EO Applications in India for governance & citizens

Vinay K Dadhwal
ISRO/ India

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Background

- 1.21 billion population, 68.8 % rural in 600,000+ villages, 22 official languages & 240,000+ local bodies govern in multi-tiered democracy
  - I Census, 2011']

- 3rd largest internet users (150 million), 900 million mobile subscribers

- Challenges remain with respect to natural resources, exposure to disasters, economic growth, infrastructure, inequity, access to government services

- Number of policy, ICT initiatives to address challenges & achieve MDG goals

- UNIQUE APPLICATION-CENTRIC SPACE PROGRAMME

National e-governance initiative

- **NeGP (2006) ;** 27 MMP (Mission Mode Projects)
- ***"Make all Government services accessible to the common man in his locality through Common Service delivery outlets and ensure efficiency, transparency & reliability of such services at affordable costs to realise the basic needs of the common man."***
- **Central Missions : 9 :** *Taxes, Banking, Insurance, Pension, Passport, Immigration, …*
- **State Missions : 11 :** *Agriculture,Land,Local Bodies,Police,Taxes,Transport, Employment*
- **Integrated Missions : 7 :** *Courts, Procurement, Biz, INDIA PORTAL, COMMON SERVICE CENTRE, …*

राष्ट्रीय इ-गवर्नेंस योजना
National e-Governance Plan

Public services closer home

Plan to establish 100,000 Common Service Centres

Challenge: ICT for Governance & Citizens to Geo-ICT

Applications of Indian Space Program

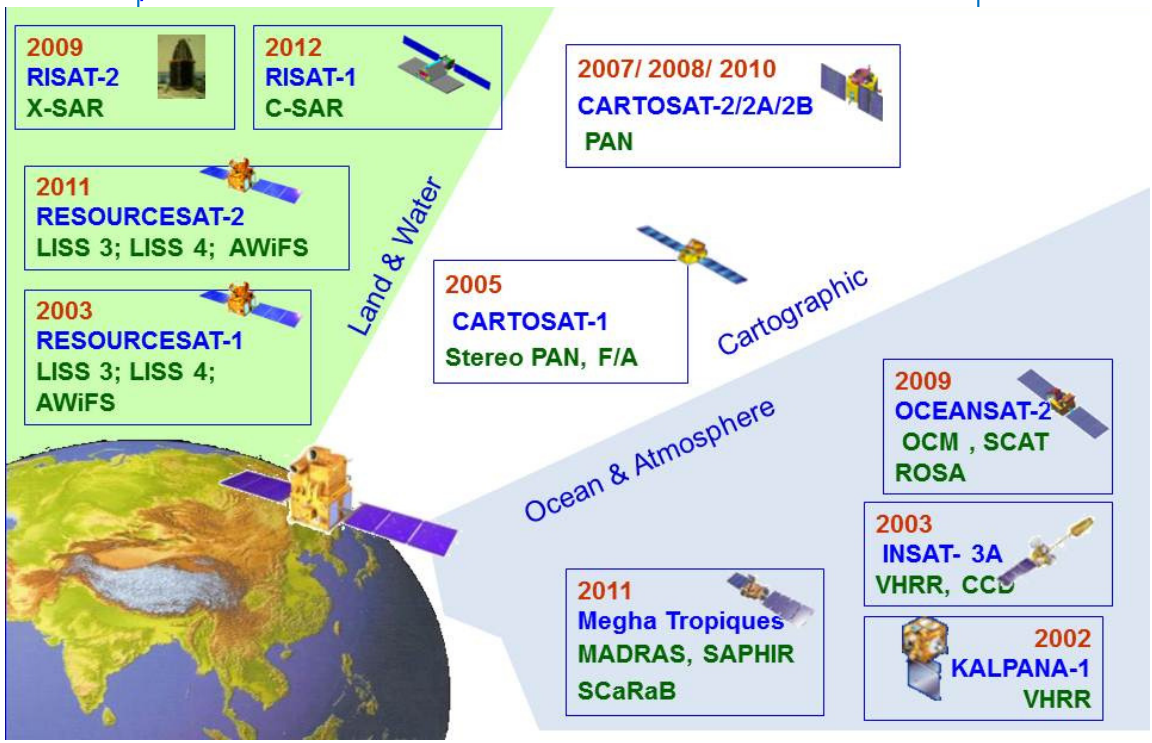
- **Communication satellites**

- INSAT & GSAT ca. 200 transponders in space
- Dedicated transponders for education, societal services,incl. (disaster-VPN)

- **Earth Observation Satellites**
- 25 years Continuous observation from IRS-1A(1988) and follow-on Resourcesat, Oceansat, Cartosat series
- Geostationary meteorological and orbiting science satellites

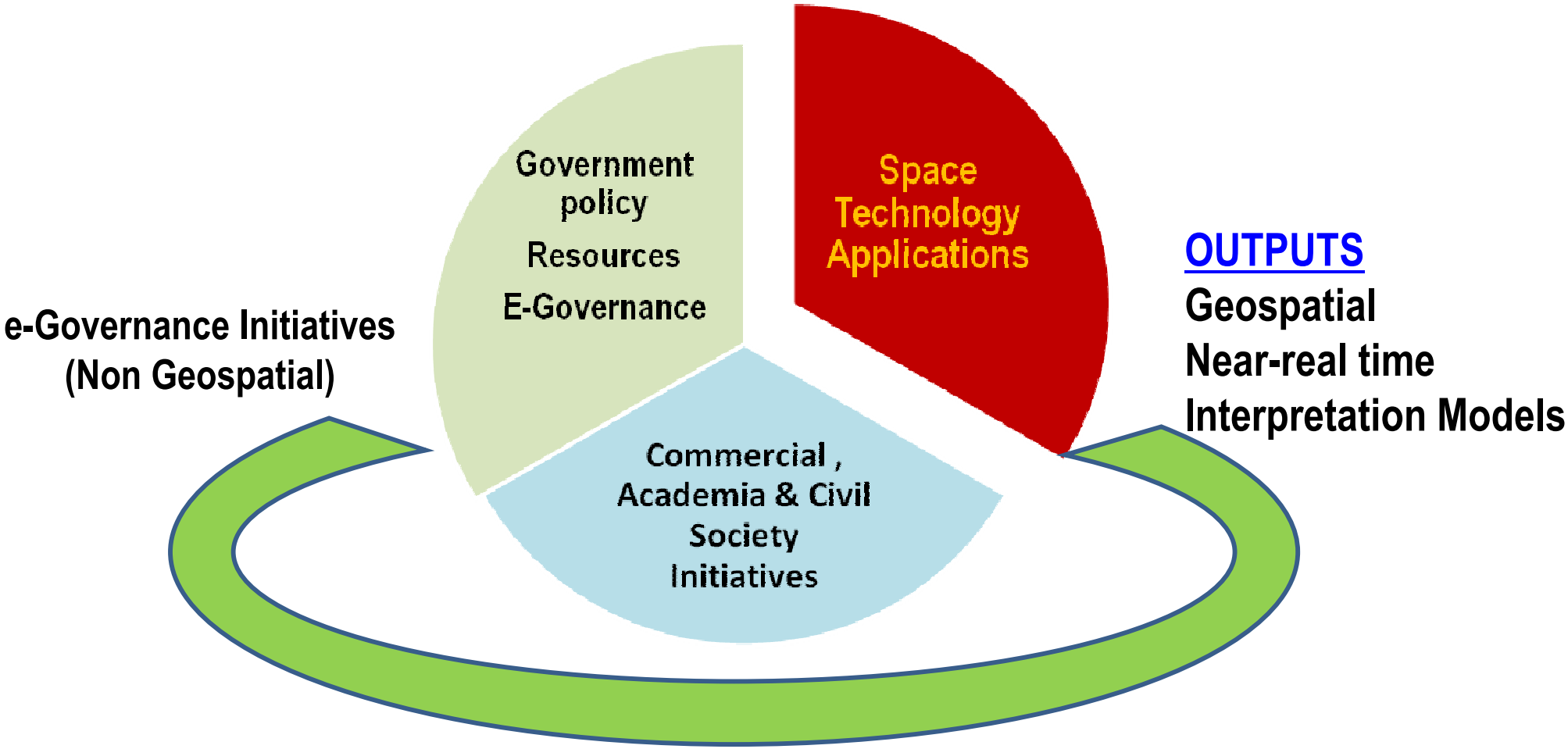
- **Positioning, navigation & timing services**

- GAGAN
  - (GPS-aided geo-augmentation navigation)
- IRNSS
  - (Indian Regional Navigation Satellite System)



SOLUTION

- Appropriate technology-based and sustainable solutions for governance as well as for citizens



Establish end-to-end n.r.t. EO data supply, interpretation/outputs, GIS basic framework, web-access with open source tools

: BHUVAN Web-GIS Portal

EO Applications & Governance

- **Good governance can be done with spatial planning (Geomatics)**
  [EO + GIS layers + non-spatial attributes + decision support tools]

- **Info needs : (i) reliable data, (ii) planning to reach high priority target areas, (iii) monitoring program implementation, …**

- **Challenges : Internalization (capacity to absorb space application); Unified working of internal MIS with geospatial data**

- **Recent examples : Land Resource (wasteland), Drinking Water, Urban Planning, Disaster Management, Environment Protection, Information support for Decentralized Planning (SiSDP)**

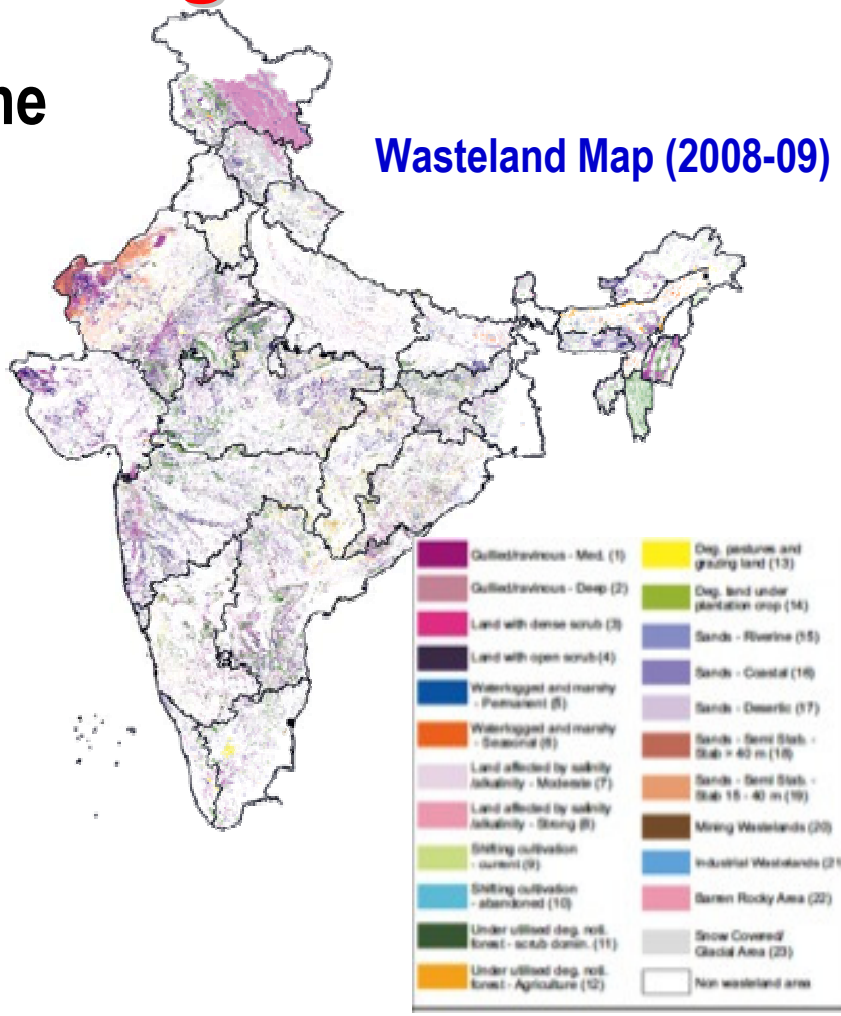
Wasteland Monitoring

- A targeted Rural Development Programme to bring more land under cultivation

- National Wasteland Inventory Project (1986 - 2000)
- National Wasteland Updation Mission (2003 - 2004)
- Monitoring of the wasteland areas (2005-06)
- Wasteland Change Analysis / 3 date LISS-III (2008-09)
- Maps at 1:50,000 scale / Wasteland classes : 28

- Maps accessible via BHUVAN

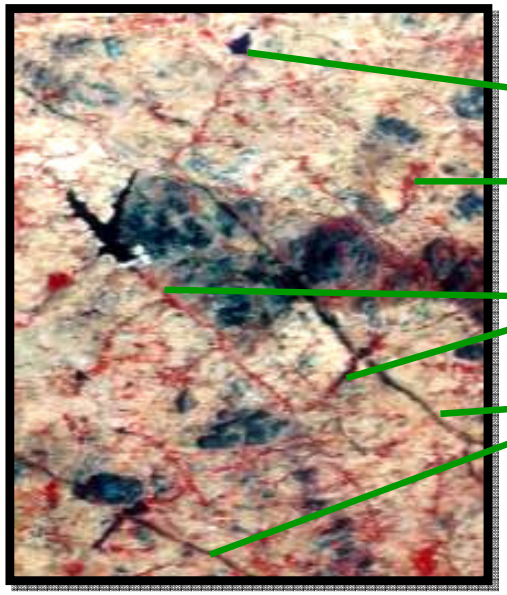
Wasteland Map (2008-09)

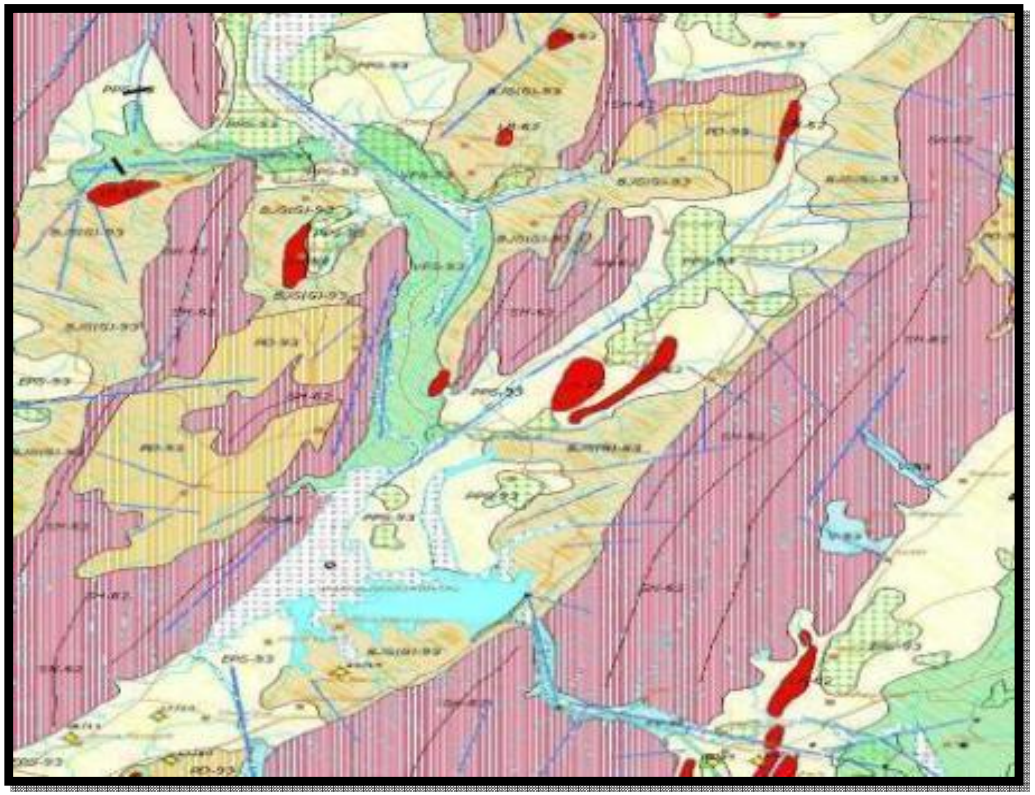


Area (Mha)	% of TGA	Year of Data
63. 85	20.17%	1986 -2000
55.27	17.45%	2003
47.22	14.91%	2005
46.73	14.76%	2009

Rajiv Gandhi National Drinking Water Mission

- Mapping of Rock types, Geomorphology, Structure
- Groundwater Exploration & Recharge sites
- Ground Water Prospects - Depth & Yield
- Identification of potable drinking water sources for problematic habitations





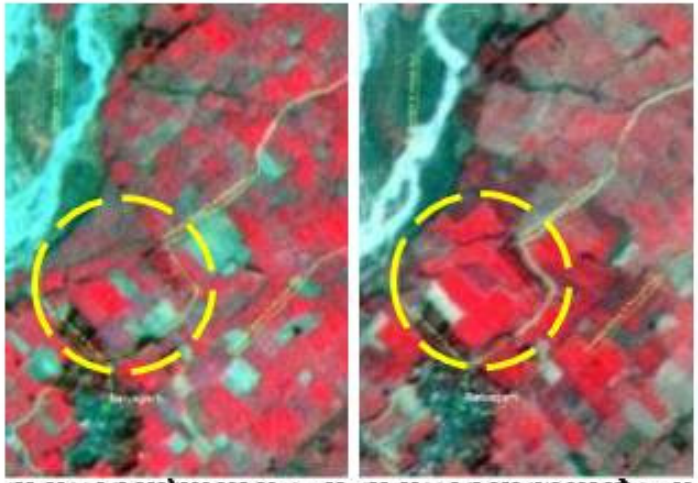
- > 296,000 Bore wells drilled using Ground Water Potential Maps (93% Success rate)
- > 9,000 Recharge structures constructed

NWDPRA Watershed Monitoring

- 45 micro-watersheds spread across 8 districts of UP
- Area of watersheds ~ 500 ha
- Change detection study using IRS-P6 LISS-4 temporal data
  - Baseline data preparation (2005-06)
  - Con-current Treatment Monitoring (2008-12)
- Development of MIS/ GIS

Monitoring Indicators

#	Indicators	Data source
1	Natural resources	Temporal LISS-4 & field observations
2	Ecological improvement	-do-
3	Technical indictors	Field, satellite & ancillary sources
4	Institutional building and community organization	Ancillary sources
5	Economic and social	Ancillary sources
6	Essential service	Ancillary sources



Field Observations

Check dam for in-situ moisture conservation

Bunds erected along field boundary

Rows of Eucalyptus trees

3-tier agricultural practices

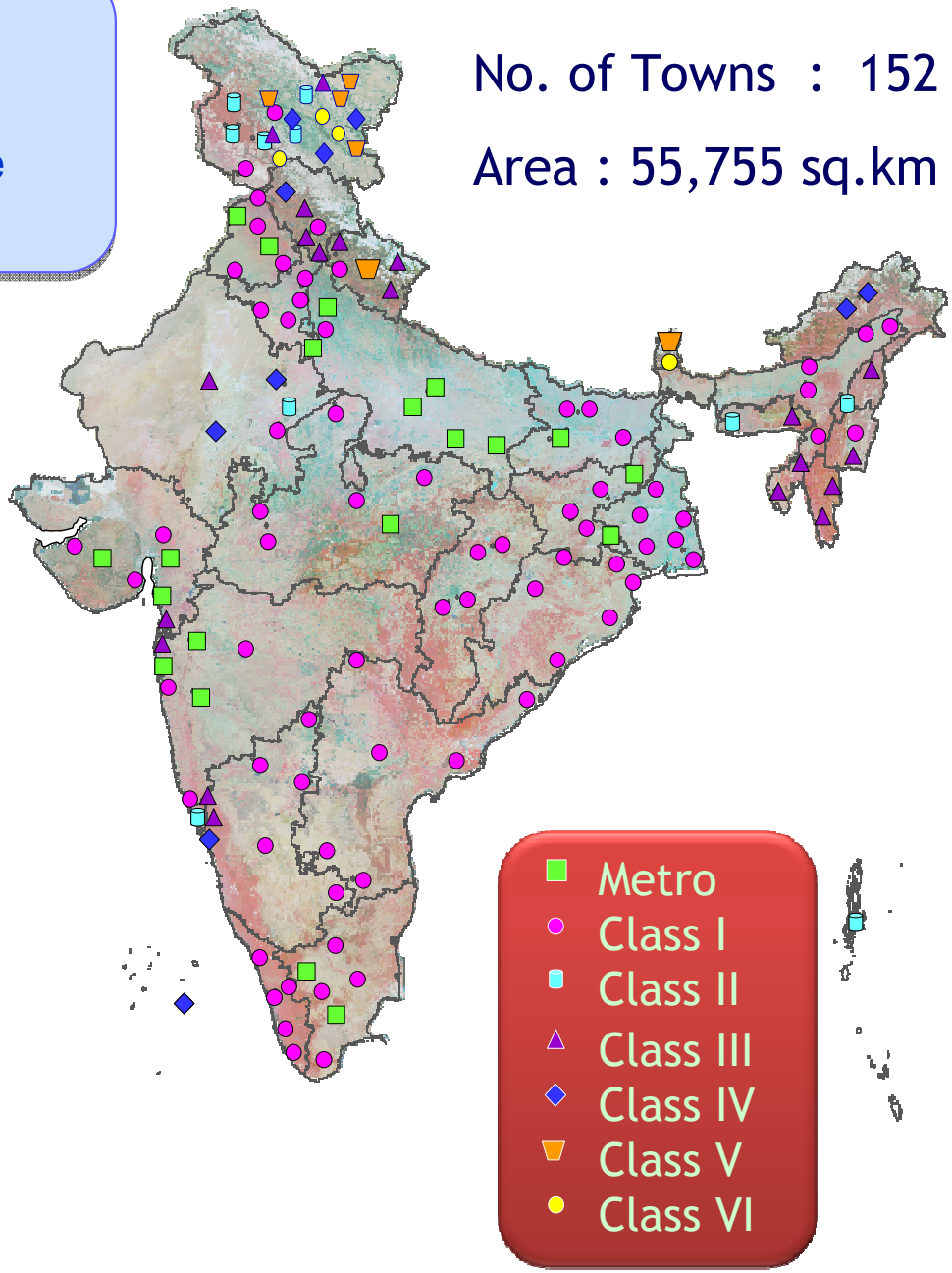
National Urban Information System (NUIS)

(Towards administering Towns/ Cities in a Scientific Manner)

- Multi scale (10K, 2K,1K) hierarchical Urban Geospatial database
- For supporting Urban Planning, Infrastructure development, e-governance, ..

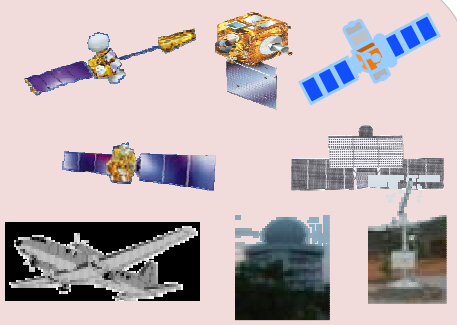
No. of Towns : 152

Area : 55,755 sq.km



Disaster Management Support (DMS) System

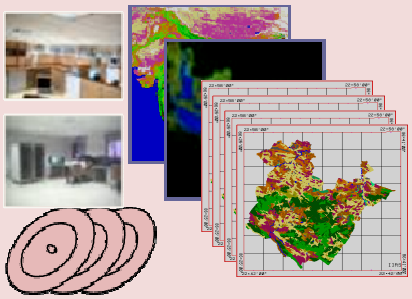
Space Technology in mitigating Disasters



Observational Systems
Satellite (GEO, LEO, All-weather), Aerial, Ground

Single-Window for Services Delivery
DMS-DSC

Multi-tier databases with query/ decision tools



Secured Commn
Fixed/ VPN, Mobile...

Disasters - Operationally addressed

Flood
Inundation monitoring
Damage assessment
Hazard zonation
Bank erosion studies

Cyclone
Inundation mapping
Damage assessment

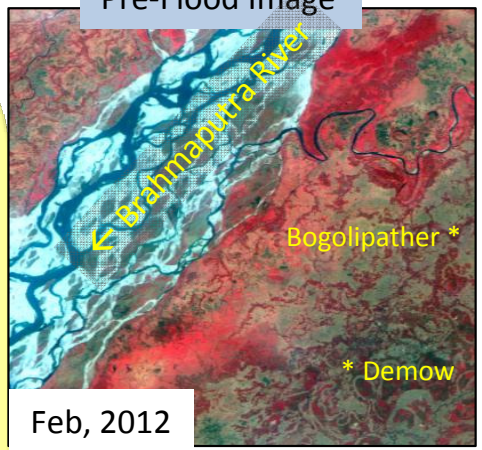
Drought
Monthly & End-of-Season
Agri Drought Assessment

Forest Fire
Active fire detection
Damage assessment

Earthquake
Damage Assessment

Landslide
Damage Assessment
Hazard zonation

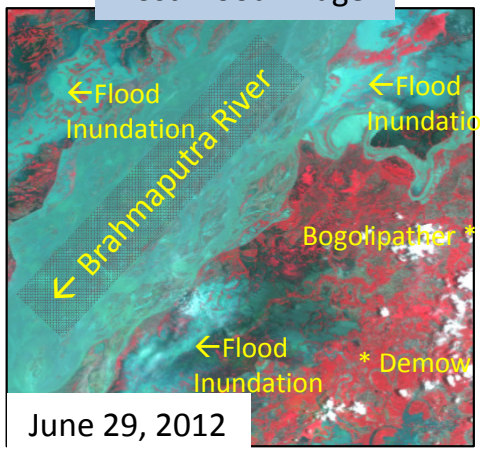
Pre-Flood Image



Feb, 2012

Monitoring of Flood

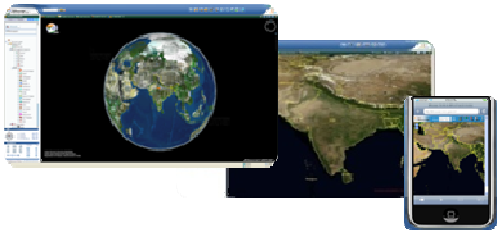
Post-Flood Image



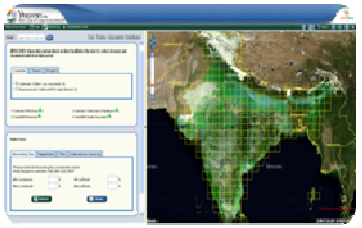
June 29, 2012

Bhuvan - Gateway to Indian EO Data Products & Services

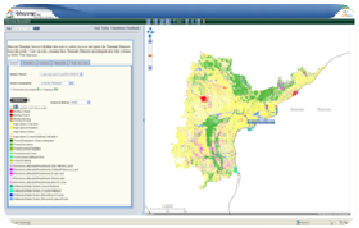
Visualisation



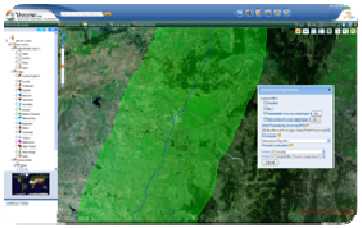
Data Archive



Thematic Services



Geo-Processing (Prototype)



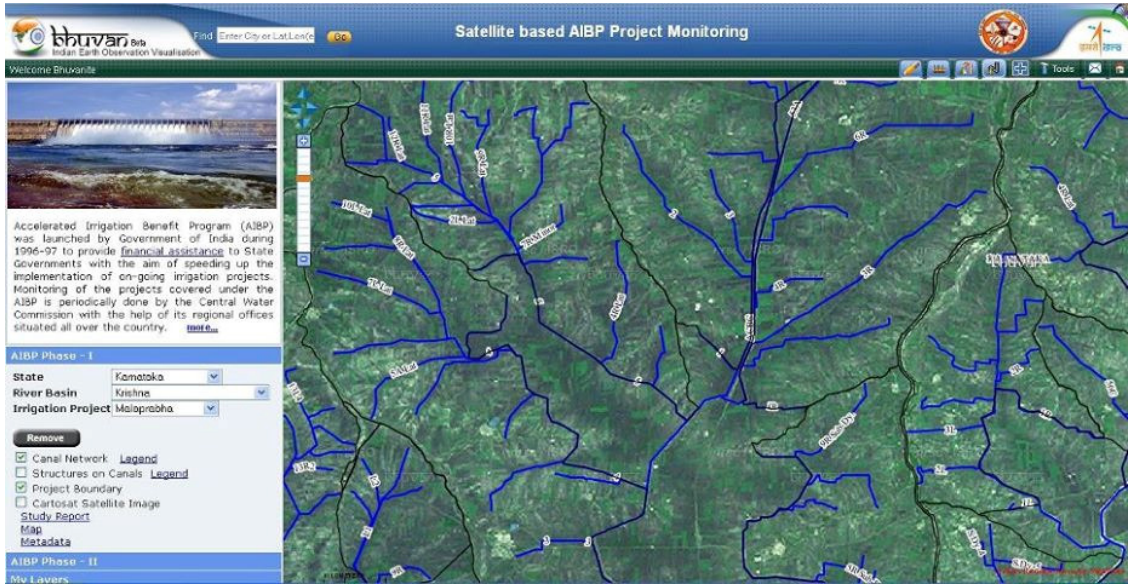
What is Unique in Bhuvan?

- ✓ Availability of Seamless High Resolution Data
- ✓ Multi-Sensor, Temporal, Resolution Data from IRS Satellites
- ✓ Rich Thematic Information
- ✓ Weather Data from ISRO AWS
- ✓ Ocean Services
- ✓ Collaboration / Sharing / Community Participation
- ✓ OGC Web Services

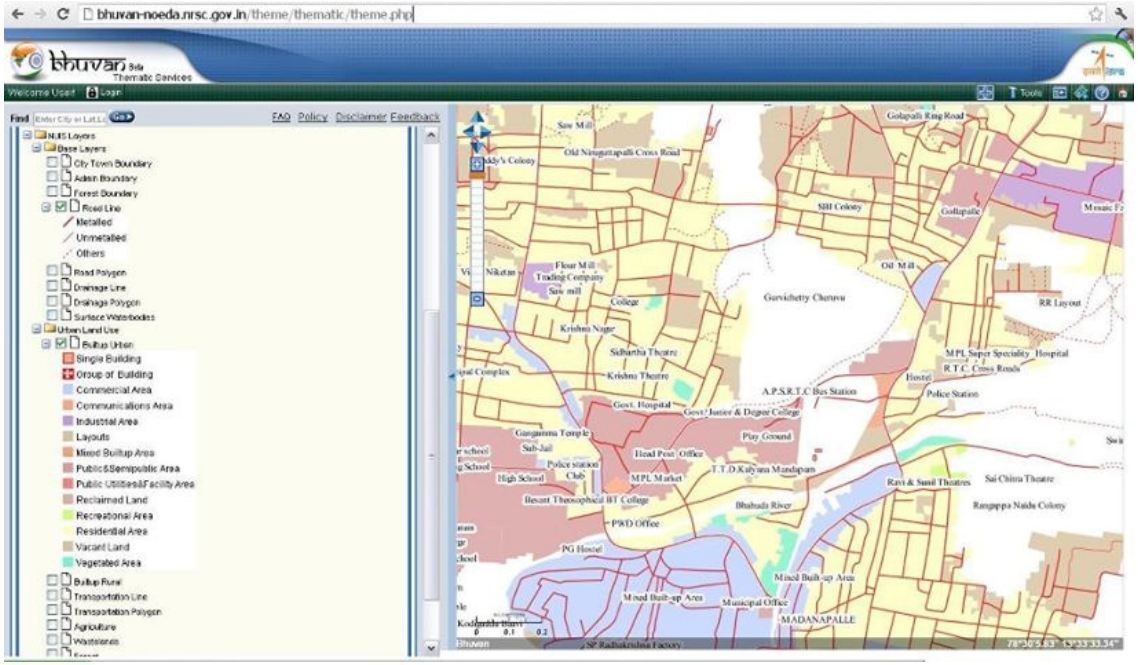
OGC Website of the Month – Dec'2010

- ✓ Online Shape file Creation
- ✓ Terrain Profile
- ✓ Urban Design Tools
- ✓ 3D Fly Through
- ✓ Multi-Lingual (English | Hindi | Tamil | Telugu | Gujarati | Marati | Kannada --)
- ✓ Data Download (CartoDEM, AWiFS , LISS III Ortho)

Bhuvan Applications for Ministries

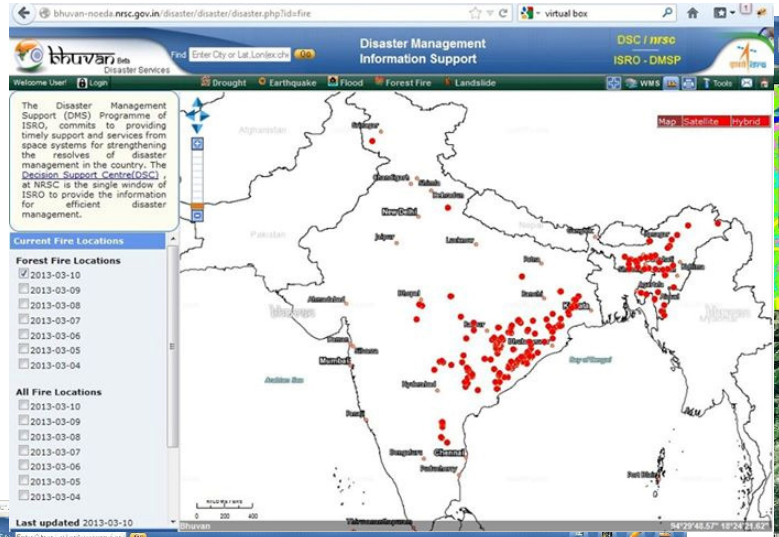


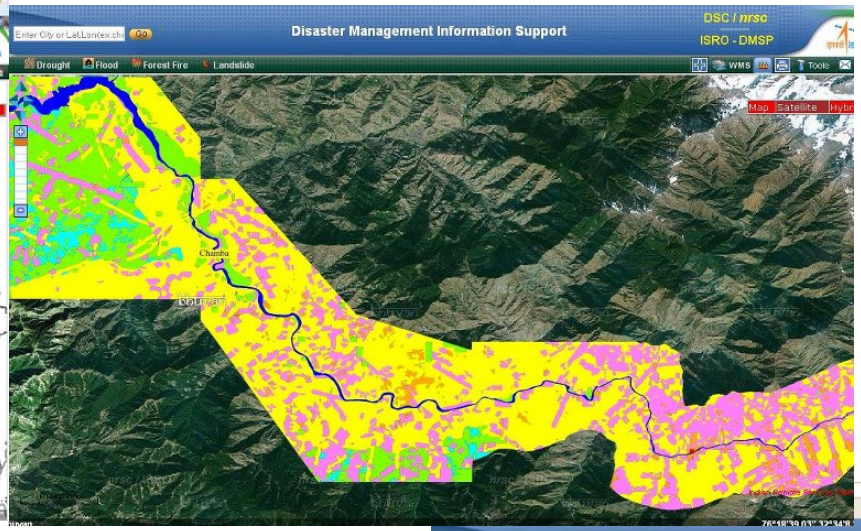
- **Irrigation infrastructure monitoring**

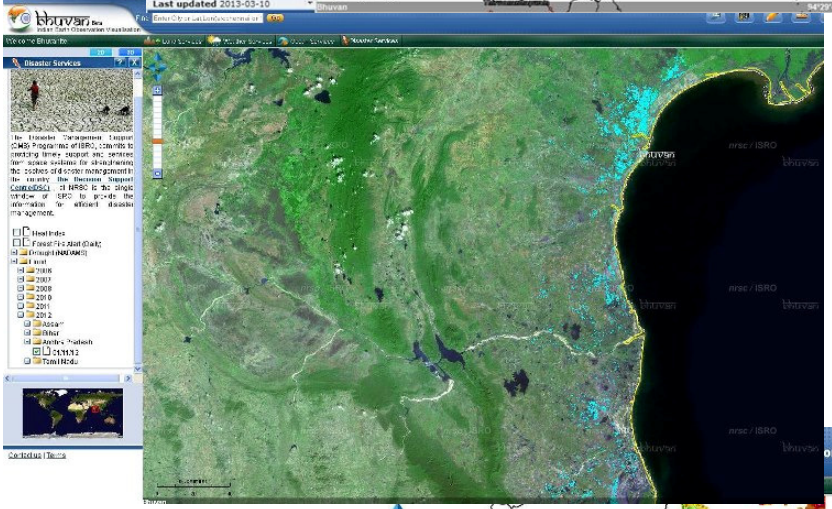


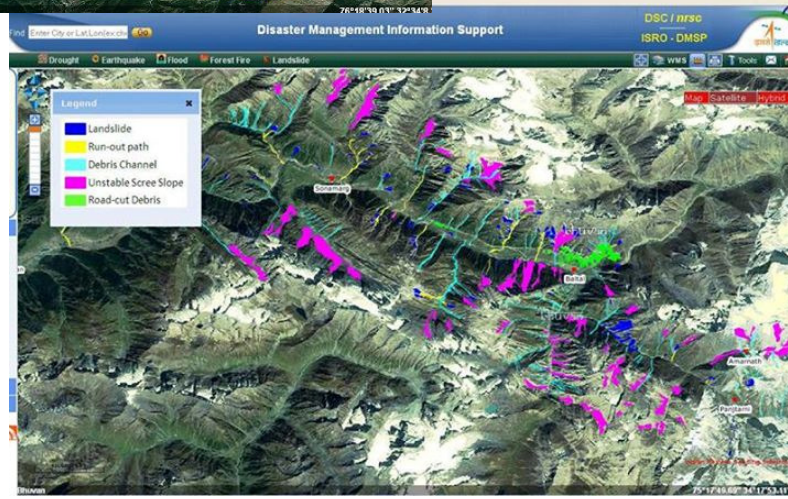
- **National Urban Information System (Master plan updation)**

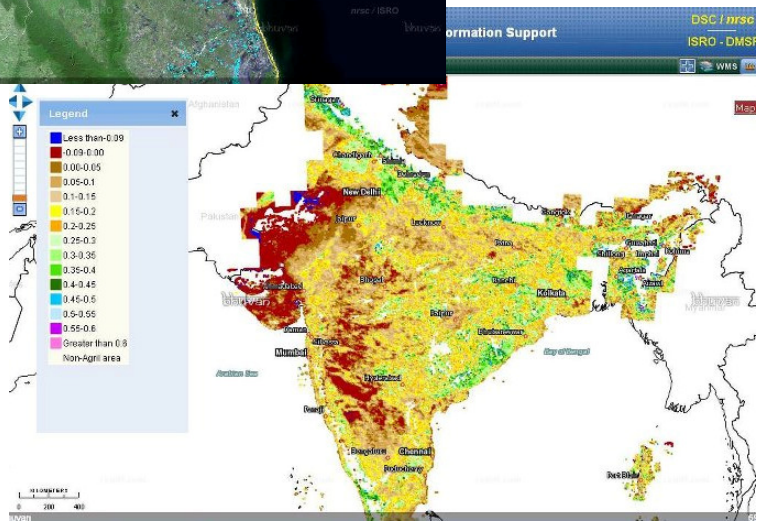
Disaster Management : Information Support





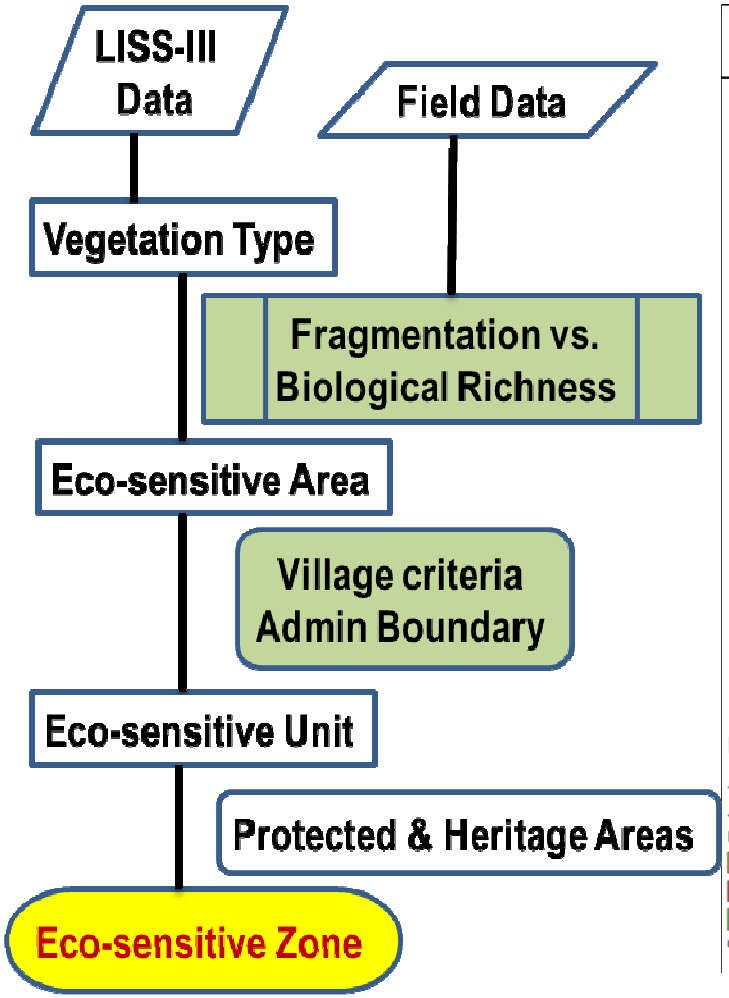


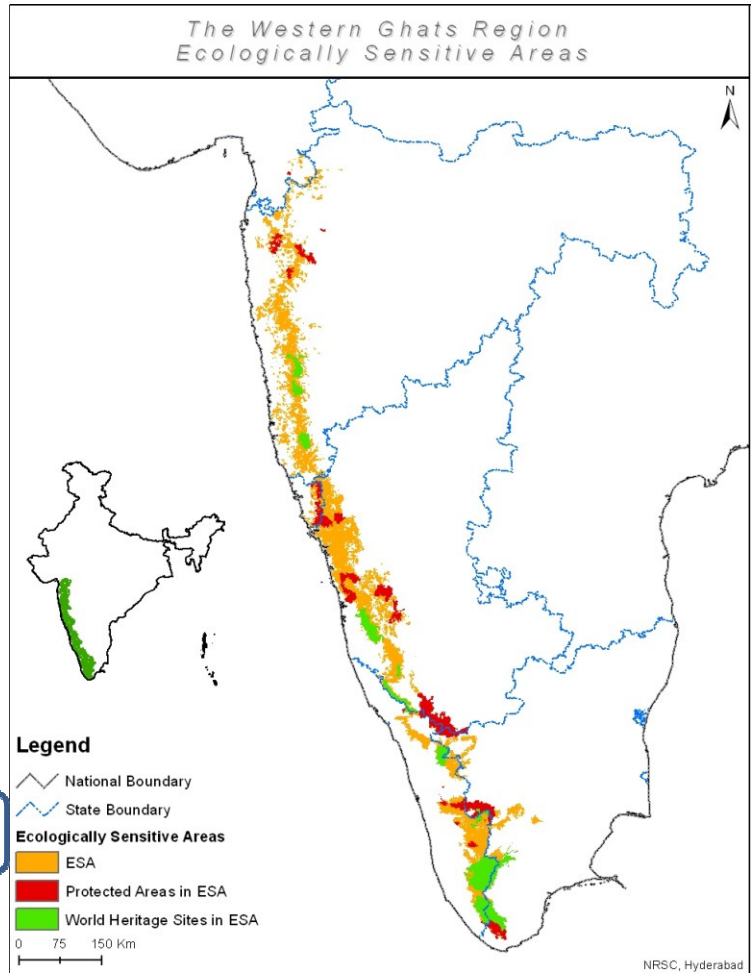




Eco-sensitive Zonation of Western Ghats

- Western Ghats are unique ecosystem with large biodiversity,
- Min. Environment & Forests established a High Level Working Group to define eco-sensitive zone and define policies for development





Total ecosensitive area - 59,940 sq km (36.49%).

EO Applications & Citizens

- Accessible geospatial information to citizens for their economic activity, sustainable development, environment & disaster risk reduction

- Current examples
  - ECONOMIC ACTIVITY : Potential fishery zone forecast
  - SUST DEVELOP : Action Plan – Soil & water conservation
  - ENVIRONMENT : Urban Planning – Master Plans
  - DISASTER RISK REDUCTION : Hazard Zonation – Flood, Landslides, ...
  - : Disaster Forewarning – Cyclone, Flood,

Potential Fishery Zone Forecast

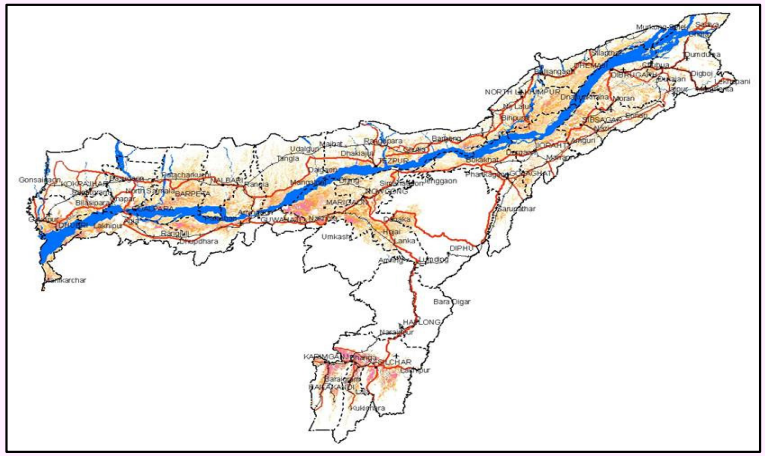
- Operational application over two decades with continuous improvements in methodology and outreach.
- Uses Oceansat data & operational agency INCOIS in Min. Earth Science
- Methodology Evolution : SST extracted features (1990s), SST + Chlorophyll (2000s), SST, Chl, Wind Vectors (2010s), new approach with model assimilation & model derived SST
- Uses radio, electronic and SMS based dissemination

Hazard Zonation for Disaster Risk Reduction

- **Multi-year in-season inundation mapping for flood hazard zonation (with overlaid of village boundaries) open access through BHUVAN**

Mitigation

Assam-Flood Hazard Atlas



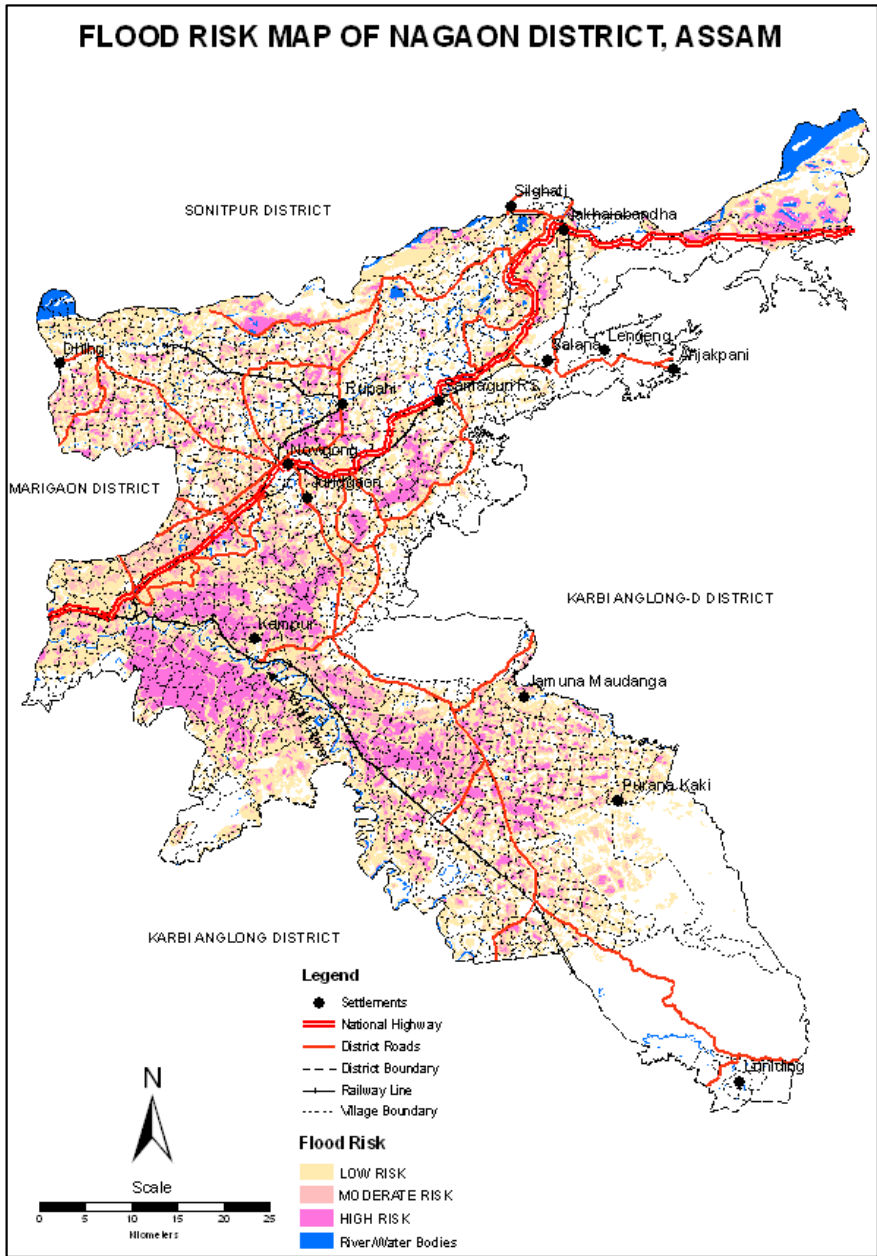
Legend

- Settlement
- District Hq
- District boundary
- Taluk boundary
- Village Boundary
- Railway
- National Highway
- District Road

Flood Hazard

- Very low
- Low
- Moderate
- High
- Very High
- River/Waterbodies

- **Prepared based on 94 satellite data sets acquired during different magnitudes of floods during 1998 - 2007**



Village Resource Centre (VRC)

VRC : Tele-education
Tele-Health
Natural Resource Data
Advisory Services

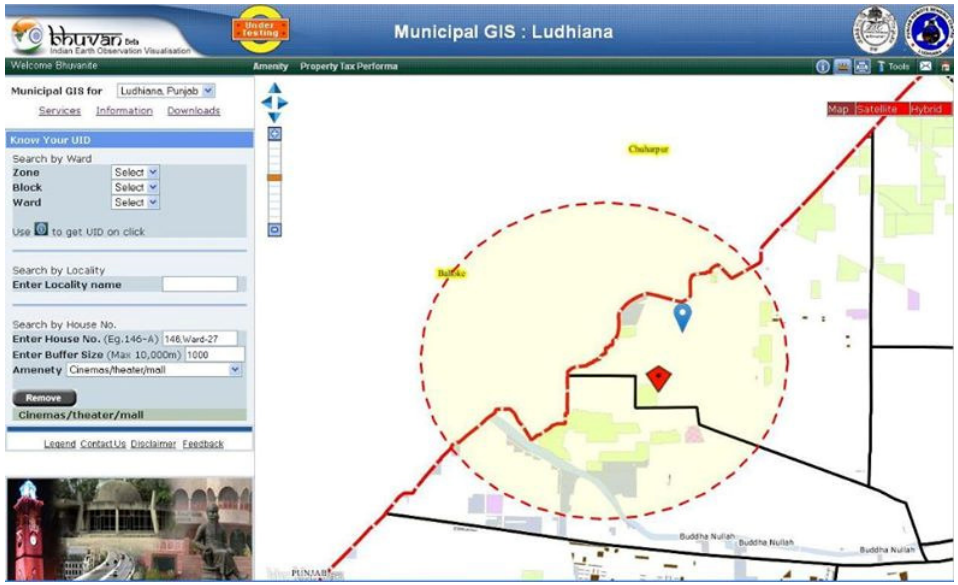
Single Window Delivery Mechanism

- Land and Water Resources
- Weather & Disaster info
- Tele education & Tele healthcare services
- Advisories on Agriculture, Fisheries
- Enhanced livelihood opportunities
- Info on Price, Market, Pests, Diseases, Livestock, Govt. schemes, job opportunities, etc.

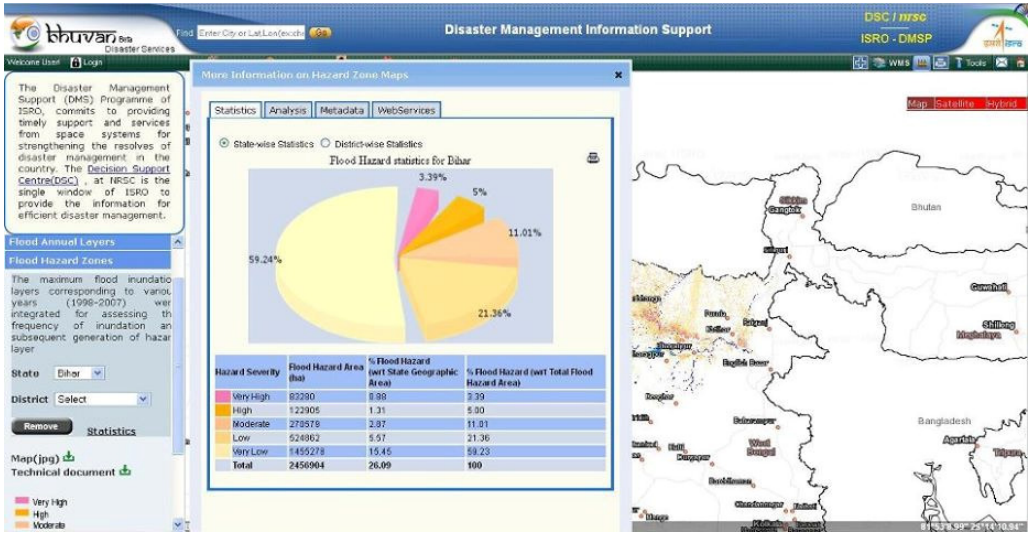
VRC Coverage:

States/ UT	: 22
No. of VRC	: 461
Expert Centres/Hospitals	: 81
No. of Programmes	: 6500

BHUVAN Services



- **Municipal GIS for Ludhiana city**



- **Flood Hazard Zonation > 10 year data**
  - Query, processing

Thank You for your kind attention

http://www.isro.gov.in

http://www.bhuvan.nrsc.gov.in