- A poor monsoon can lead to inflation, reduced food security, and lower agricultural output.

c) Water Resources and Hydropower

- Monsoon recharges groundwater, rivers, and reservoirs.
- Critical for drinking water, irrigation, and hydropower generation.
- Impacts water security for both urban and rural populations.
- d) Environment and Biodiversity
 - Supports natural ecosystems like wetlands, forests, and rivers.
 - Aids in migratory patterns, breeding cycles, and ecosystem productivity.

e) Cultural Significance

- Monsoon is central to Indian festivals and folklore (e.g., Teej, Onam, Pongal).
- Traditionally seen as a symbol of fertility, prosperity, and agricultural bounty.

f) Disasters

- Heavy rainfall can trigger floods, landslides, and urban waterlogging.
- Vulnerable areas like the Himalayan region and northeast India face recurrent disasters during the monsoon.
- 5. Recent Government Initiatives for Monsoon Forecasting
- a) Monsoon Mission (2012)
 - Launched by the Ministry of Earth Sciences.
 - Aim: Improve the accuracy of monsoon prediction through better weather models.
 - Supported development of dynamic models and seasonal forecasting systems.

b) National Supercomputing Mission

- Enhances India's computational infrastructure for high-resolution climate and weather simulations.
- Critical for improving long-term monsoon forecasts and real-time weather warnings.

c) ICAR-IMD Collaboration

- Collaboration between the Indian Council of Agricultural Research (ICAR) and India Meteorological Department (IMD).
- Provides Agromet Advisory Services (AAS) to farmers:
 - Location-specific weather forecasts.
 - Crop-specific advisories to manage farming operations during monsoon fluctuations.

Conclusion

- The Indian monsoon is a complex phenomenon influenced by both regional and global factors.
- Its timely arrival and spread are essential for agriculture, water security, and economic stability.
- With climate variability increasing, accurate forecasting, early warning systems, and policy coordination have become more crucial than ever.

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