



## Delayed Monsoon

**For Prelims:** [Inter Tropical Convergence Zone \(ITCZ\)](#), [westerly jet stream](#), [Southern Oscillation \(SO\)](#), [India Meteorological Department \(IMD\)](#).

**For Mains:** Significance of the southwest monsoon, [Indo-Pacific region](#).

### Why in News?

In 2023, the [monsoon](#) arrived over the Kerala coast on June 8, which is a delay compared to its normal onset date of June 1.

### What is Monso on?

#### ▪ About:

- Monsoons are **seasonal winds** (Rhythmic wind movements or Periodic Winds) **which reverse their direction** with the change of season.

#### ▪ Factors Influencing South-West Monsoon:

- The **differential heating and cooling of land and water** creates a low pressure on the landmass of India while the seas around experience comparatively high pressure.
- The **shift of the position of [Inter Tropical Convergence Zone \(ITCZ\)](#)** in summer, over the Ganga plain (this is the equatorial trough normally positioned about 5°N of the equator).
  - It is **also known as the monsoon-trough** during the monsoon season).
- The presence of the **high-pressure area, east of Madagascar**, approximately at 20°S over the Indian Ocean. The intensity and position of this high-pressure area affect the **Indian Monsoon**.
- The **Tibetan plateau gets intensely heated during summer**, which results in strong vertical air currents and the formation of low pressure over the plateau at **about 9 km above sea level**.
- The **movement of the [westerly jet stream](#) to the north of the Himalayas** and the presence of the [tropical easterly jet stream](#) over the Indian peninsula during summer.
- **[Southern Oscillation \(SO\)](#):**
  - It is a shift in wind and sea surface temperature between the tropical eastern Pacific Ocean and the Indian Ocean. It is commonly referred to as the phenomenon of shifting air pressure.
  - **[La Nina is the cooling phase, and El Nino](#)** is the warming phase.
  - La Nina generally impacts positively on Indian Monsoon.
- **Indian Ocean Dipole (IOD):**
  - IOD is the difference between the temperature of eastern (Bay of Bengal) and the western Indian Ocean (Arabian Sea).
  - A positive IOD brings more rainfall in India while negative IOD impacts negatively.

DECEMBER and JANUARY



JUNE and JULY



## What is the Onset of Monsoon?

### ▪ Monsoon Onset:

- The onset of the monsoon over the Kerala coast signifies the **start of the four-month southwest monsoon season, which accounts for over 70% of India's annual rainfall.**
- Contrary to common assumptions, the onset does not refer to the first rain of the season but rather follows specific technical criteria set by the [India Meteorological Department \(IMD\)](#).

### ▪ Conditions for Monsoon Onset:

- The IMD determines the monsoon onset based on significant transitions in atmospheric and ocean circulations in the [Indo-Pacific region](#).
- The declaration of onset relies on specific parameters related to rainfall consistency, intensity, and wind speed.

#### • Rainfall:

- The onset is declared when at least 60% of 14 designated meteorological stations in **Kerala and Lakshadweep record at least 2.5 mm of rain for two consecutive days** after May 10.
- The **onset is declared on the second day if specific wind and temperature criteria are met.**

#### • Wind Field:

- The **depth of westerlies within the equator to 10°N latitude and the 55°E to 80°E longitude range** should extend up to 600 hectopascal (hPa).
- The **zonal wind speed between 5-10°N latitude and 70-80°E longitude** should be around 15-20 knots (28-37 kph) at 925 hPa.

#### • Heat:

- The **Outgoing Longwave Radiation (OLR) value, derived from INSAT,** should be below 200 watt per sq m (wm<sup>2</sup>) in the area between 5°N and 10°N latitudes and 70°E and 75°E longitudes.

### ▪ Impact of Delayed Onset:

#### ◦ Agriculture:

- Delayed monsoon onset can affect agricultural activities, particularly sowing of crops.
- Farmers heavily rely on monsoon rains for irrigation and crop growth.
- A delay in rainfall can lead to a postponement of sowing, affecting crop yields and agricultural productivity.

#### ◦ Water Resources:

- Delayed monsoon onset can result in water scarcity, especially in regions dependent on rainfall for replenishing water reservoirs, rivers, and lakes.

#### ◦ Energy Sector:

- Delayed monsoon can impact hydropower generation, which relies on sufficient water availability.

#### ◦ Environment:

- It can affect the growth and distribution of vegetation, delay the migration of

certain species, and disrupt ecological cycles.

- Delayed monsoon can also contribute to soil erosion, land degradation, and reduced biodiversity in affected regions.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### ***Prelims;***

**Q. With reference to 'Indian Ocean Dipole (IOD)' sometimes mentioned in the news while forecasting Indian monsoon, which of the following statements is/are correct? (2017)**

1. IOD phenomenon is characterised by a difference in sea surface temperature between tropical Western Indian Ocean and tropical Eastern Pacific Ocean.
2. An IOD phenomenon can influence an El Nino's impact on the monsoon.

**Select the correct answer using the code given below:**

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

**Ans: (b)**

**Exp;**

- The Indian Ocean Dipole (IOD) is an atmosphereocean coupled phenomenon in the tropical Indian Ocean (like the El Nino is in the tropical Pacific), characterised by a difference in Sea-Surface Temperatures (SST).
- A 'positive IOD' is associated with cooler than normal sea-surface temperatures in the eastern equatorial Indian Ocean and warmer than normal sea-surface temperatures in the western tropical Indian Ocean.
- The opposite phenomenon is called a 'negative IOD', and is characterised by warmer than normal SSTs in the eastern equatorial Indian Ocean and cooler than normal SSTs in the western tropical Indian Ocean.
- Also known as the Indian Nino, it is an irregular oscillation of sea-surface temperatures in the Indian Ocean in which the western Indian Ocean becomes alternately warmer and colder than the eastern part of the Indian Ocean. Hence, statement 1 is not correct.
- The IOD is one aspect of the general cycle of global climate, interacting with similar phenomena like the El Nino-Southern Oscillation (ENSO) in the Pacific Ocean. An IOD can either aggravate or weaken the impact of El Nino on Indian monsoon. If there is a positive IOD, it can bring good rains to India despite of an El Nino year. Hence, statement 2 is correct.
- Therefore, option (b) is the correct answer

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***Mains:***

**Question:** How far do you agree that the behaviour of the Indian monsoon has been changing due to humanizing landscape? Discuss.(2015)

**Source: IE**

