

Monsoon in India: UPSC Geography Revision Slides

LESSON SLIDES

Monsoon in India

UPSC Geography revision · Mechanism, onset, withdrawal, El Niño and the IOD



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Monsoon in India

SPEAKER NOTES

Ask aspirants: on what date does the monsoon normally reach Kerala? Most will say 1 June; tell them we will also learn the dates for Mumbai, Delhi and the whole country. Remind them that UPSC tests both mechanisms and exact facts.

By the end of this session you can

- 🎯 Explain the roles of the ITCZ and jet streams
- 🎯 Trace the onset from Kerala to the whole country
- 🎯 Describe the Arabian Sea and Bay of Bengal branches
- 🎯 Explain breaks, withdrawal and October heat
- 🎯 Link El Niño and the IOD to Indian rainfall

By the end of this session you can

SPEAKER NOTES

Read the objectives aloud. Suggest that aspirants keep a blank outline map of India to mark the branches and onset dates as we go.

Why the monsoon matters

- Most of India gets 70–90% of annual rain in June–September
- Winds reverse: southwest in summer, northeast in winter
- India's average annual rainfall is about 125 cm
- Onset timing shapes sowing and water planning

Why the monsoon matters

SPEAKER NOTES

The 70–90% figure comes from IMD's 2020 report on normal onset dates. Ask: which crops depend most on monsoon timing? Kharif crops such as rice. A common misconception is that the monsoon is just heavy rain; it is a seasonal reversal of winds.

The benchmark IMD uses

87 cm

**Long Period Average of June–September
rain, 1971–2020**

- IMD states forecasts as a percentage of this LPA
- April 2026 forecast: 92% of LPA, model error $\pm 5\%$

The benchmark IMD uses

SPEAKER NOTES

Explain that the LPA is the all-India seasonal average. Ask: if a season gets 92% of LPA, roughly how many centimetres is that? About 80 cm. Stress that an all-India figure can hide big regional differences.

The older idea: differential heating

- April–May: the sun is overhead near the Tropic of Cancer
- Land heats fast; low pressure forms over northwest India
- The Indian Ocean heats slowly, so pressure stays higher
- Winds are drawn from sea to land, but this is incomplete

The older idea: differential heating

SPEAKER NOTES

NCERT says this was the accepted view towards the end of the nineteenth century. Ask: what does this simple model leave out? Upper-air winds and the global circulation, which the next slides add.

The ITCZ and the monsoon trough

- ITCZ: low-pressure belt where trade winds converge
- In July it lies near 20°N–25°N over the Gangetic plain
- Southeast trades cross the equator between 40°E and 60°E
- Coriolis force turns them into southwest winds
- In winter the ITCZ moves south and winds reverse

The ITCZ and the monsoon trough

SPEAKER NOTES

Sketch the equator, the ITCZ in July and the curving trade winds. Ask: why do the winds bend to the right after crossing the equator? The Coriolis force deflects moving air to the right in the northern hemisphere.

Jet streams and the onset

Westerly jet

- Lies south of the Himalayas before the monsoon
- Withdraws from the north Indian plain
- Linked to the northward shift of the ITCZ

Easterly jet

- Sets in along about 15°N
- Arrives only after the westerly jet withdraws
- Held responsible for the monsoon burst

Jet streams and the onset

SPEAKER NOTES

This follows the NCERT Class 11 explanation. Ask: what has to happen first, the westerly jet leaving or the easterly jet arriving? The westerly jet must withdraw first. Many aspirants mix up which jet causes the burst.

Onset and the 'burst'

- Normal onset over Kerala: around 1 June
- Burst: sudden heavy rain with thunder and lightning
- Day temperatures fall 5–8 °C from mid-June to mid-July
- The monsoon approaches in two branches

Onset and the 'burst'

SPEAKER NOTES

Onset over Kerala is the first official milestone every year, and IMD declares it using rainfall, wind and cloud criteria. Ask: why does the first rain bring such a big drop in temperature? Cloud cover and evaporation cool the land.

 Example

The monsoon's march north

- 1 Thiruvananthapuram and Kochi: around 1 June
- 2 Mumbai: around 11 June
- 3 Delhi: around 27 June
- 4 The whole country: around 8 July

The monsoon's march north

SPEAKER NOTES

These are IMD's new normal dates, published in 2020 from 1961–2019 data; in any single year actual dates vary. Ask: how many days does the monsoon take from Kerala to Delhi? About four weeks. The old normal for full coverage was 15 July.

Two branches of the southwest monsoon

Arabian Sea branch

- Western Ghats: 250–400 cm on the windward side
- Rain-shadow area east of the Ghats
- Other arms reach central India and Gujarat

Bay of Bengal branch

- Arakan Hills deflect it into West Bengal
- One arm moves west along the Ganga plains
- Another reaches the northeast and Mawsynram

Two branches of the southwest monsoon

SPEAKER NOTES

Ask aspirants to compare Mangaluru with Bengaluru to see the rain-shadow effect. Mawsynram, on the crest of the Khasi hills, receives the highest average annual rainfall in the world according to NCERT.

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Why Tamil Nadu stays dry in summer

- Its coast runs parallel to the Bay of Bengal branch
- It lies in the rain shadow of the Arabian Sea branch
- Its main rain comes in October and November
- Cyclonic depressions bring heavy rain to the east coast

Why Tamil Nadu stays dry in summer

SPEAKER NOTES

This is a favourite Prelims statement question. Ask: which two reasons does NCERT give? Parallel coastline and rain shadow. A common error is to blame the Eastern Ghats alone.

Break in the monsoon

- A dry spell of one or more weeks within the season
- North India: few rain-bearing storms along the trough
- West coast: winds blow parallel to the coast
- Long breaks stress kharif crops

Break in the monsoon

SPEAKER NOTES

Stress that breaks are normal, not a failure of the monsoon. Ask: why would a two-week break in July worry a rice farmer? Transplanted seedlings need standing water.

Withdrawal and the retreating monsoon

Withdrawal

- Starts from northwest India around 17 September
- Monsoon trough moves south with the sun
- Leaves most of India by about 15 October

Retreating season

- Clear skies and rising temperature
- Moist land plus heat gives 'October heat'
- Rainiest months for the eastern Peninsula

Withdrawal and the retreating monsoon

SPEAKER NOTES

IMD moved the normal start of withdrawal from 1 September to about 17 September in 2020. Ask: why is October heat so uncomfortable? High temperature and high humidity together. Withdrawal is gradual, unlike the sudden onset.

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El Niño and the Southern Oscillation

- El Niño: warm water off Peru in the eastern Pacific
- Recurs roughly every three to seven years
- Indian monsoon rain is often suppressed in El Niño years
- Southern Oscillation: pressure difference, Tahiti versus Darwin
- Often, not always: other factors can offset it

El Niño and the Southern Oscillation

SPEAKER NOTES

NCERT notes that El Niño is used in India for long-range monsoon forecasting. Ask: does every El Niño year bring drought in India? No, which is why the Indian Ocean Dipole matters too.

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Indian Ocean Dipole (IOD)

- IOD index: west minus east Indian Ocean sea-surface temperature anomaly
- Positive IOD: the western side is warmer
- A positive IOD tends to favour Indian monsoon rain
- IMD tracks Pacific and Indian Ocean temperatures

Indian Ocean Dipole (IOD)

SPEAKER NOTES

Researchers define the IOD index as the sea surface temperature difference between a western and an eastern box of the tropical Indian Ocean. Ask: how could a positive IOD help in an El Niño year? It can partly offset the drying effect.

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 Prelims practice

Which of these usually favours a stronger Indian summer monsoon?

- A** An El Niño in the eastern Pacific
- B** A positive Indian Ocean Dipole
- C** Westerly jet staying south of the Himalayas
- D** Winds blowing parallel to the west coast

Prelims practice

SPEAKER NOTES

Answer: B, a positive Indian Ocean Dipole. El Niño often suppresses rainfall, the westerly jet must withdraw before the burst, and parallel winds cause breaks on the west coast.

Revision takeaways

- ✓ ITCZ shift and jet streams drive the southwest monsoon
- ✓ Kerala around 1 June; whole country by about 8 July
- ✓ Two branches: Arabian Sea and Bay of Bengal
- ✓ Withdrawal starts around 17 September from the northwest
- ✓ El Niño often weakens it; a positive IOD tends to help

Revision takeaways

SPEAKER NOTES

Ask aspirants to mark the onset dates and both branches on their outline map. Then take the five-question quiz on the page and revise the NCERT Class 11 chapter on climate alongside these slides.