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.
  - **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**
  - Monitoring ecosystem changes and measuring forest biomass.
  - Tracking earthquakes, landslides, and volcanic deformation.
  - Studying glacier retreat and polar ice movement.
  - Measuring soil moisture and detecting groundwater variations.
  - 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]