

# The Role of Communication & Meteorological Satellites in Disaster Management Support

- Experience of ISRO

Presentation By  
**Indian Delegation**

**43<sup>rd</sup> Session of S&T Session of UN COPUOS**

**23<sup>rd</sup> Feb. 2006 , Vienna**

# DISASTERS IN INDIA - VULNERABILITY

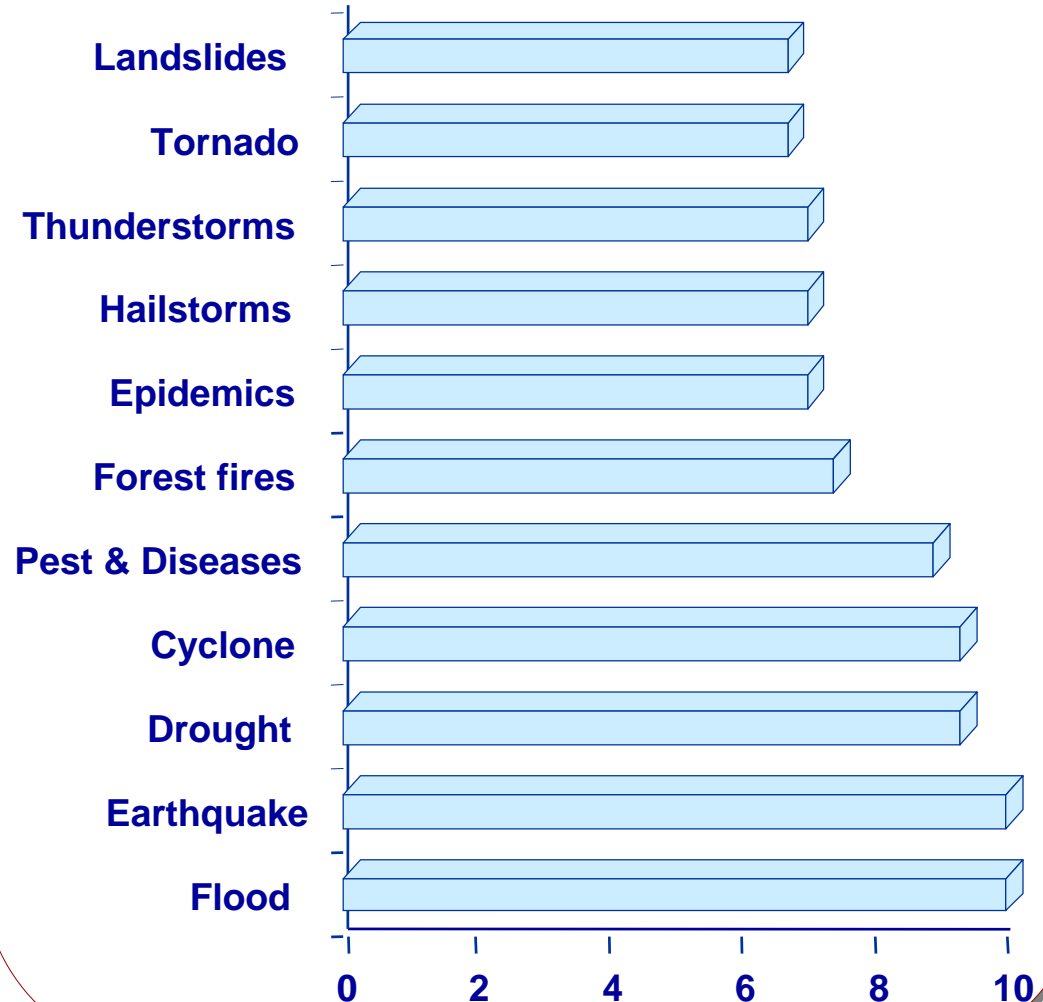


## Key Vulnerability:

- 5700 Km Long Coastline - Cyclone-prone
- 40 Mha - Flood-prone
- 68% of Net Sown Area (116 Districts) - Drought-prone
- 55% Total Area - Seismic Zones III - V
- Sub-Himalayan/ Western Ghats - Landslide-prone

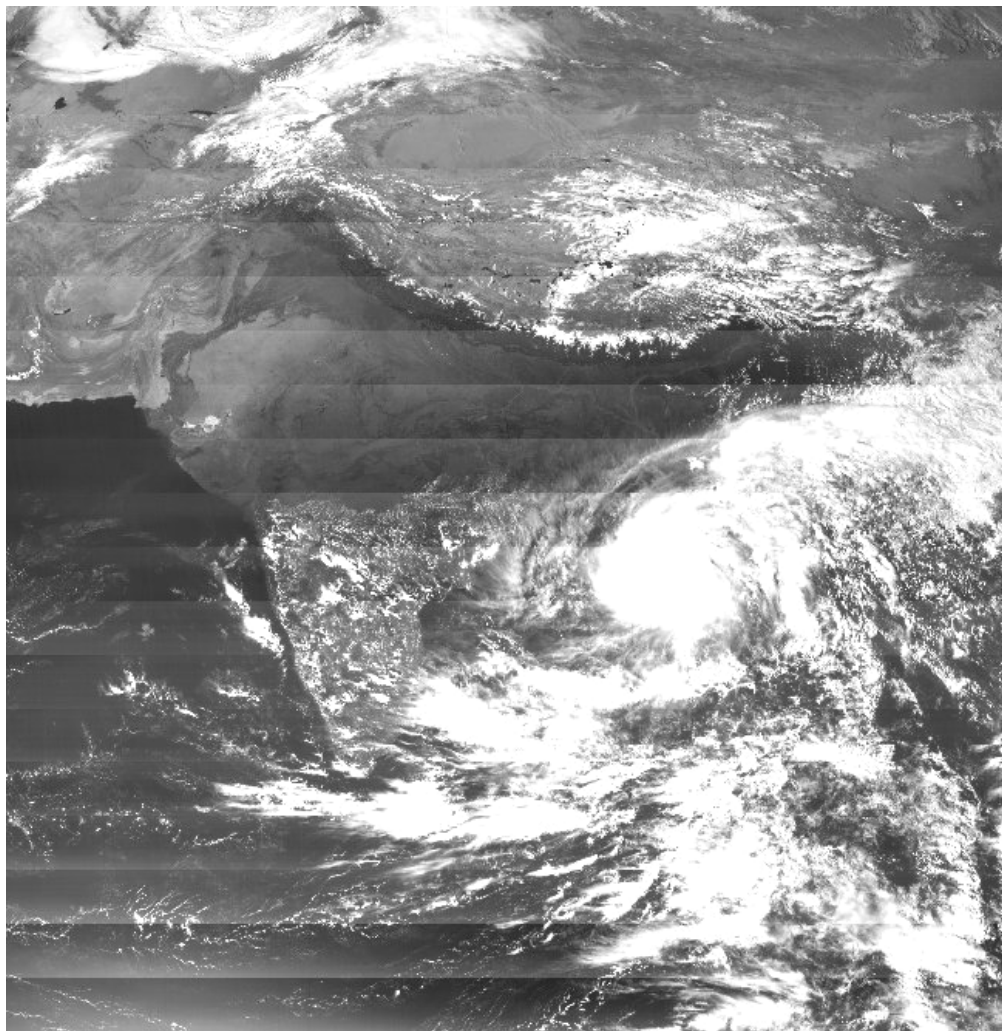
## Severity Index (Last 50 yrs Data)

Analysis based on Extent affected (Population, Area);  
Loss to Economy, Lives; Frequency of incidence





# Super-cyclone in Orissa during 28-30 Oct 1999



**Meteorological imagery from  
INSAT-2E**

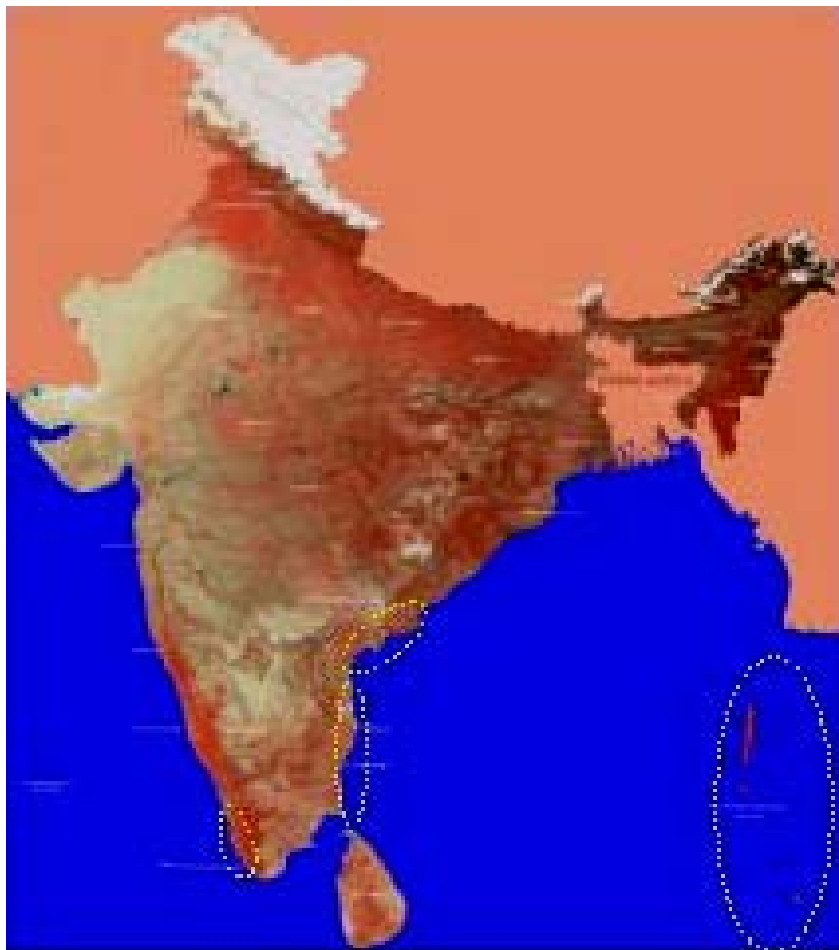




# Damage due to Earthquake in Bhuj – 26 Jan 2001

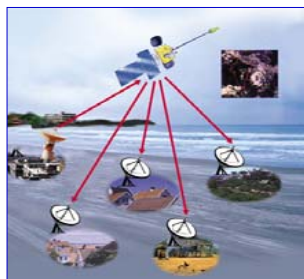
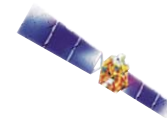
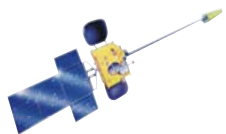


# Areas affected by Tsunami of 2004 in India

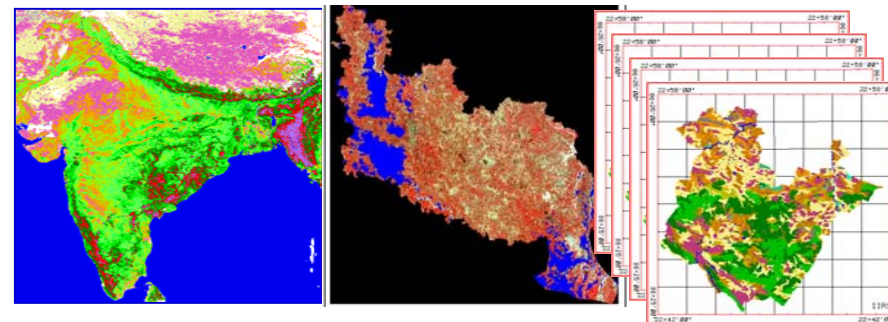


- **The worst affected area – An archipelago of 572 islands called Andaman & Nicobar Islands**
- **Three coastal districts of Tamil Nadu State in South India.**
- **The coastal areas of State of Pondicherry.**
- **One district of Kerala State in South India.**
- **Two districts in Andhra Pradesh.**

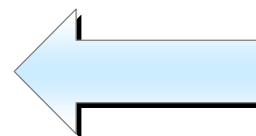
# SPACE IN DISASTER MANAGEMENT



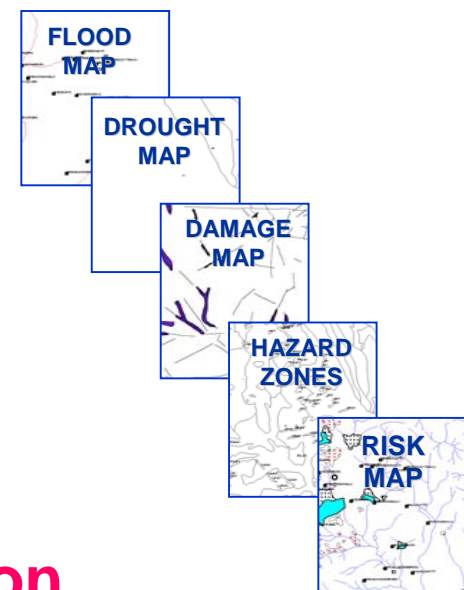
Observation for Information



Information for Decision

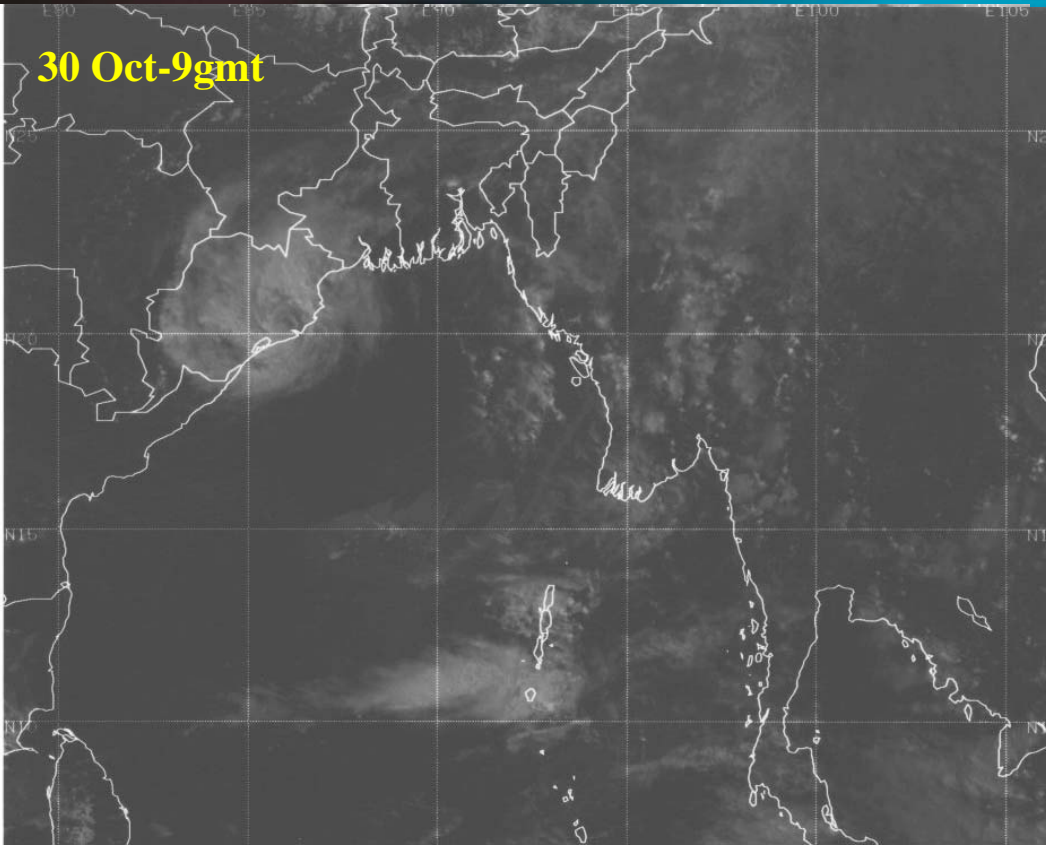


Decision for Action





**30 Oct-9gmt**



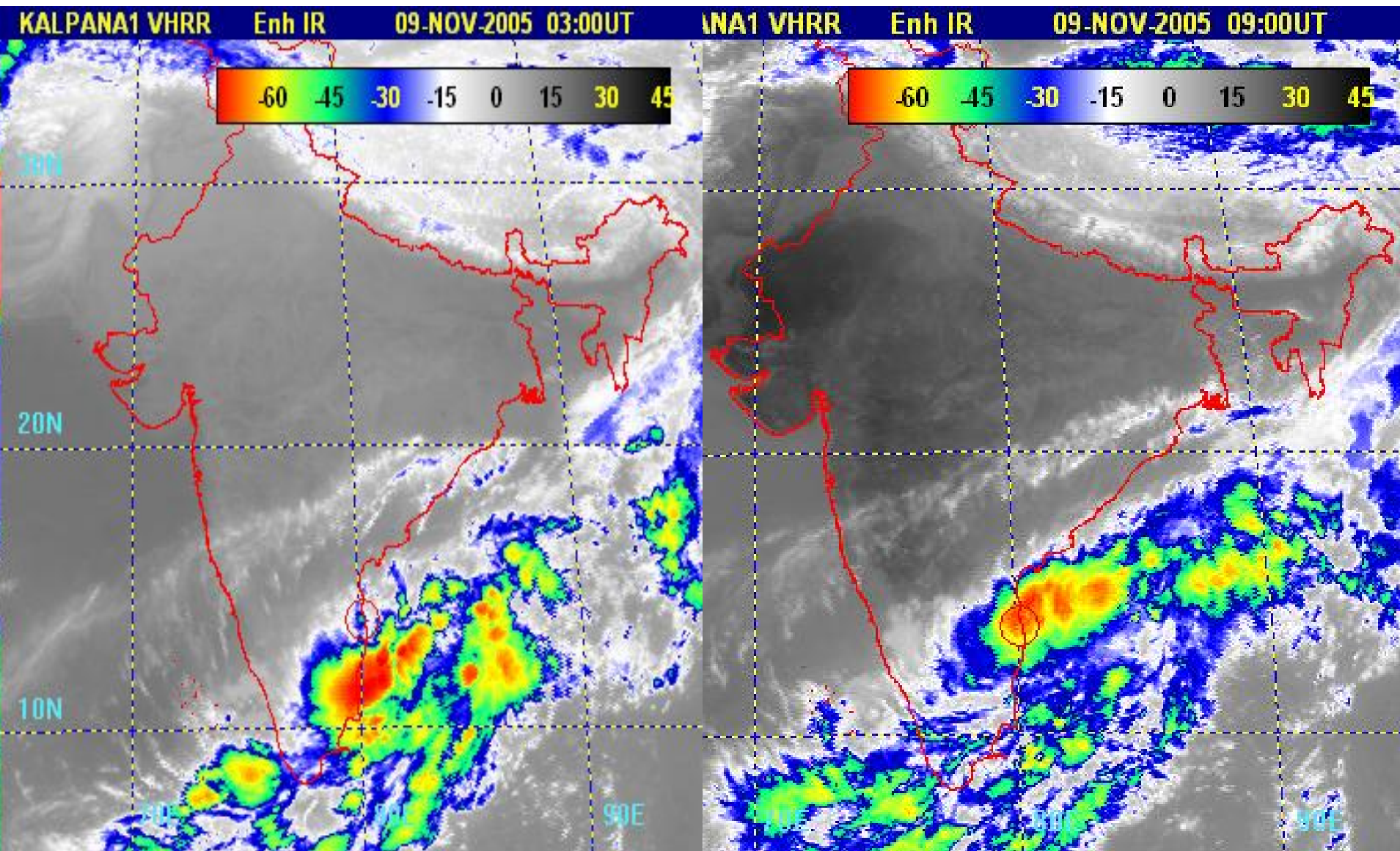
# **SUPER CYCLONE OVER ORISSA COAST**

**INSAT IMAGES  
SHOWING THE  
CYCLONE  
MOVEMENT**

- Ø CYCLONE FORECASTS BASED ON INSAT VHRR IMAGES**
- Ø USE OF MESOSCALE MODELS FOR IMPROVING TRACK FORECAST**

# INSAT Pictures of Nov. 9, 2005

## 55 mm Rain at SHAR during 1000-1430 IST

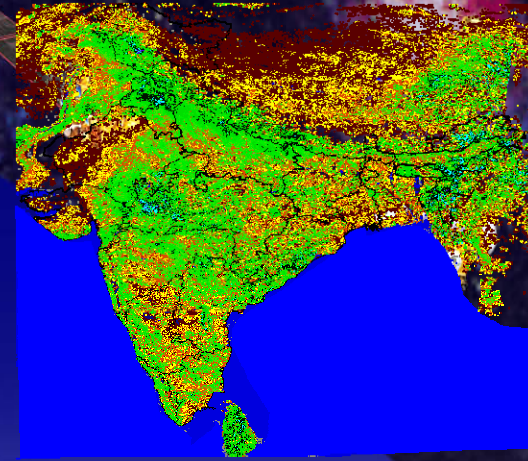




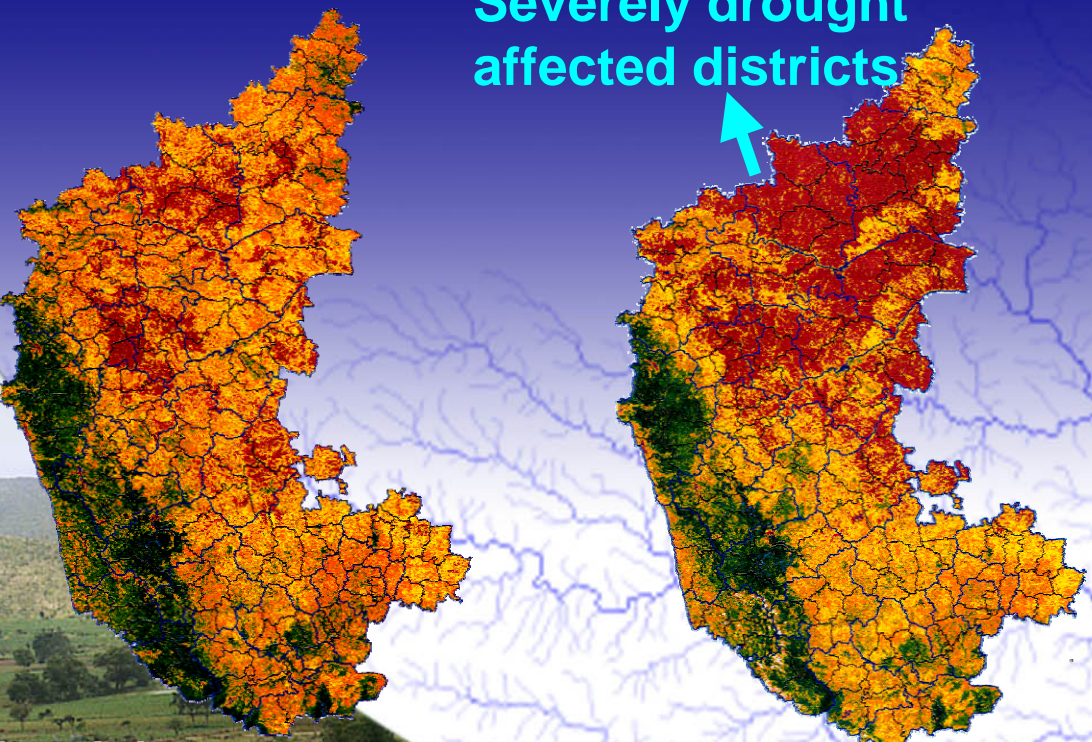
# DROUGHT MONITORING

## KARNATAKA STATE

IRS WiFS based NDVI

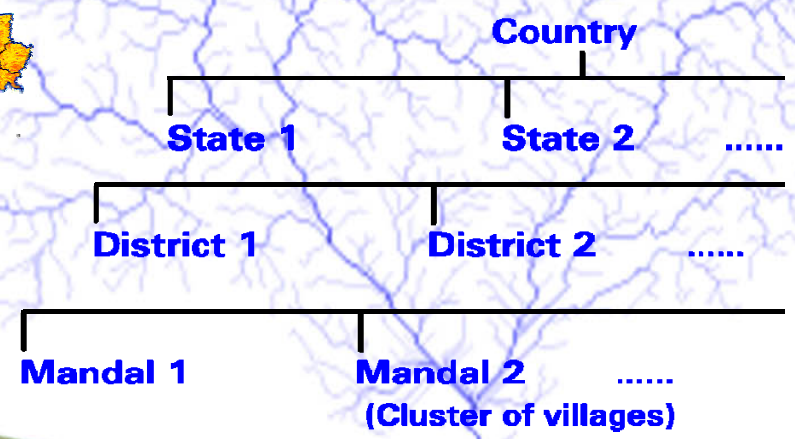
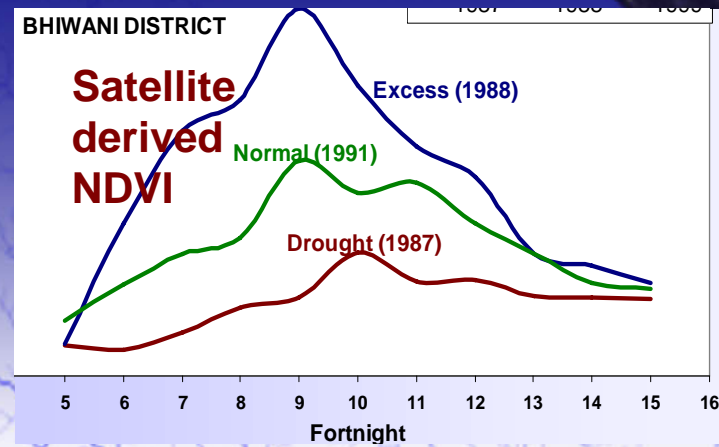


Severely drought affected districts



May-July 2000

May-July 2001



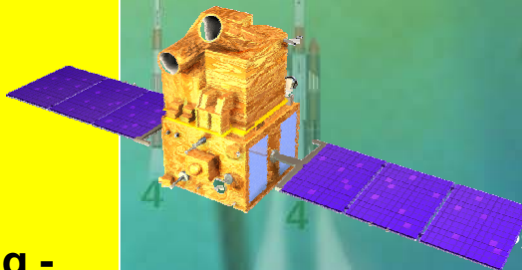
# Four Decades of Indian Space Programme

Applications driven programme  
Self reliance in building & launching satellites

LAUNCH VEHICLE  
SATELLITE  
APPLICATIONS

- 2.5 m resolution, 30 Km Swath
- Stereo mission; +26° / -5° forward/ Aft view
- Revisit : 5 days
- Along Track Stereo viewing - first of its kind in the world

## CARTOSAT-1



TODAY, 2004



ONE AMONG THE SIX NATIONS



42 + 4 Missions





# CARTOSAT-1 Image

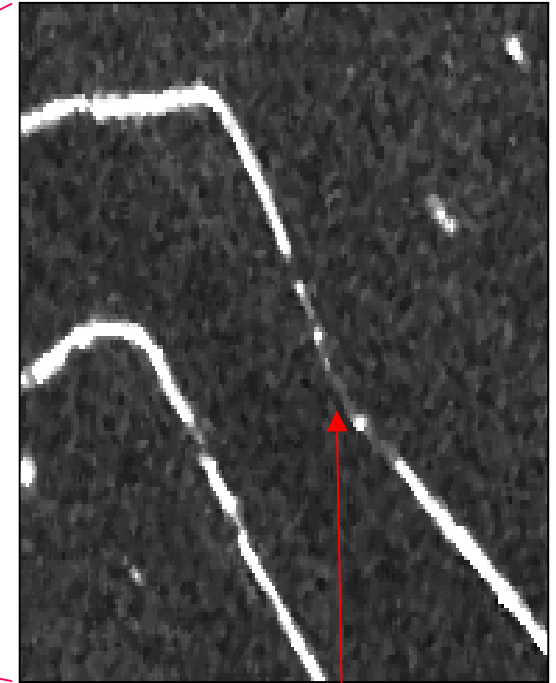
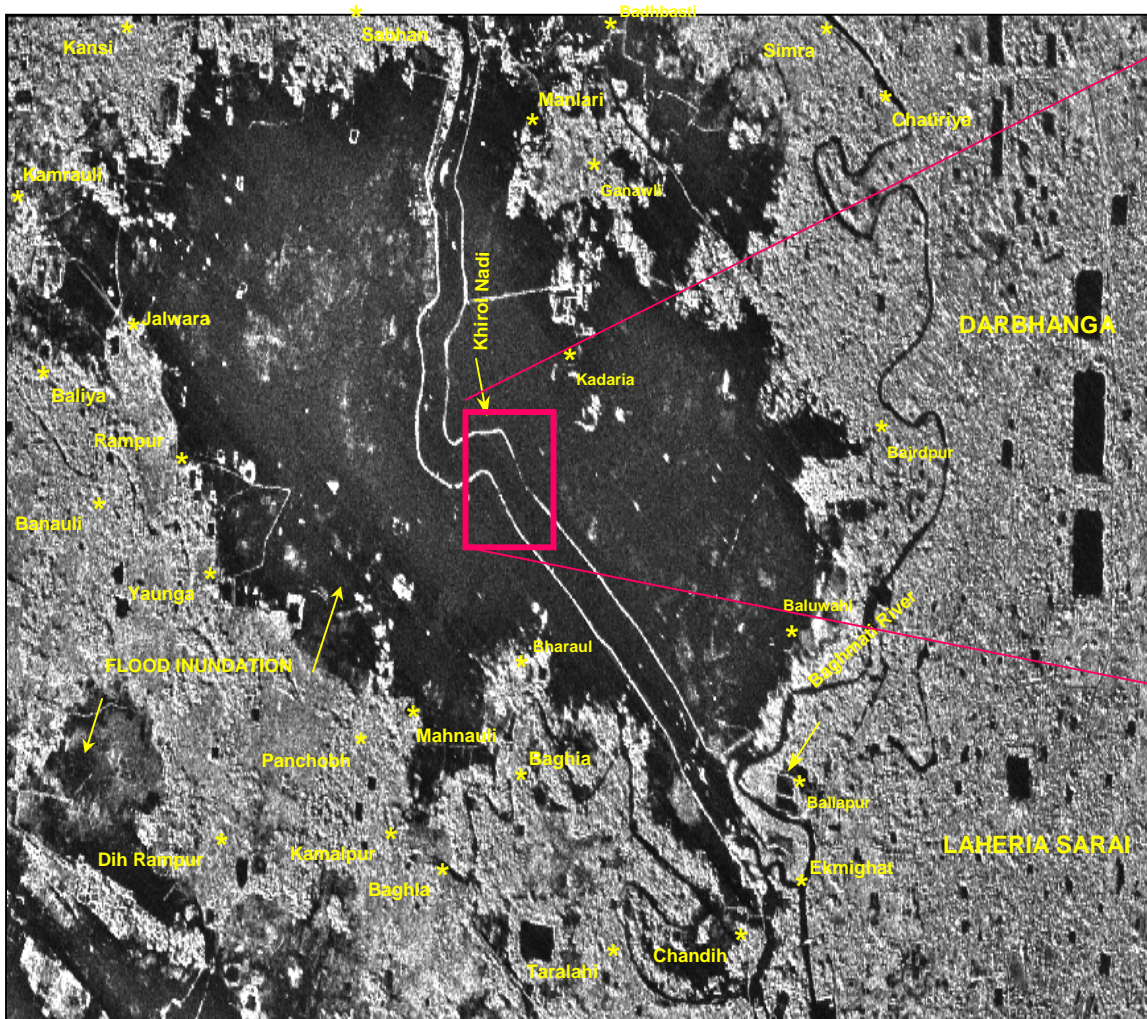




# Airborne SAR data over Bihar State

## Darbhanga Area

During Floods – Airborne SAR data of 24-Jul-2004



Affected Embankment



# Programmatic Response to Tsunami

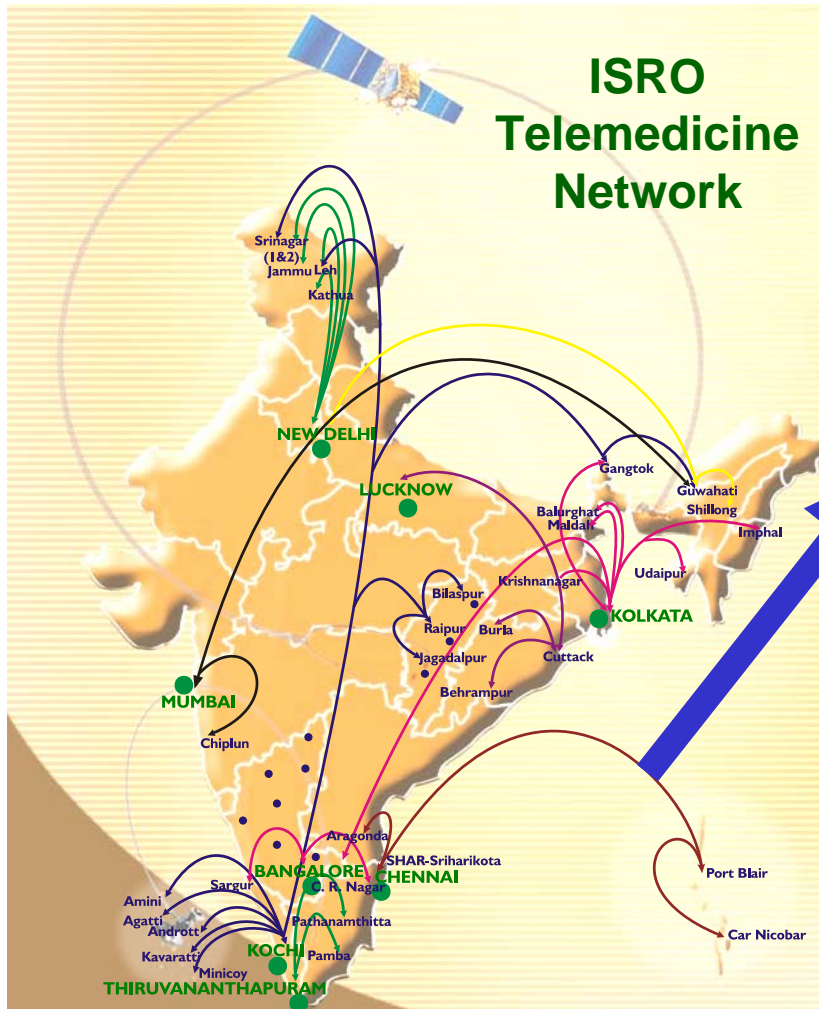
Multi-Tasking for Disaster Reduction



SRG

Tsunami affected A & N Islands

Used for locating the missing children..



Multi-tasking

Satcom/VSATS:  
Deployable terminals, Mobile WLL VSATS

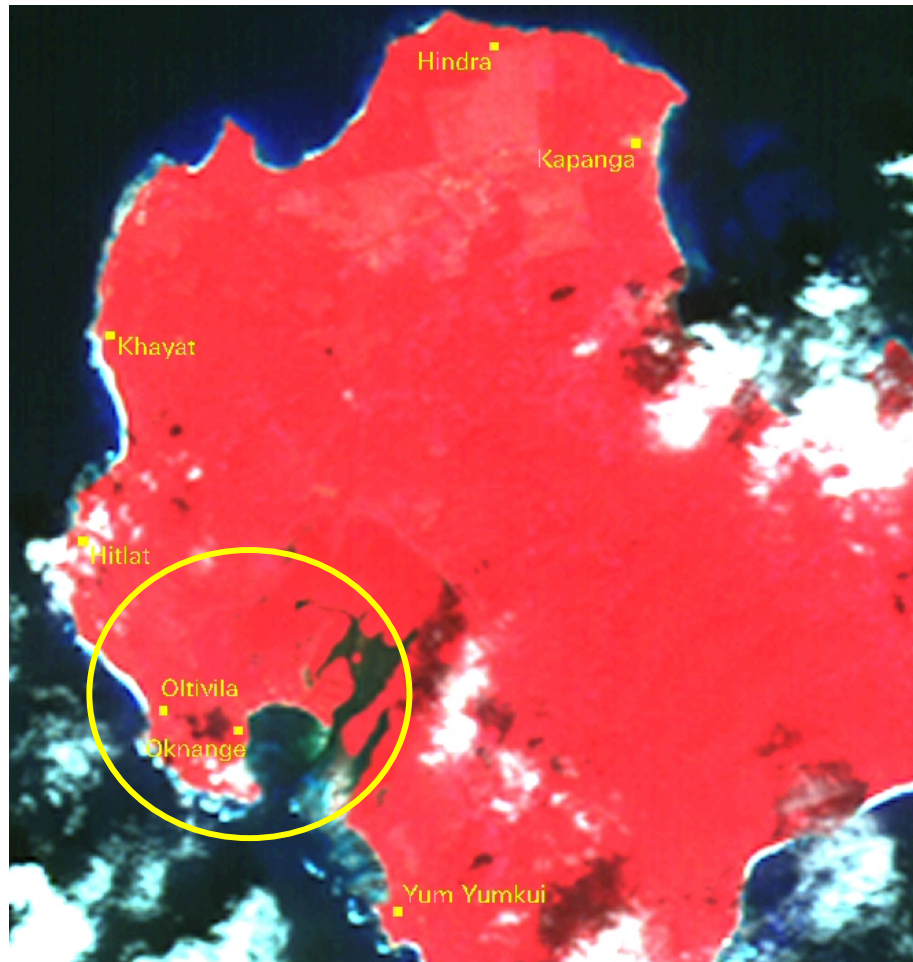
Space + Other IT-enabled Services

- Tele-education: Broadband System
- Tele-Medicine: Broadband System
- Disaster Management Support: Emergency Communication, Vulnerability, Risk & Early Warning
- Spatial Info. support, Weather info., Farmers Advisory services, ..
- Access to: Telephone, Fax, Internet

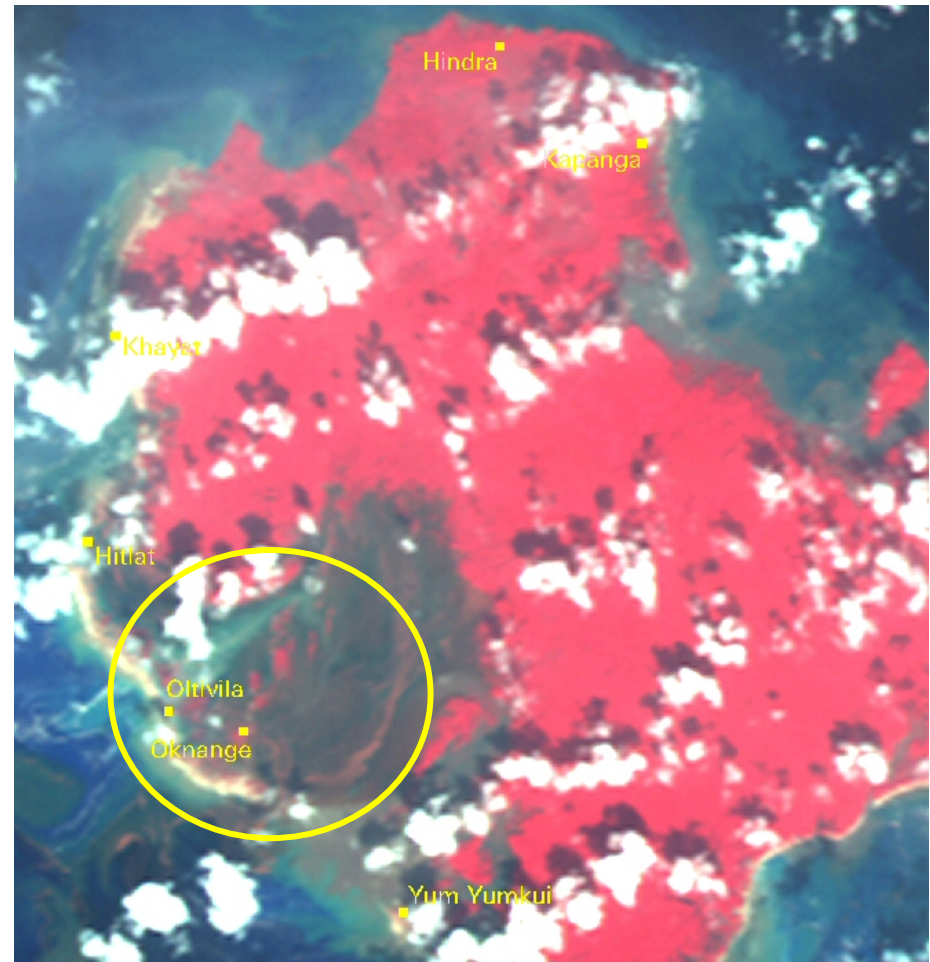


# Katchal Island *before & after Tsunami*

IRS-P6 AWiFS Image of 21-Dec-04



IRS-P6 AWiFS Image of 26-Dec-04

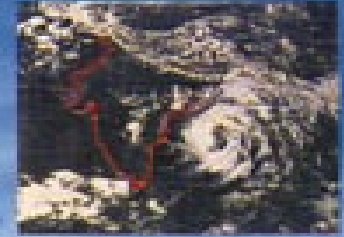




# Locale-specific Early Warning System Cyclone Warning Dissemination System (CWDS)

## Inputs

INSAT VHRR Imaging/  
Cyclone Tracking  
Cyclone Warning



Cyclone  
Formation

Cyclone Warning  
Centre

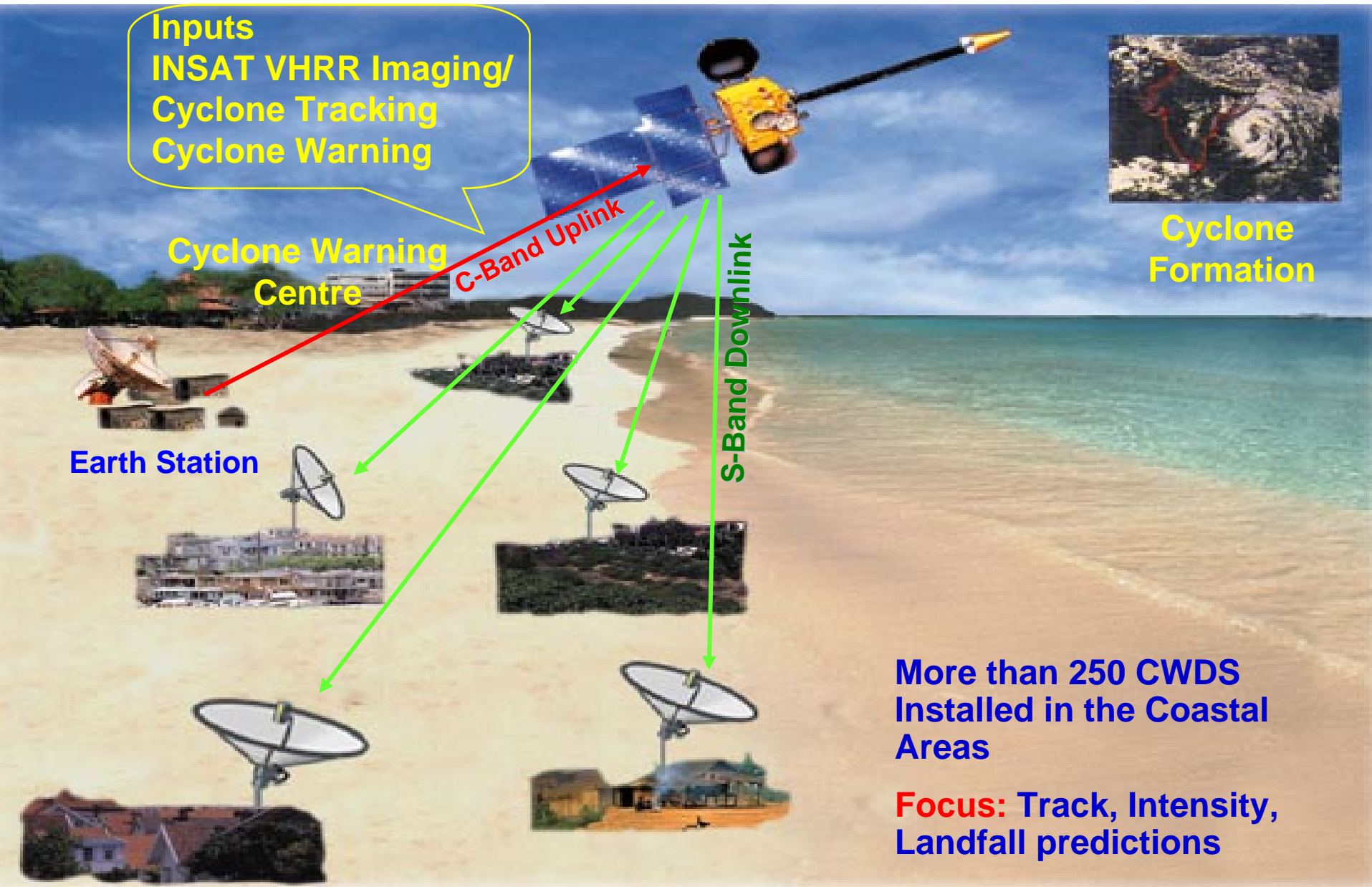
C-Band Uplink

S-Band Downlink

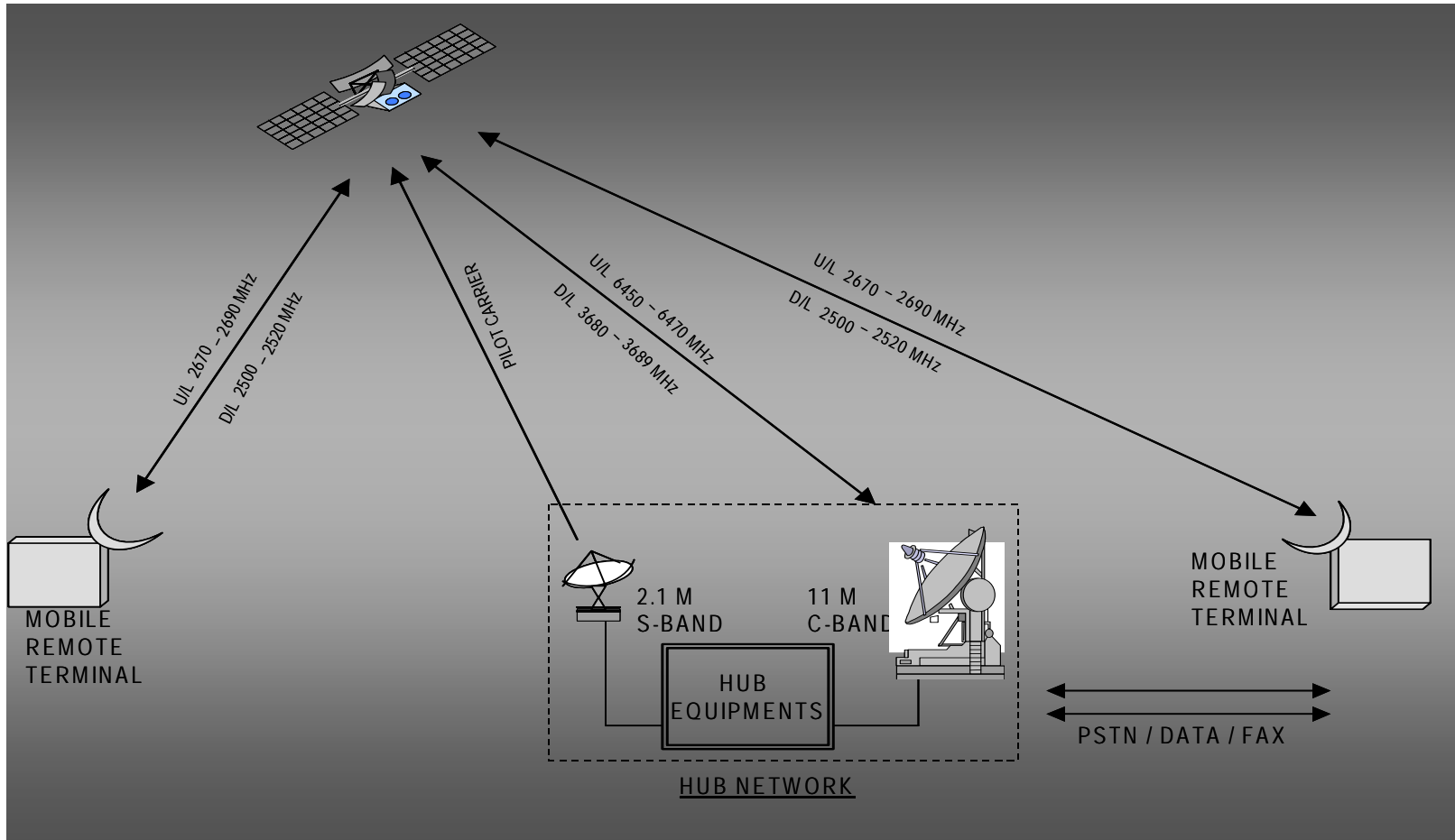
Earth Station

More than 250 CWDS  
Installed in the Coastal  
Areas

**Focus:** Track, Intensity,  
Landfall predictions



# INSAT MSS Ground Terminals



- **Type-D terminal**

- Briefcase terminal with solar panel on the cover, and battery back-up.
- Two-way voice link capability.
- Uplink and downlink work in S-band.
- Development & evaluation completed, units under field trial.
- Serviced by a central Hub with DAMA NMS.

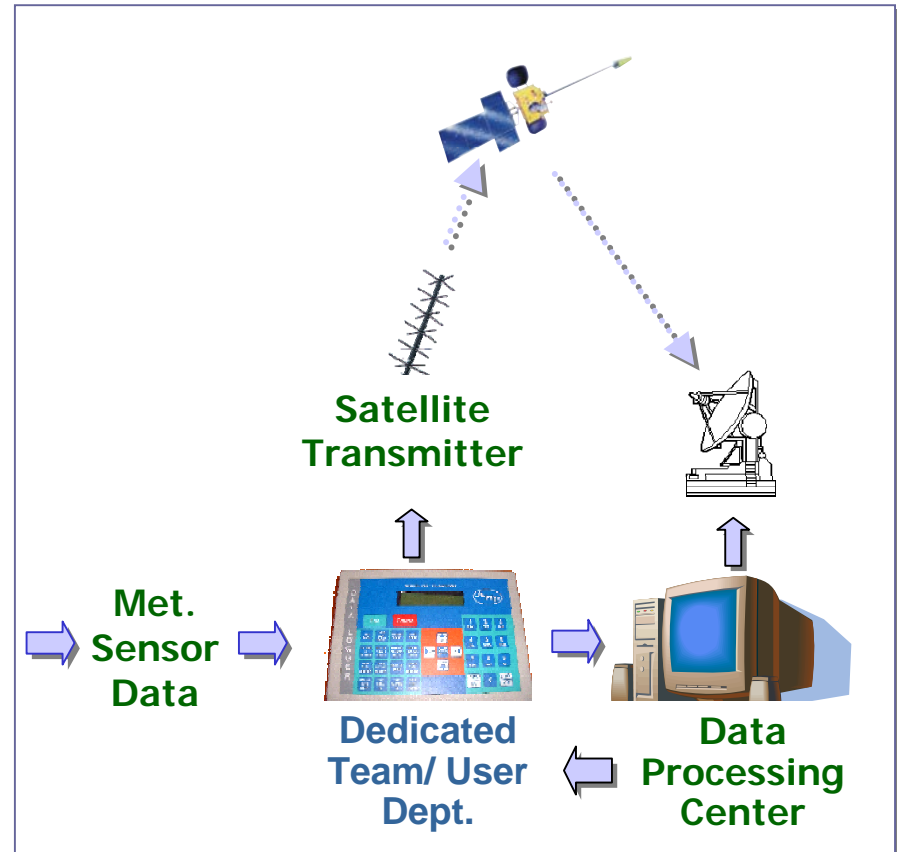


# Strengthening of Observation Network

## Automatic Weather Station (AWS)

Developed thro' Industry Partnership

- Large No. of AWS - replacing human observers world over
- Facilitate frequent/ continuous observations
- Data transmission via satellite to receiving station; and directly as input to numerical models



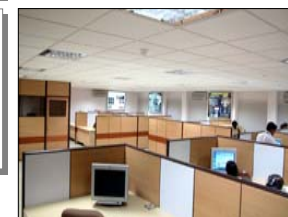
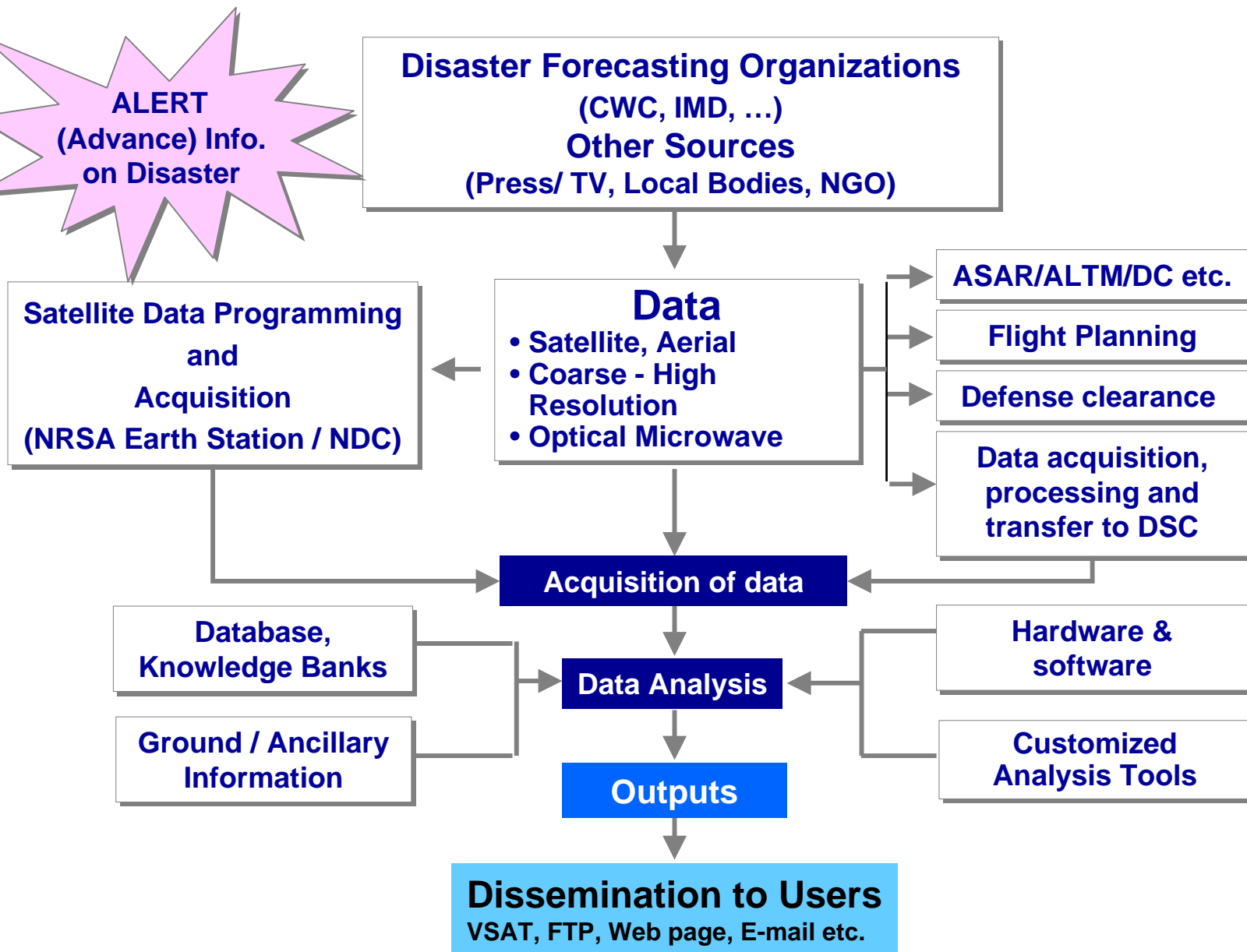
# Strengthening of Observation Network Doppler Weather Radar

IMD - ISRO Doppler Weather Radar at Sriharikota



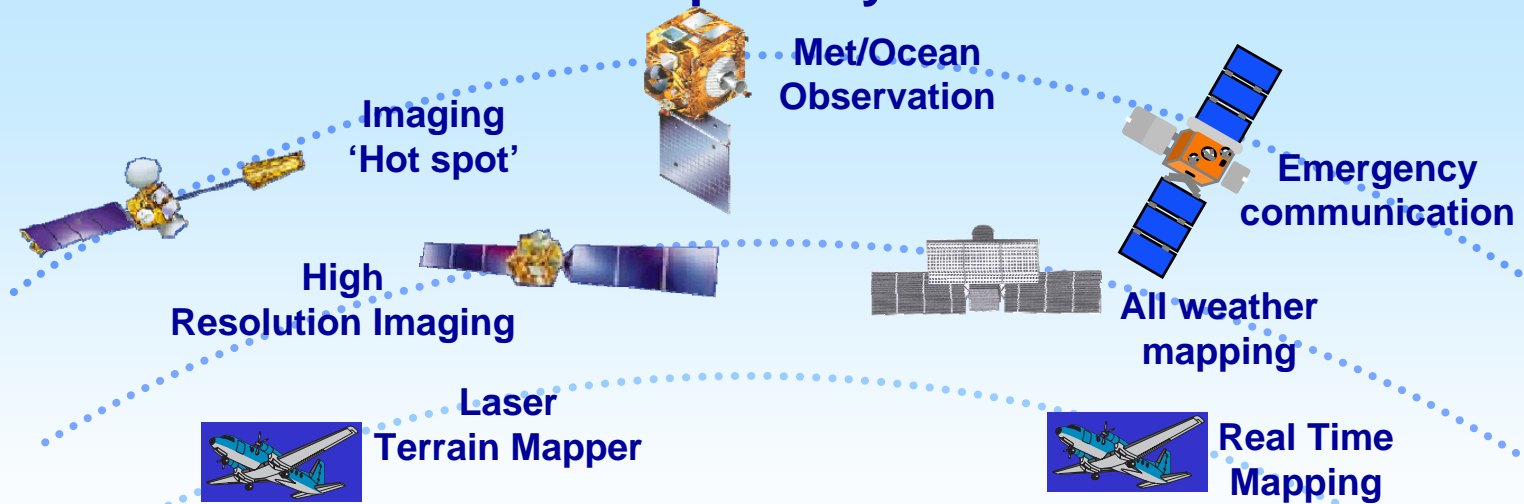
- **Continuous monitoring of severe weather events**
- **Key parameters for atmospheric studies**
- **Urgent need to expand the Radar network to cover entire coastal areas, NE region, major cities, ...**



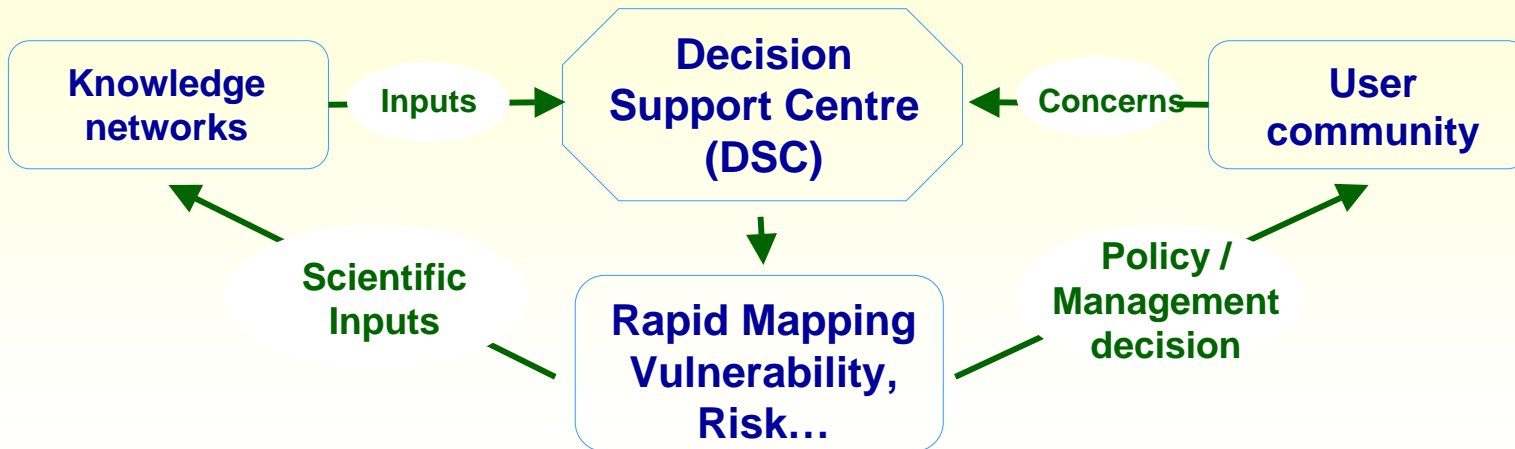


# DMS - Infrastructure

## Aerospace Systems



## Institutional Interfaces



## Communications Backbone

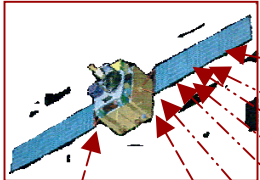
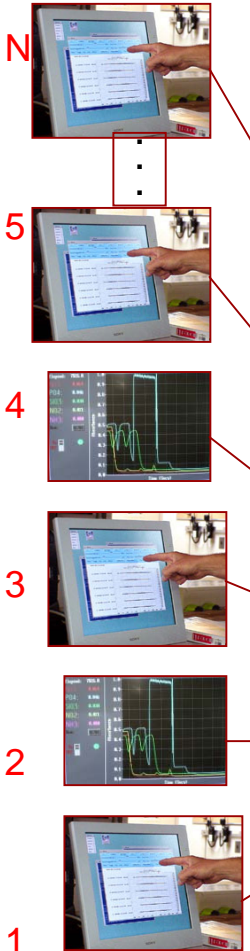
Terrestrial & Satellite based (Mobile Terminals, VSAT, WLL VSATs, CWDS, S&R, ..)



# Virtual Private Network under DMS



Knowledge Institutions



State Emergency Centres



Decision Support Centre

VPN



Nodal Agency

# Conclusion

The Disaster Management Support programme of ISRO is the outcome of the extensive efforts put towards optimally utilizing the capabilities of the space systems to provide critical inputs to the disaster management efforts.



Prime Minister of India talking to Tsunami disaster affected people, with satellite communication antenna in the background.