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.

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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 10ºN latitude and the 55ºE to 80ºE** longitude range should extend up to 600 hectopascal (hPa).
      - The **zonal wind speed between** 5-10ºN latitude and 70-80ºE 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 (wm2) in the area between 5ºN and 10ºN latitudes and 70ºE and 75ºE 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

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