ALMA Telescope

Why in News?

The **Atacama Large Millimetre/submillimetre Array (ALMA)** is a **radio telescope** located in the **Atacama Desert of northern** Chile. It is set to receive software and hardware upgrades.

- The upgrades will enable ALMA to collect more data and **produce sharper images.**

What is ALMA?

- **About:**
  - ALMA is a **state-of-the-art telescope** that studies celestial objects at **millimetre and submillimetre wavelengths** — they can penetrate through dust clouds and help astronomers examine dim and distant galaxies and stars out there.
  - ALMA is an international partnership of the **European Southern Observatory (ESO),** the **U.S. National Science Foundation (NSF)** and the **National Institutes of Natural Sciences (NINS) of Japan,** together with NRC (Canada), MOST and ASIAA (Taiwan), and KASI (Republic of Korea), in cooperation with the Republic of Chile.
- **Properties:**
  - It also has **extraordinary sensitivity**, which allows it to detect even extremely faint radio signals.
  - Each of its **66 antennas is equipped with a set of receivers** that are designed to detect **specific ranges of wavelengths on the electromagnetic spectrum.**
  - To combine the data collected by each antenna into a single image, **ALMA uses a correlator.**
    - The correlator is a **powerful supercomputer** that processes the vast amounts of data collected by the antennas and creates detailed images of celestial objects with exceptional resolution.
    - This technology allows astronomers to study distant galaxies, stars, and other celestial bodies with a level of detail never before possible.
- **Discoveries Made by ALMA:**
  - In 2013, ALMA discovered **starburst galaxies** that existed earlier in the universe's history than previously thought.
  - ALMA also provided detailed images of a protoplanetary disc around a young star, **HL Tauri, in 2014,** which challenged existing theories about planetary formation.
  - In 2015, the telescope helped scientists observe the **Einstein ring phenomenon,** where light from a galaxy or star passes by a massive object on its way to Earth.

Why is ALMA located in Chile's Atacama Desert?

- It is situated at an **altitude of 16,570 feet (5,050 metres)** above sea level on the Chajnantor plateau in **Chile's Atacama Desert** as the **millimetre and submillimetre** waves observed by it are very **susceptible to atmospheric water vapour absorption** on Earth.
- Moreover, the **desert is the driest place in the world**, meaning most of the nights here are clear of clouds and free of light-distorting moisture — making it a perfect location for examining the universe.

Source: IE