

NISAR (NASA-ISRO Synthetic Aperture Radar)

Prelims - Current events of National & International importance and General Science.

Why in News?

NISAR will be launched by Geosynchronous Satellite Launch Vehicle (GSLV) from the Satish Dhawan Space Centre in Sriharikota.

- NASA-ISRO SAR (NISAR) Mission It is a *unique Earth observation satellite,* and the first satellite to observe the Earth with a dual frequency *Synthetic Aperture Radar (SAR).*
 - **Dual frequency SAR** NASA's L-band and ISRO's S-band.
- It is the first joint collaboration between *NASA and ISRO*.
- Aim To deliver extensive environmental and geological data to scientists worldwide.
- Features
 - Launch Vehicle GSLV-F16 rocket.
 - $\circ~$ **Orbit -** Sun-synchronous orbit at a distance of 743km with an inclination of 98.40 degrees.
 - **Payload capacity -** 2,392 kg.
 - Antenna & reflector NASA's 12m unfurlable mesh reflector antenna, integrated to ISRO's modified I3K satellite bus.
 - **High-Resolution Imaging -** It uses Sweep SAR (Swept Synthetic Aperture Radar) technology for the first time.
 - **All-Weather, Day & Night Operation** NISAR's radar systems can penetrate clouds and light rain, enabling continuous data collection regardless of weather conditions or time of day.
- Goals
 - $\circ\,$ Monitoring ecosystem changes and measuring forest biomass.
 - $\circ\,$ Tracking earthquakes, landslides, and volcanic deformation.
 - Studying glacier retreat and polar ice movement.
 - Measuring soil moisture and detecting groundwater variations.
 - $\circ\,$ Generating 3D surface maps of land and ice with high precision twice every 12 days after launch.
- Significance
 - **Disaster response** Rapid detection of earthquakes, floods, and landslides could help save lives and infrastructure.
 - Agriculture and water management Accurate data on soil moisture and crop health can inform drought mitigation and boost food security.
 - Climate monitoring Continuous tracking of forests, glaciers, and wetlands

enhances climate resilience.

- **Technological advancement** Developing and operating dual-band radar technology strengthens ISRO's future missions.
- **Global data access -** All NISAR data will be freely available worldwide, enhancing India's standing in global Earth science.

Synthetic Aperture Radar (SAR)

• SAR is a technology that uses microwave pulses instead of visible light to create high-resolution images.

• It works regardless of lighting or weather conditions like darkness, clouds, or smoke.

• A SAR system uses a small antenna on a moving platform like a satellite to record echoes from the ground.

• By combining these signals with precise timing and phase data, it mimics a very large antenna.

• **All-Weather, Day-Night Capability** – Microwaves can penetrate clouds, rain, and smoke, enabling SAR to operate 24/7.

• It can detect surface features and changes invisible to optical cameras.

Reference

The Hindu| NISAR First joint Satellite of NASA and ISRO

