Space Infrastructure as service to Geospatial Applications

Leveraging Space Technology & Applications for Viksit Bharat 2047 : Outcome of National Meet 2.0 on Aug 22, 2025

Dr Prakash Chauhan, Director, NRSC/ISRO

Space Applications : Enabler for National Development

Space Applications

- Food & Energy Security
- Infrastructure & Planning
- Natural Resources Assessment
- Water Resources
- Land Monitoring & Records
- Ocean & Atmosphere
- Disaster Risk Reduction
- Telemedicine & Tele-Education
- DTH, Broadcasting & Internet
- E-Governance
- Defense, Topography & GeoINT
- PNT & Location based Services

EARTH OBSERVATION	SATCOM	SATNAV
ISRO	NSIL	IN-SPACe

INDUSTRY		START-UPS	ACADEMIA			
450+	50+	200+	6	6	9	300+
MSME	Large companies		RAC-S	STIC	STC	Sponsored Research

- Understanding of Earth System Processes
- Accelerating Socio-economic Development & SDGs
- Shaping Economy Quality of Life & Livelihood
- National Security
- Disaster Risk Reduction

Satellites Launched in last 10 years

- 23 Earth Observation
- 15 Communication
- 7 GNSS

International Collaborations

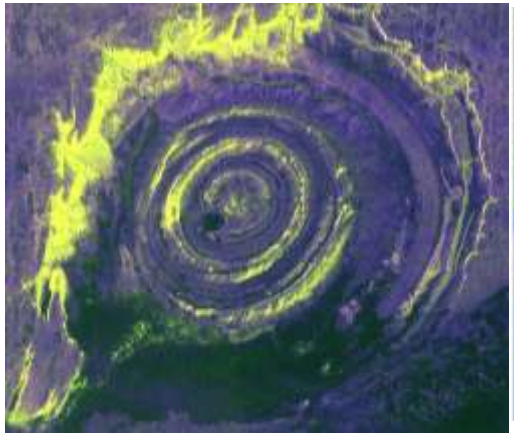
NASA, CNES, JAXA,….

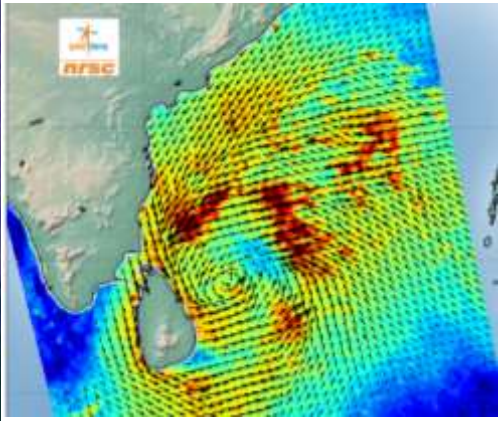
Current & Planned Indian EO Satellites Supporting Geospatial Applications

Natural Resources Inventory & Disaster Management

RESOURCESAT- 2 & 2A, RISAT-1A
NISAR

- Three tier imaging : 56 m / 23 m / 5.8 m
- Revisit Capability : 03 / 11 / 03 days
- Microwave SAR imaging in multi mode





Large Scale Mapping, Infrastru. Planning & Cartography

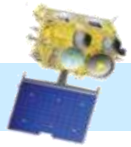
CARTOSAT- 2S & CARTOSAT-3

- 2.5 m Stereo imaging
- Sub-meter PAN and 1.5 m Multi-spectral
- 0.50 m PAN
- `0.30 m PAN

Oceanography

OCEANSAT-3 ;Scatterometre, OCM

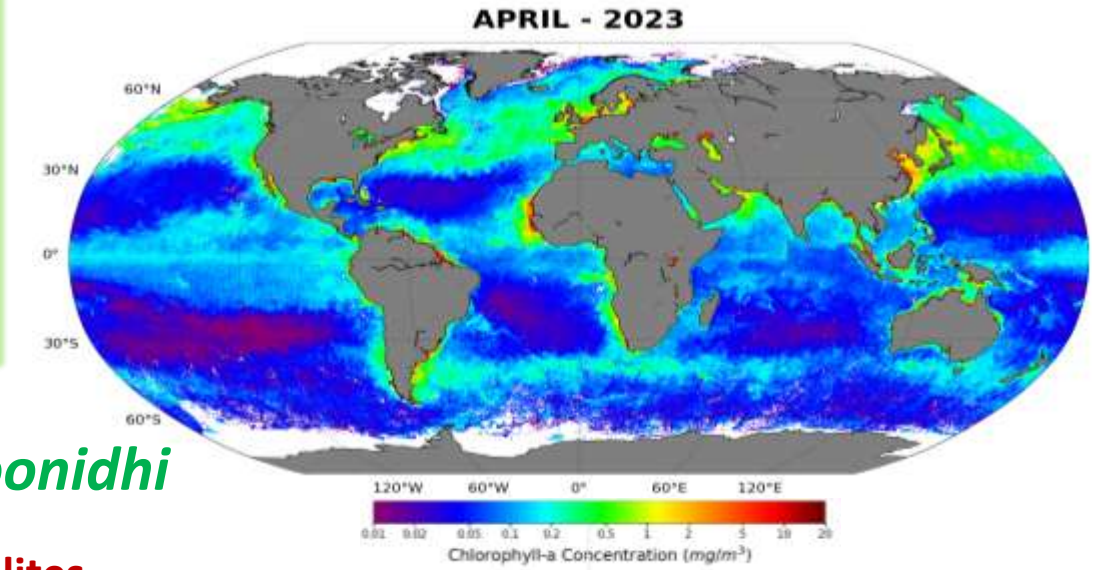
- Ocean color 360 m with 2 days revisit
- PFZ, Ocean State Forecast
- Surface Wind Vector



Weather & Climate

INSAT 3DR & 3DS

- 6 channel Imager – 48 images per day
- 19 Channel Sounder – Atm. Profiles



ISRO EO data from Bhoonidhi

ISRO/NSIL EO Planned Satellites

- Resourcesat -3/3A (2027/28)
- Resourcesat-3S/3SA (2028)
- TRISHNA (2027)
- OCEANSAT-3A (2026)

PPP mode constellation through In-SPACE

NGE EO satellites in Optical/SAR

Theme

"Leveraging Space technology & Applications for Viksit Bharat 2047"

Preparations:

- **63** Central Ministries/ Depts.
- **36** States / UTs
- **300+** one-to-one meetings,
- **08** Regional State meets

National Meet 2025 (NM2.0):

- **10** Parallel Sessions
- **One** Industry Session
- **108** User requirement presentations
- **90** User-requirement documents

Report Submitted on 23rd Aug 2025

NM 2025 Inaugural Function
@ Bharat Mandapam, New Delhi on 22nd Aug

Chief Guest: Dr. V.K. Saraswat,
Member Niti Aayog

NM 2025 Concluding Function
@ Bharat Mandapam, New Delhi on 22nd Aug

Chief Guest: Dr. P.K. Mishra
Principal Secretary to PM

Glimpses of preparatory meetings

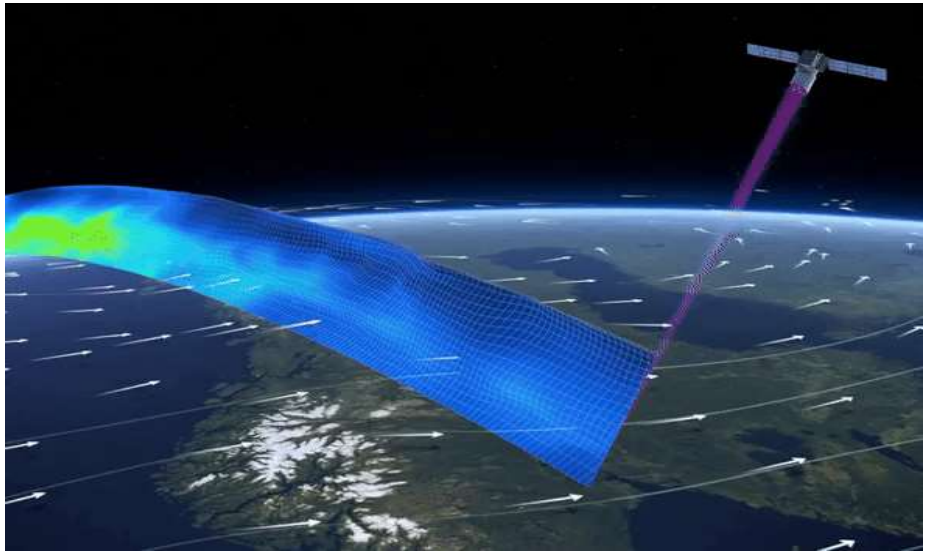
Uttarakhand State Meet (June 30th)

Uttar Pradesh State Meet (July 7th)

Secretary, Dept. of Rural Development

Augmentation needed in Sovereign EO Infrastructure

- High/Very-high Spatial & Temporal Resolution satellites for Daily/ Sub-daily/ Weekly monitoring of Infrastructure, Disasters & Resources
- High/ Very-High Resolution Stereo data for volumetric analysis and terrain evaluation
- Continuity of medium-resolution (~5m) EO missions for long-term resource monitoring
- High-resolution Thermal, Hyperspectral satellites, High Resolution DEM updation
- Precipitation Radars; Temperature & Humidity Profilers (MW Sounders); LiDAR based Wind Profilers
- Atmospheric Chemistry/ GHG monitoring missions-Climate Change
- Microwave missions for Ocean Parameters, Altimeters for High-resolution Ocean Surface Topography, GNSS Radio Occultation (RO)/ Reflectometry (R) missions
- High-resolution Imaging from Geostationary satellites
- Enhanced Ground Stations, Cal/Val infrastructure
- Cloud-based access and analytics of Indian EO data



Data Processing, Analytics & Dissemination: Gaps, Requirements & Plan

- Surge in EO data volumes from upcoming very high-resolution, hyperspectral & multi-mission satellites
- Growing demand from ministries, states, and industry for cloud-based ARD, AI/ML analytics, and user-centric dissemination

Current Gaps:

- Heavy dependence on foreign cloud & analytics platforms (AWS, Google Earth Engine, Copernicus DIAS, etc.)
- File-based delivery model; limited cloud-native ARD repositories
- Limited AI/ML integration and fragmented architectures
- Lack of on-board edge processing for rapid product generation

User Requirements:

- **Cloud-native, AI-enabled platforms** for ARD generation
- **Interoperable PaaS/DaaS delivery models** integrated with national digital frameworks
- **Centralised Data Warehouse** with APIs, Metadata Standards, and strong Cybersecurity
- **User-centric dissemination**: Automated thematic products, AI-enabled discovery, Immersive visualisation

Plan:

- Sovereign cloud-based repositories hosting ARD, accessible via APIs & microservices
- "Indian Earth Engine" platform for analysis, discovery, and personalisation of EO data
- On-board AI/Edge computing in future missions
- Establish next-gen processing hubs (HPC + Cloud-native architecture + AI/ML automation)

National Meet 2.0 (contd.)

Major Outcome

User Requirement	Proposed
Very High Resolution data for Urban, cadastral, infrastructure, Disaster Risk Reduction	Constellation of VHR satellites for improved repeat cycle
Early warning drought & pest infestation, crop discrimination	Constellation of high resolution thermal (50m) & hyperspectral (5m) imaging
High resolution, multiple (daily) fire (forest, agri.) observation	Fire monitoring constellation (50m), 6-16 times daily observation
Improved weather services, Lightning mapping	Next Generation Weather Satellite with 2X better resolution, Lightning Imager, hyperspectral IR Sounder (5km) with 50X channels
Fully indigenous data for Numerical Weather Prediction (NWP)	Dedicated NWP Mission
Atmospheric Chemistry Missions to monitor climate change	G20 Satellite and a dedicated satellite for GHG, Trace Gases & Aerosol monitoring

119 EO Missions Proposed till 2040, to meet the projected requirements

SATNAV – User Requirements

PNT Service Performance Improvement

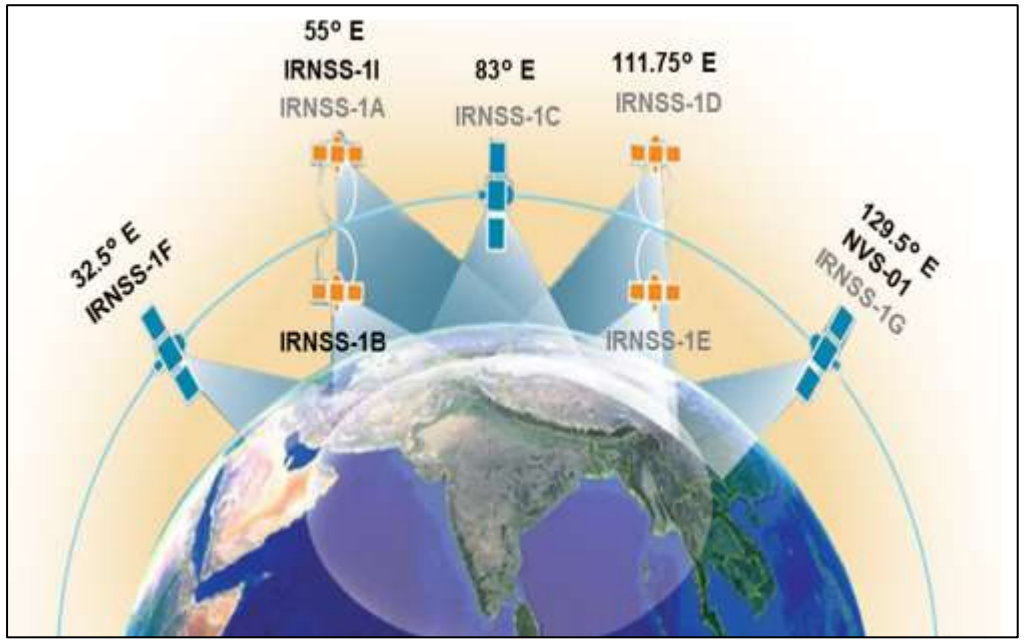
- Improvement of PNT service **2D accuracy to better than 5m**
- High-accuracy PNT service **(better than 10cm) via CORS network** and RTK based receiver solutions
- **Improved signal availability in difficult terrain** for positioning
- Multi-band (L1, L2, L5, and S) NavIC SPS resilient to Jamming/Spoofing

Current NavIC space segment needs to be strengthened to meet the performance requirements

Application Solution Development Support

- **NavIC enabled mobile apps** customized for user applications
- NavIC devices integrated with **vehicle/asset tracking** solutions
- NavIC devices with **SATCOM capability** for real-time information transfer
- **Capacity building** & training on NavIC utilization

Current Indian Industry is capable of meeting most of the application requirements



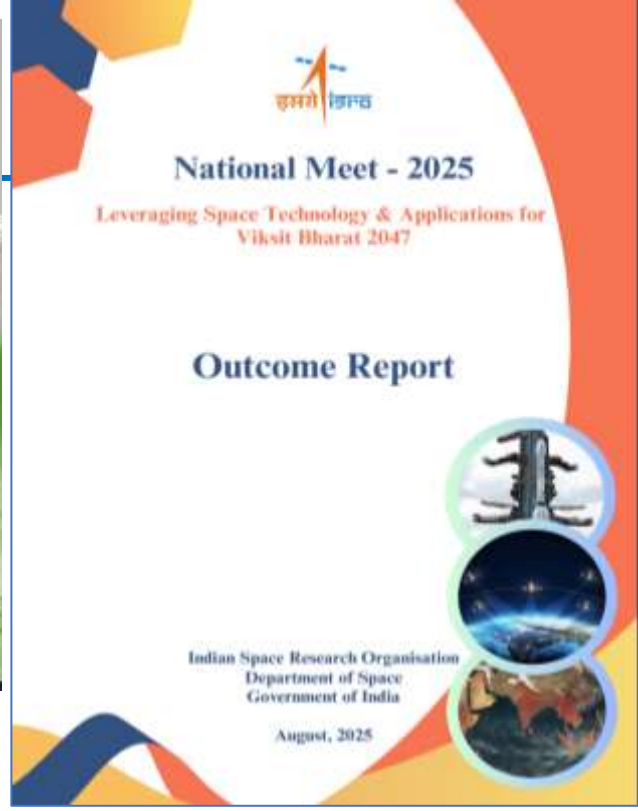
Current space segment of NavIC constellation

❖ Mission Roadmap 2040

- 103 Operational Missions for Land, Ocean & Atmospheric Applications & 16 Technology Demonstration Missions
- ~65% of Proposed Missions <500Kg class; Launch by SSLV/ Cluster Launch/ Piggyback
- Operational Missions' realization through Industry; Technology Demonstration Missions by ISRO
- Doubling ground stations, High Data Rate Link from LEO Satellites, Indian Earth Engine, On-board AI/ Edge Computing
- Expanded NavIC coverage, New Signals in L1, L2 bands, National CORS (SoI) with NavIC
- Advanced Communication Satellites, Thin Data (IoT) & Mobility Services, Low Latency; Broadband, D2D & Expanded Coverage from LEO-MEO

Summary

- High demand for EO, SATNAV & SATCOM data & services in country with significant potential for Space Economy development
- Outcome Report having details of future satellites missions and ground segment profile
- Realization strategy for achieving the proposed mission plan of 119 EO & SATCOM/ SATNAV satellites till 2040



National Infrastructure for Societal & Govern. Applications

- Moderate to Coarse Resolution (>5 m) Satellites
- NAVIC satellites

Ownership: Govt.
Funding: Ministries/ Depts.

Public-Private Partnership PPP) for Commercially viable Infrastructure

- High to Very High-Resolution (<5m) Satellites
- Communication Sat

Ownership: Private (NGE)
Funding: PPP

Infrastructure for Technology Demonstration

- Technology development & demonstration by ISRO

Ownership : Govt.
Funding : DoS

Thank You