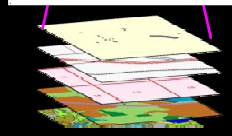
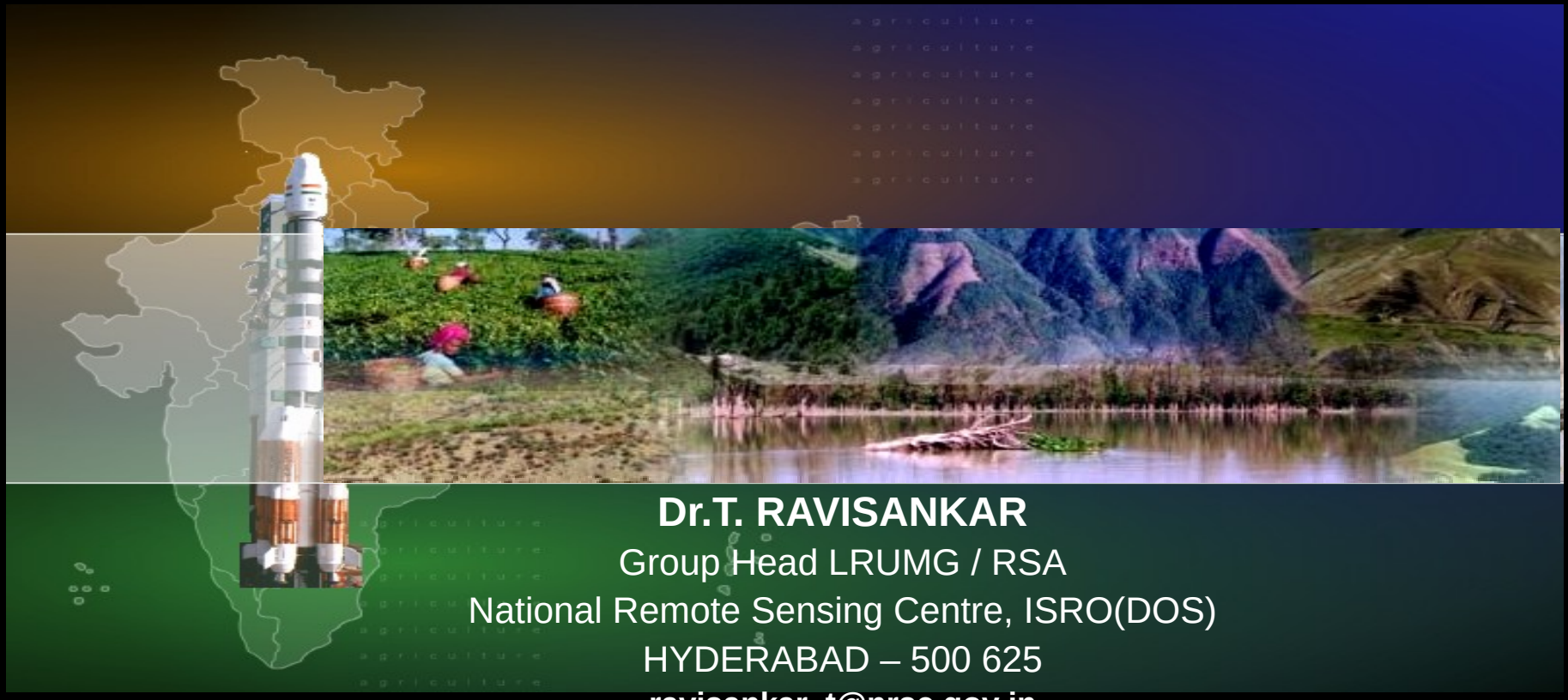
Monetising Modern Land Management Practices





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INTRODUCTION

Over the past two decades the demand for land increased many fold for developmental activities .

The cascading effects of pressure on land is experienced through increased levels of environmental pollution, changes in climate parameters and enhancing land degradation.

Major concern:

Is existing land use / land cover pattern,
changes in land use pattern;
and their relationship between developmental activities /food security is a matter of major concern.

Key is – sustainable developmental of natural resources

Scenario - India

Land resources in the country are limited and are declining due to increasing population, land degradation and land conversions.

The per-capita availability of land is declining :

0.9 Ha in 1951,
0.5 Ha in 1981
0.4 Ha in 1991
0.3 Ha in 2001 and
0.1 Ha by 2035 (projected).

The per-capita availability of cultivable land is also declining:

0.48 Ha in 1951,
0.20 Ha in1981,
0.16 Ha in 1991
0.15 Ha in 2001 and I
0.08 Ha by 2035 (projected).

LAND TRANSFORMATION

Land transformation is a continuous dynamic process in which nature and human beings alter the surface and sub-surface of the landscape, creating positive and negative impacts, some reversible, others irreversible. The process involves physical, chemical and biological changes affecting land, water and air over time.

Eg: reclamation of land from the sea / felling of trees / mining/ quarrying for minerals & rocks, agricultural practices / urbanization / industrialisation

For millions of years, human beings have so altered the land both intentionally and inadvertently. The drive to do so is inherent in human cultural and economic activities.

These changes may be temporary or permanent and can be reversed.

Natural factors like climate, and vegetation influence the potential for land use and soil erosion also contribute significantly to the process of land transformation.

For example

Trans-formation of range lands to thorny shrub lands is often irreversible.
Irreversible transformations from crop land or grassland to shrub occurs

LAND TRANSFORMATION IN AGRICULTURE

Land transformation in agriculture should address

productivity, or potential productivity,
sustainability,
reversibility and
fragility.

Under traditional agricultural practices, alterations of the natural system by human beings were limited. Through centuries cropping patterns and rotations developed sustainable agriculture adapted to local conditions of soil and water in many temperate and humid regions.

The scale and rate of modern change raise the spectre of exceeding the buffering capacity of the land and soil, reducing the sustainability of agricultural enterprise, and degrading land and soil to irreversible (or nearly irreversible) states.

Land transformations viz., land use and land cover changes, are determined by the land management practices.

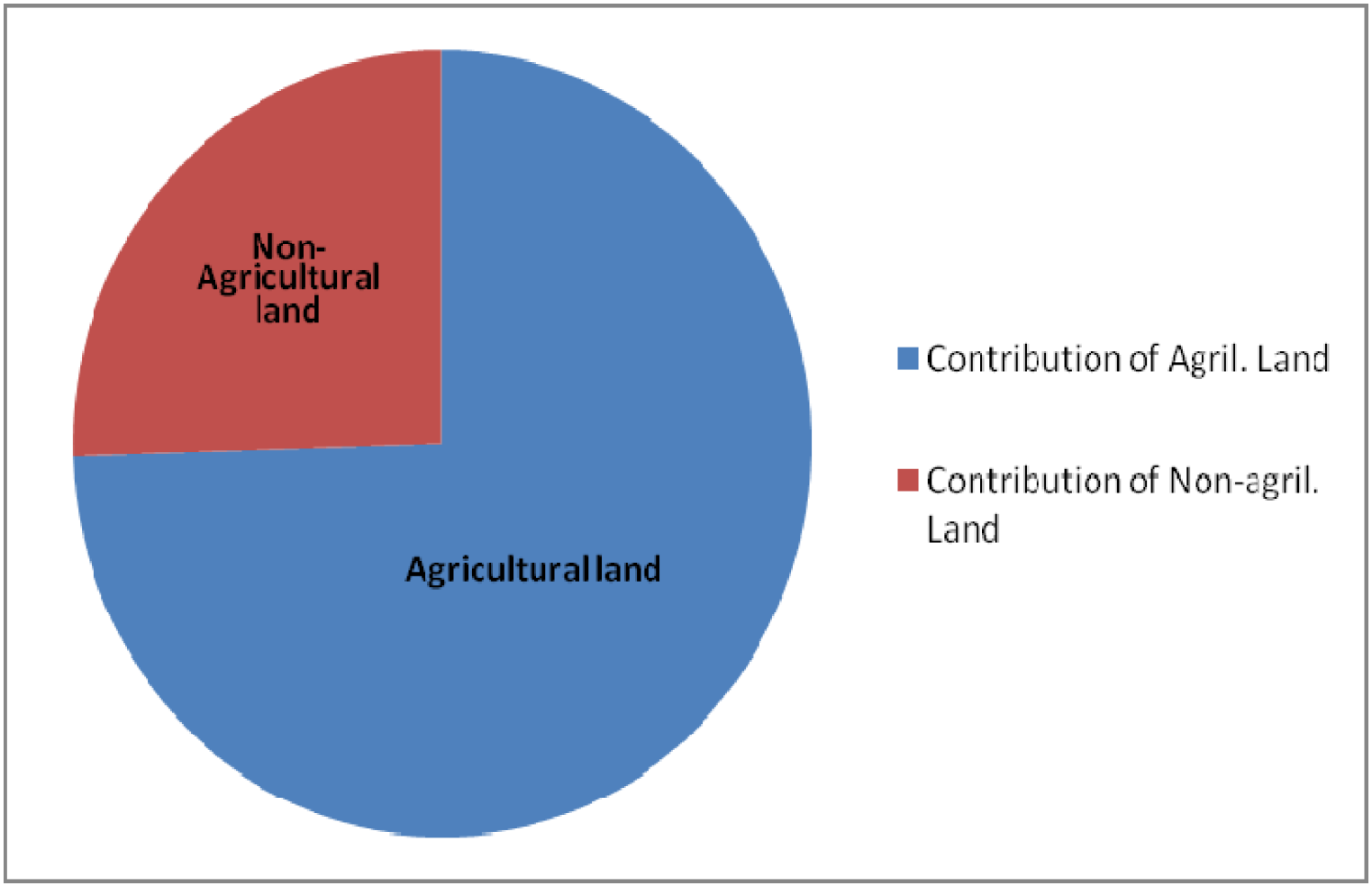
Understanding the dynamics behind the land transformations is essential to arrive at appropriate management practices that include items like geographic distribution of land, status of land resource and its suitability, land use dynamics, policy interventions, socio-economic practices and compulsions, science and technology inputs etc.

Thus, understanding of the various land practices help in developing an integrated policy framework for arresting negative trends in land transformations and monitoring the health of the land.

Cropping pattern in India- Area in Million Hectare

Years	1990-91	2003-04	2009-10(p)
Total Area Under Crops	185.74	189.67	192.2
Net area sown	143	140.71	140.02
Cropping Intensity (percent)	129.89	134.8	137.26
Area under Food Crops	141.03	142.12	141.06
Area under Non-Food Crops	44.71	47.55	51.14
Net Irrigated area	48.02	57.05	63.26
TOTAL/ Gross Irrigated Area	63.2	78.04	86.42

Contribution of Agricultural and Non-agricultural land to Urban sprawl during 2005-06 and 2011-12.



LAND MANAGEMENT

Land Management - Utilization types, Land cover, Land transformation, Management Practices, sustainable use and development,

It requires - Good spatial data infrastructure (SDI), Good governence, and spatial enabled society.

Sustainable Land Management System consists of
Investment choices and quality and risk assessment,
information standards, capacity and organisation building and the setting up of a local / state/national spatial information infrastructure.

The societal demand for data, information and knowledge should be put centrally in the decision making, resulting in appropriate service levels of the LMS.

Agricultural Land by Type of Use *

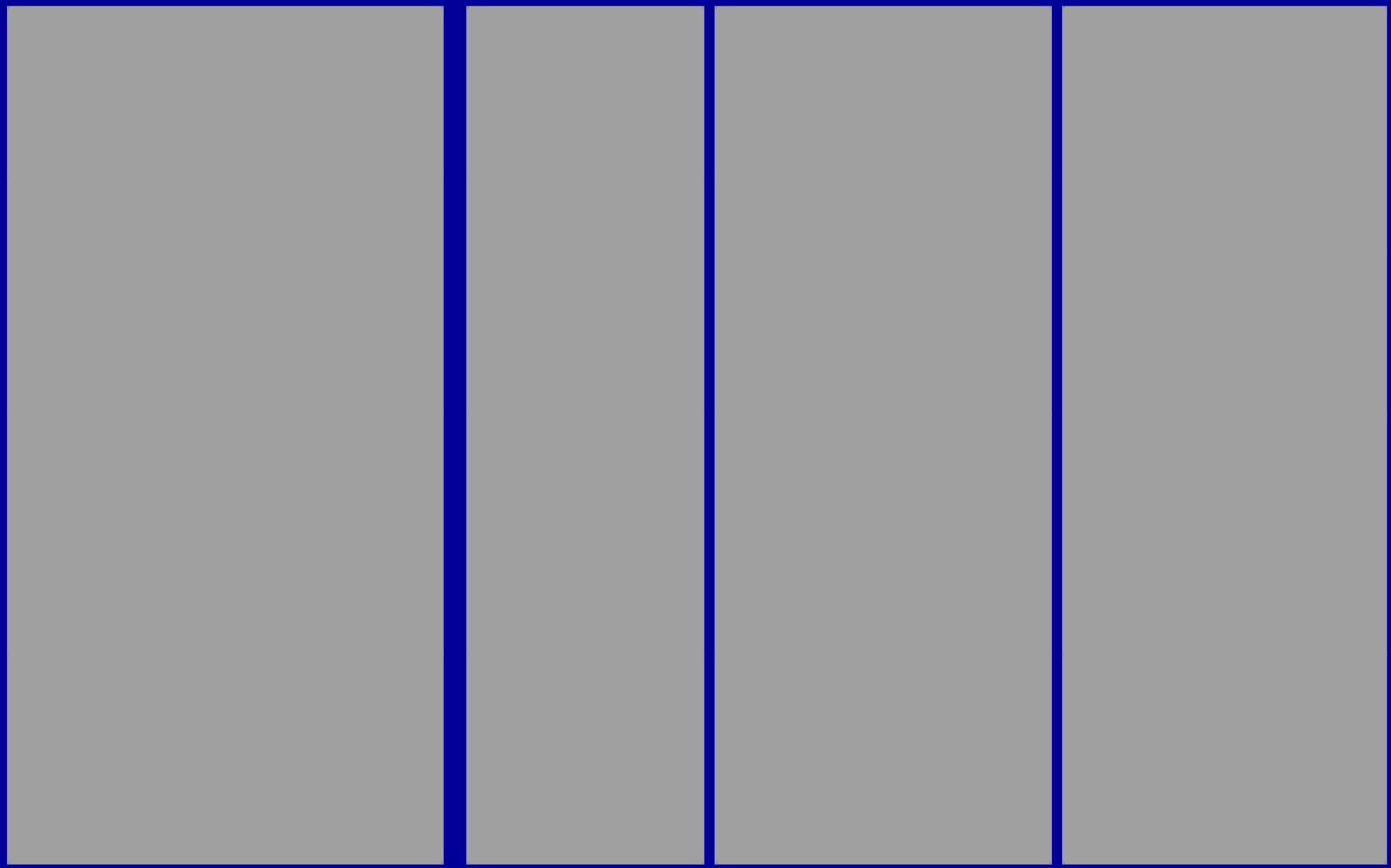
(Thousand Hectares)

State / Union Territory / Year	Geographical Area	Reporting Area for Land Utilisation Statistics	Forest	Land not Available for Cultivation	Other uncultivated land excluding Fallow Land				Fallow Land			Net Area Sown	Total Cropped Area	Agriculture Land/ Cultivable Land/ Culturable Land	Cropping Intensity
					Permanent Pastures & other Grazing Lands	Land Under Misc. Tree Crops & Groves not incl. in Net Area Sown	Culturable Wasteland	Total	Fallow Lands other than Current Fallows	Current Fallows	Total				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
All India															
2007-08	**328726**	**305610**	**70022**	**42701**	**10136**	**3413**	**13059**	**26671**	**13329**	**14512**	**24842**	**141377**	**195138**	**182691**	**138.0**
2008-09	**328726**	**305586**	**70034**	**42662**	**10177**	**3156**	**12752**	**26235**	**13266**	**14191**	**24478**	**141329**	**195357**	**182514**	**137.6**
2009-10	**328726**	**305611**	**70042**	**42654**	**10149**	**3151**	**12657**	**26356**	**13484**	**15753**	**26236**	**140022**	**192197**	**182456**	**137.3**

* Provisional data. '0' relates to the area below 500 hectares.

Source : Directorate of Economics & Statistics, Department of Agriculture & Cooperation.

LAND INFORMATION VS SCALE



GEOSPATIAL TECHNOLOGIES AND LAND MANAGEMENT

Remotely sensed data have been used in India and in many other countries to identify the problem areas to map and to monitor the changes on the land over a period of time.

As satellites with different orbits and sensors are becoming available, users are able to acquire and compare the latest data with those obtained from various conventional sources.

The strength of the satellite observation system lies in the repetitive coverage that has greatest potential for change detection in the quality of the land that can change abruptly or gradually.

Indian Imaging Capability

Geo stationary

Sun Synchronous

1990
INSAT-1D
VHRR

1992
INSAT-2A
VHRR

1993
INSAT-2B
VHRR

1999
INSAT-2E
VHRR, CCD

2002
KALPANA-1
VHRR

2003 INSAT-3A
VHRR,CCD

2012

2011 Risat-

Resourcesat

L3&4,AWiFS

2009
Oceansat-2
OCM, SCAT,
ROSA

2009
RISAT-2
X-SAR

2007/ 08
CARTOSAT-2 & 2A
PAN

2005
CARTOSAT-1
PAN, F/A

2003
RESOURCESAT-1
LISS 3; LISS 4;
AWiFS

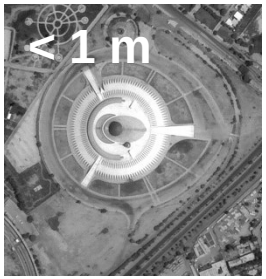
2001
TES
Step& Stare
PAN

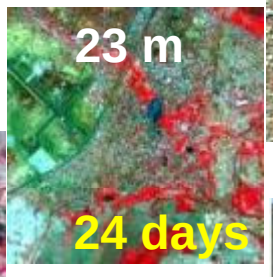
1999
OCEANSAT-1
OCM & MSMR

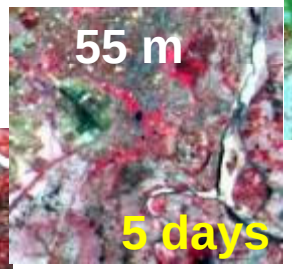
1995/97
IRS-1C/1D
LISS-3, PAN
& WiFS

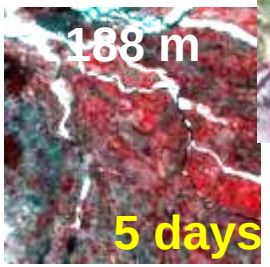
1996
IRS-P3
WiFS, MOS
X-Ray

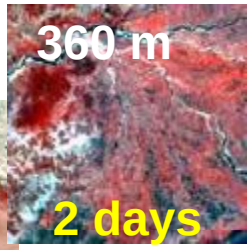
1988/91
IRS-1A &
1B LISS-
1&2

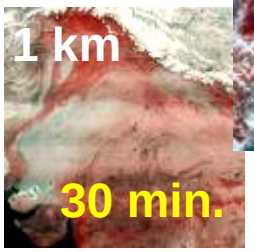


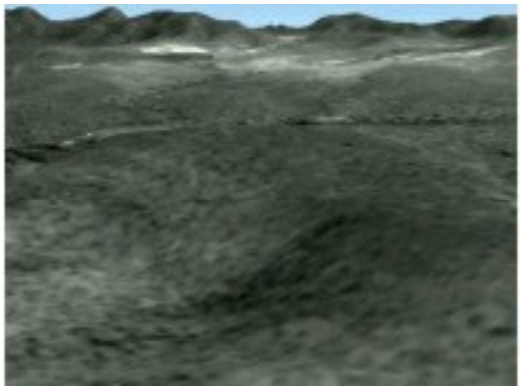




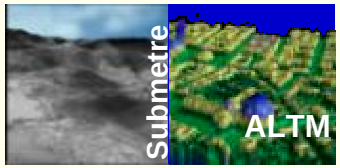








Aerial



Digital Camera
Laser Terrain Mapper

A Valuable infrastructure in Space for monitoring NR & Environment

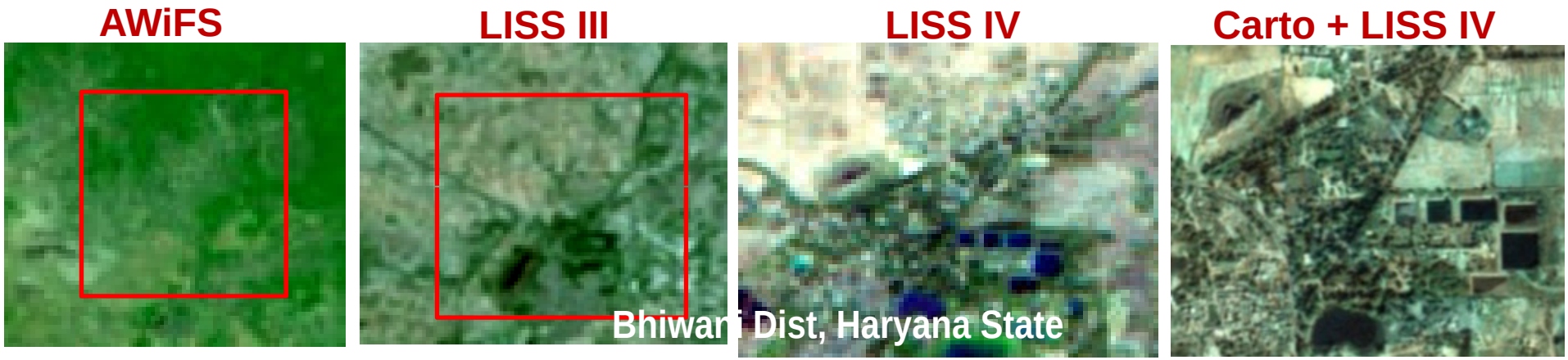
Space Inputs for Watershed Development

NR Databases available from NNRMS Program (Year 2005-2009: 1:50,000 Scale)

- Land use & land cover (2005-06)
- Wasteland (2005-06 and 2008-09)
- Land degradation (2005-06)
- Wetland (2005-06)
- Rajiv Gandhi National Drinking Water Mission (18 States)
- Soil Map (13 States + others by SLUSI ;1:250,000 entire country by NBSS&LUP)
- Drainage and Watershed maps (2006)
- Administrative boundaries (Census)
- Cadastral maps overlaid on satellite data (for 1 Lakh villages)
- Digital Surface Models – from Cartosat 1 Stereo

Satellite Data

- IRS-AWIFS,LISS-III, LISS-IV, CARTOSAT
- Satellite Ortho image database at 1:10,000 scale for the entire country – SIS-DP



NATURAL RESOURCE INVENTORY USING SATELLITE DATA

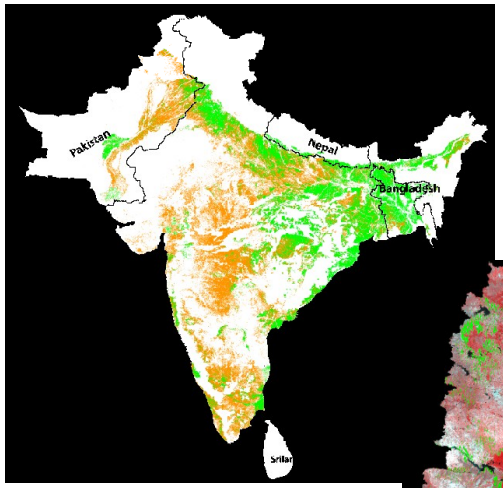
National level

180m

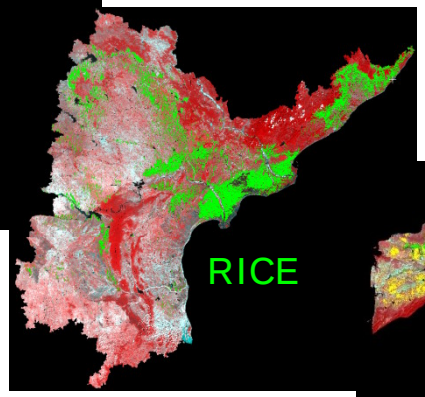
60m

24m

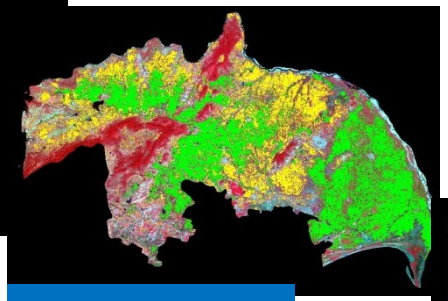
6m



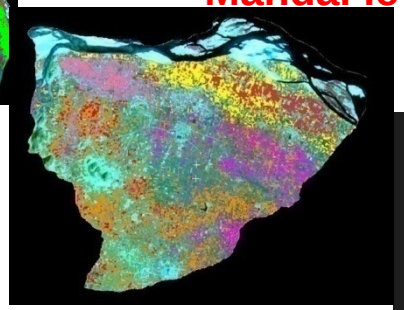
State level



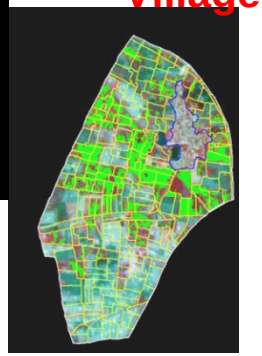
District level



Mandal level



Village level



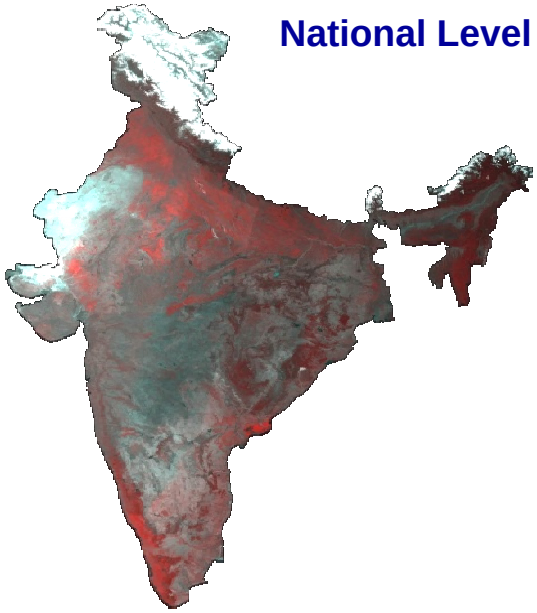
IRS WIFS

AWiFS

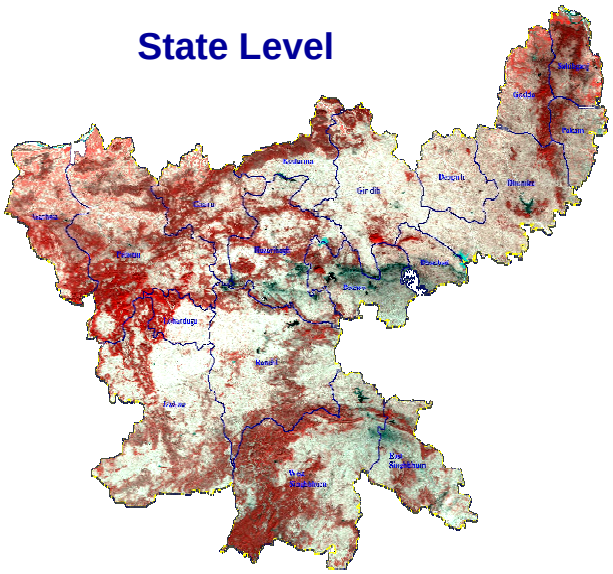
IRS LISS-III

LAND DEGRADATION ASSESSMENT AT DIFFERENT LEVELS

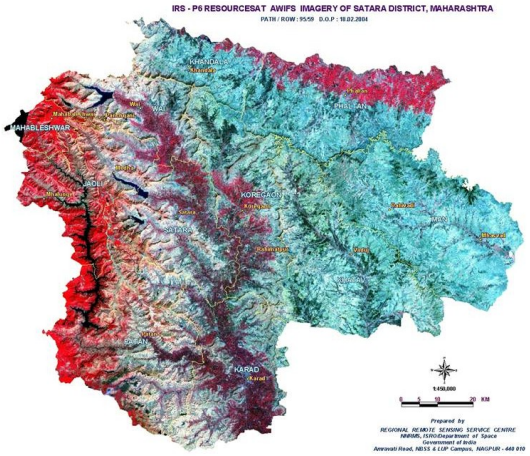
National Level



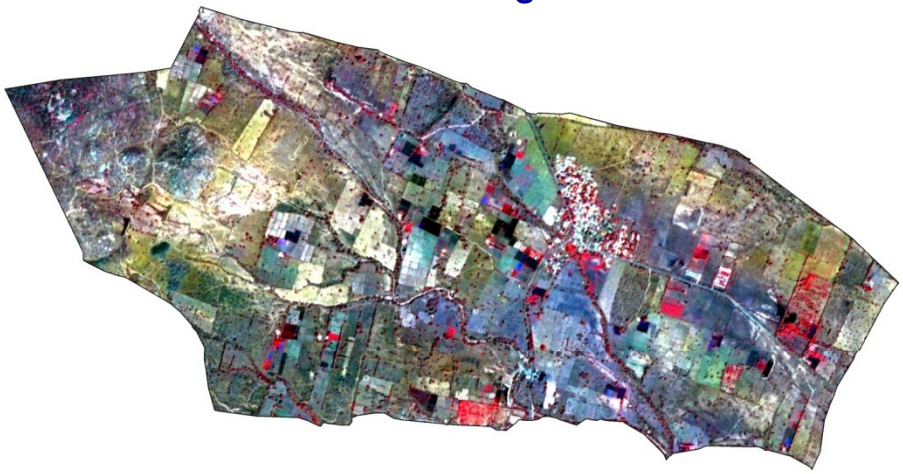
State Level



District Level

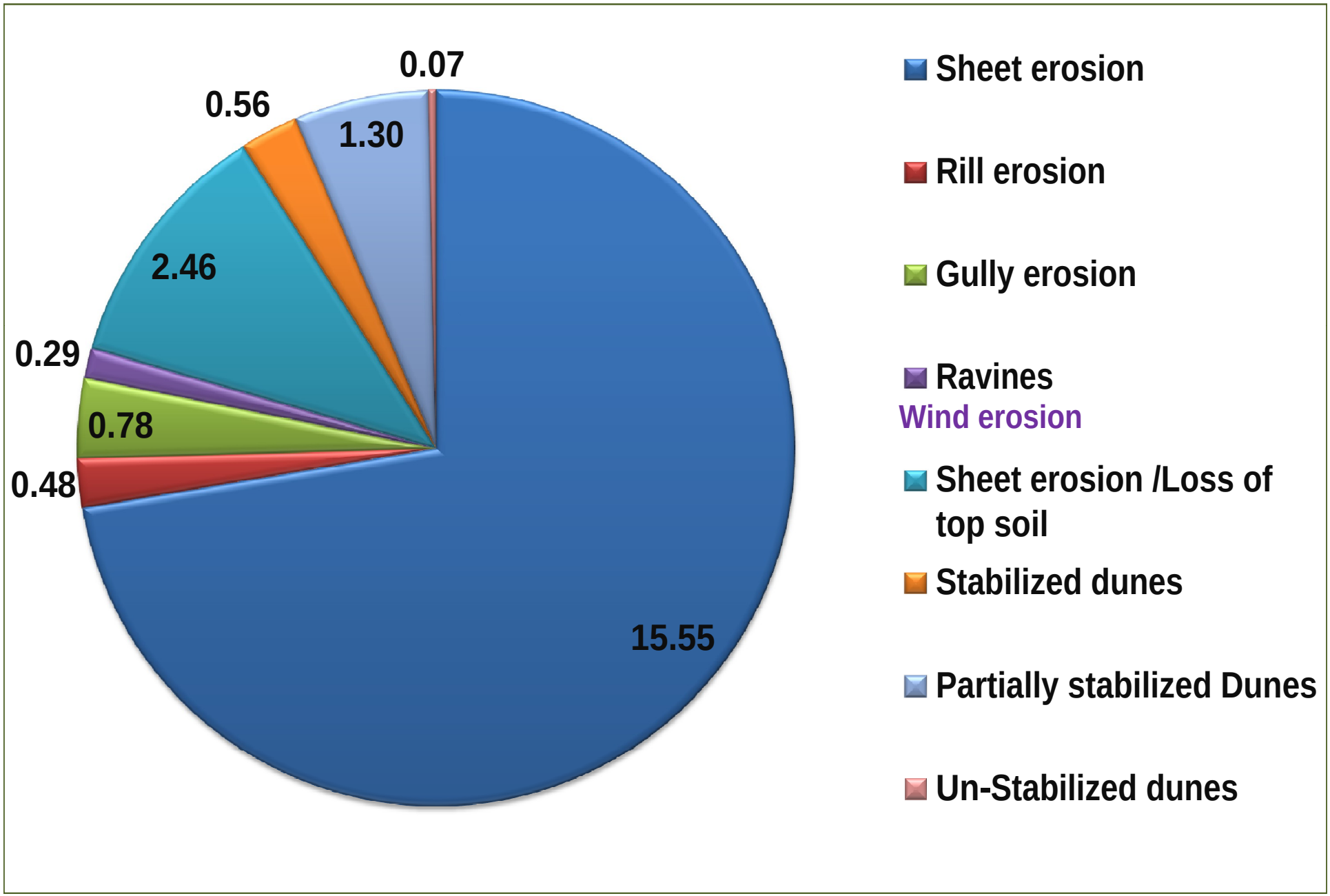


Village Level

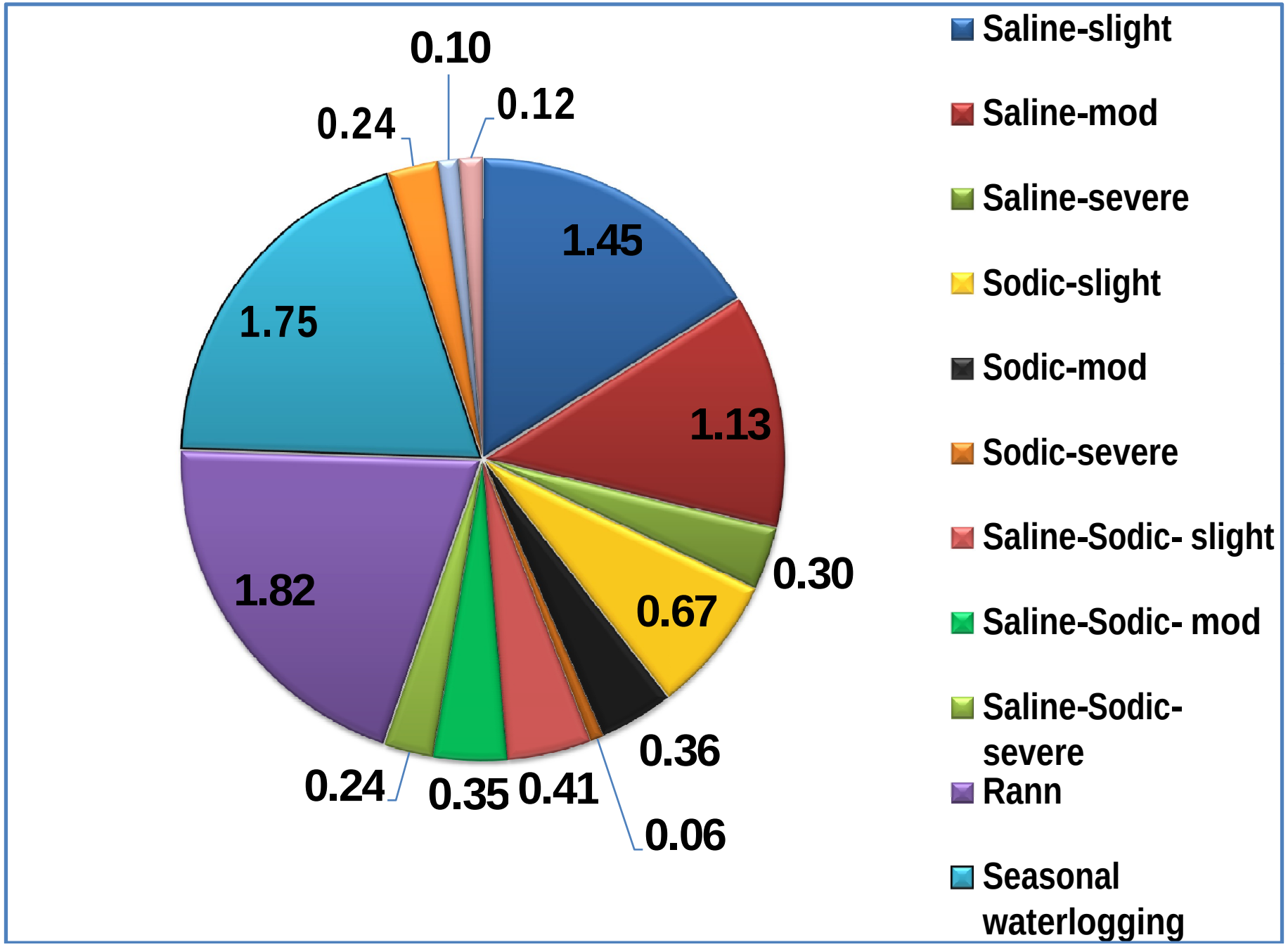


Field / Farm Level

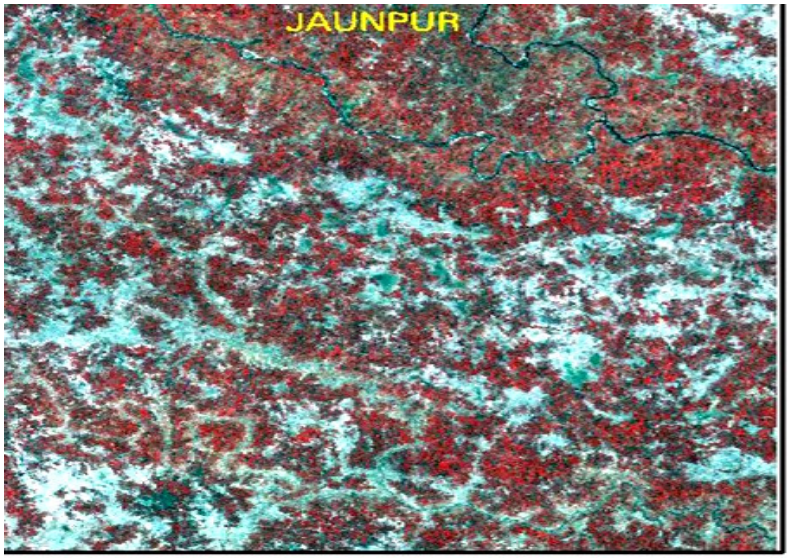
Water and Wind Erosion in India (%)



SALT AFFECTED AND WATER LOGGED AREAS OF IN



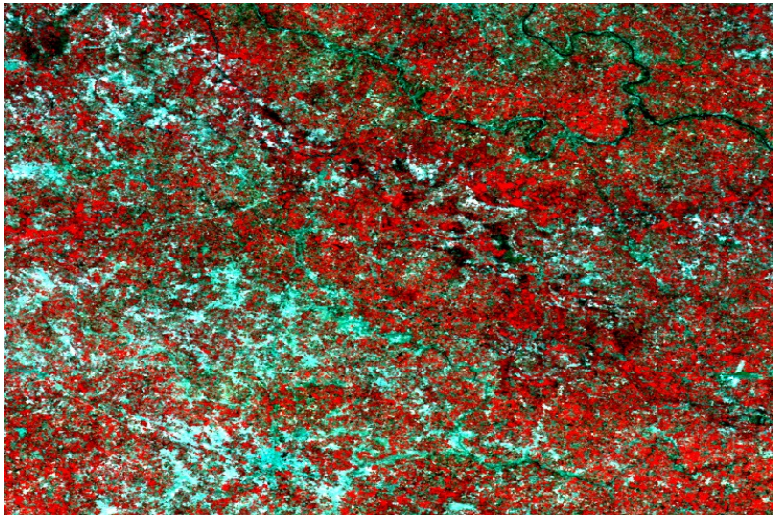
FEB - 1975



Salinity / Alkalinity

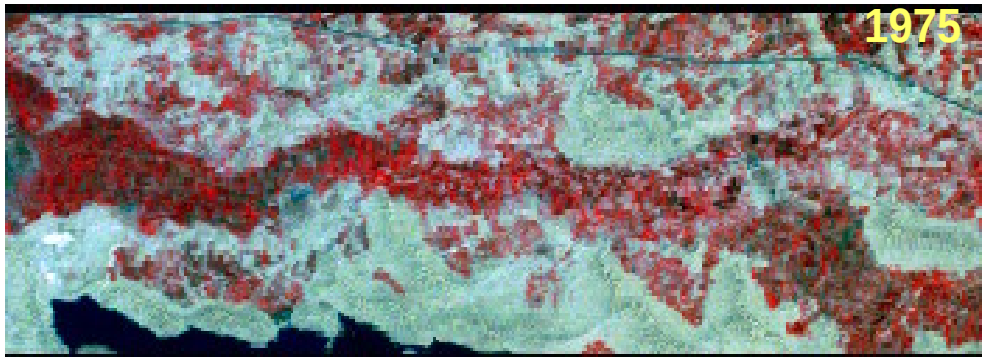
Part Of Sharda Sahayak Command Area (Indo-Gangetic Plains), Jaunpur (UP)

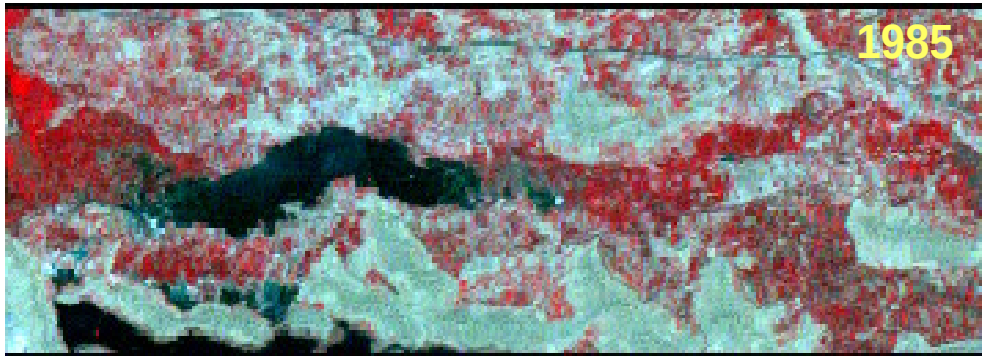
MARCH - 2008

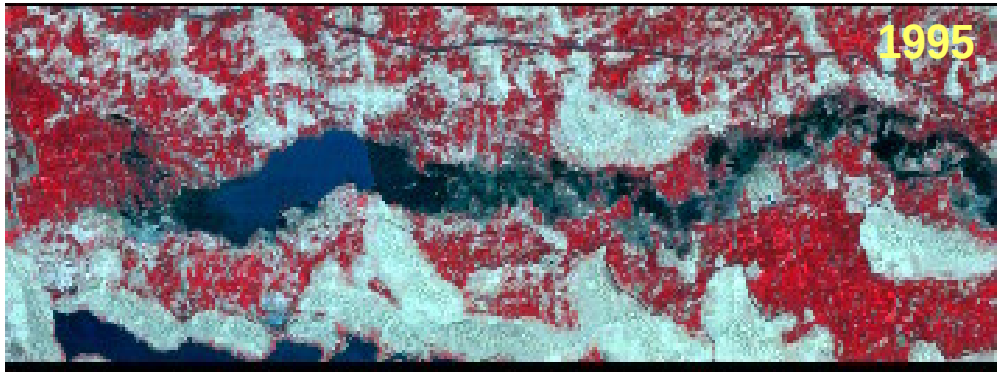


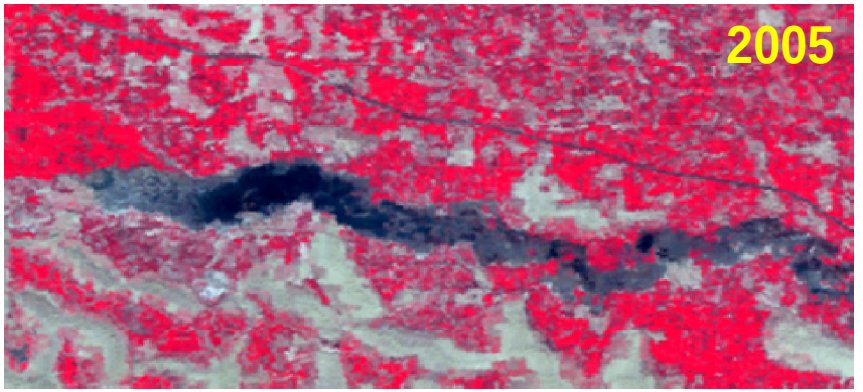
WATERLOGGING

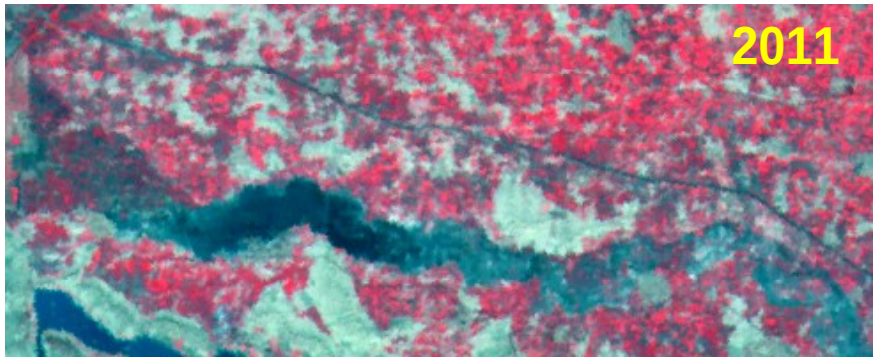
Part of Indira Gandhi Canal Command Area
(Badopal, Gaganagar, Rajasthan)







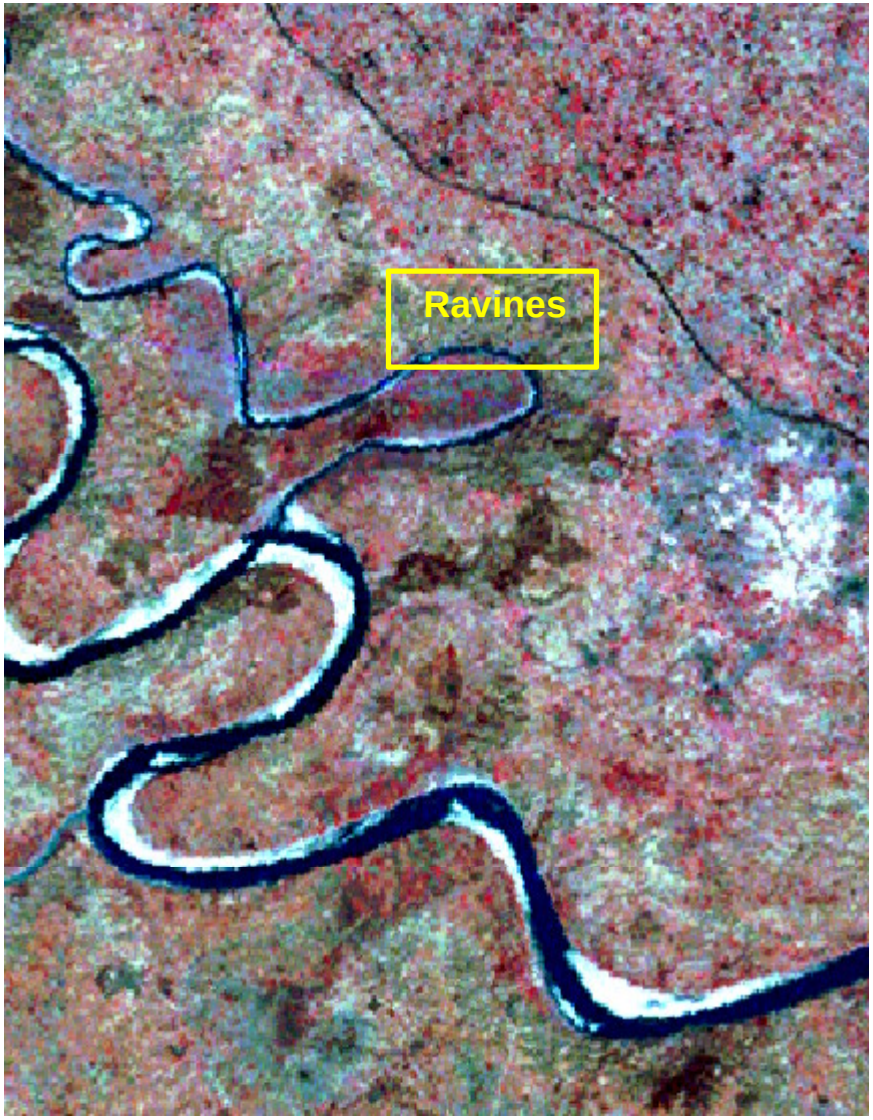




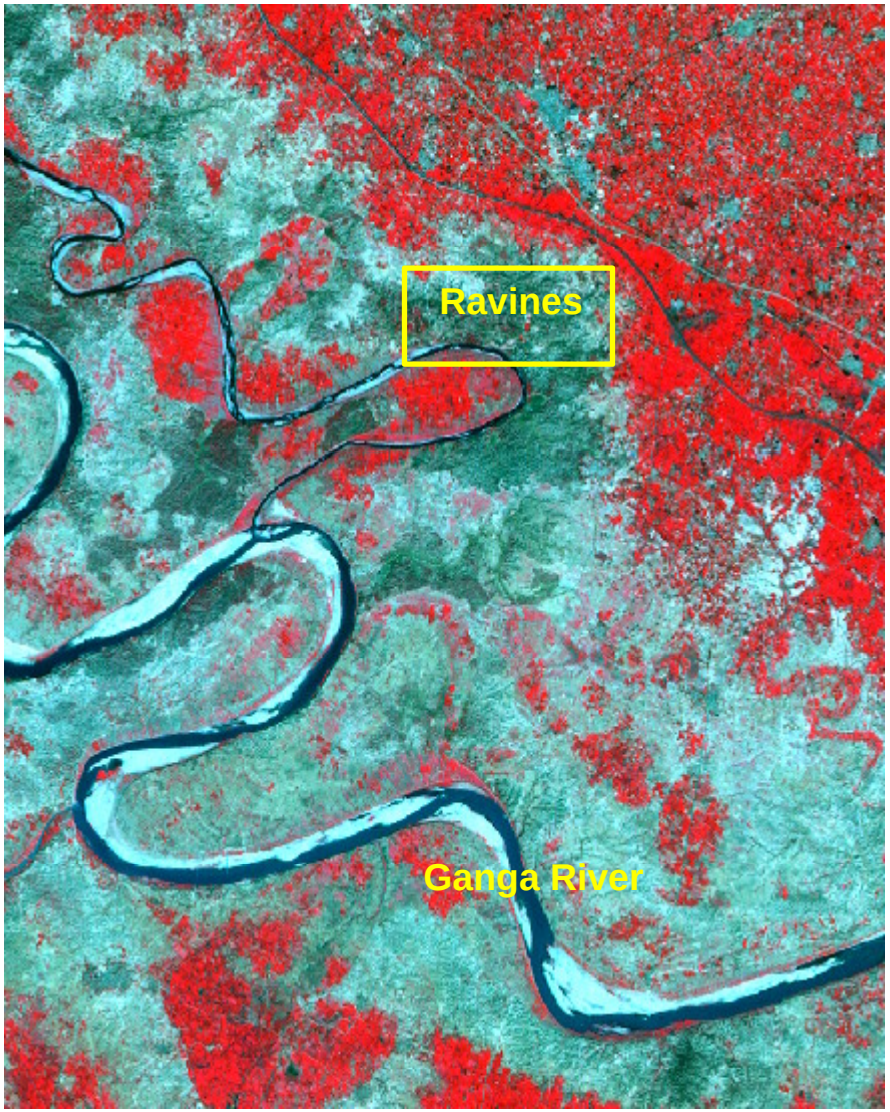
Transformation of Eroded areas, Kanpur district, UP

Increase in water erosion: Ravinous lands

Period: 30 years



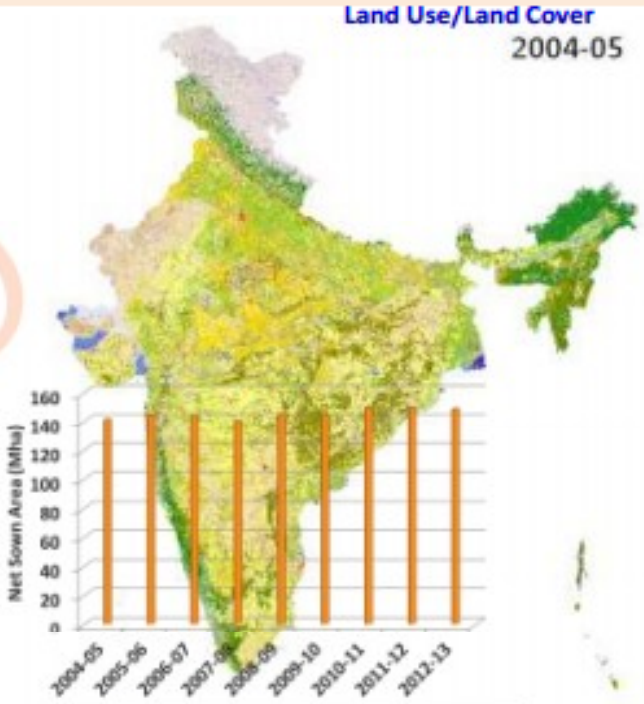
LANDSAT MSS 12 Dec 1975

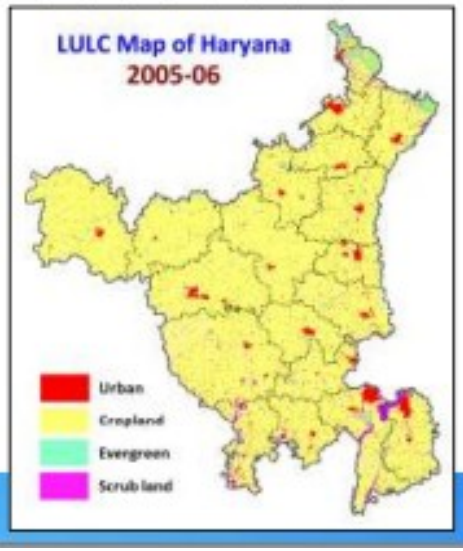


IRS LISS-III 22 Feb 2006

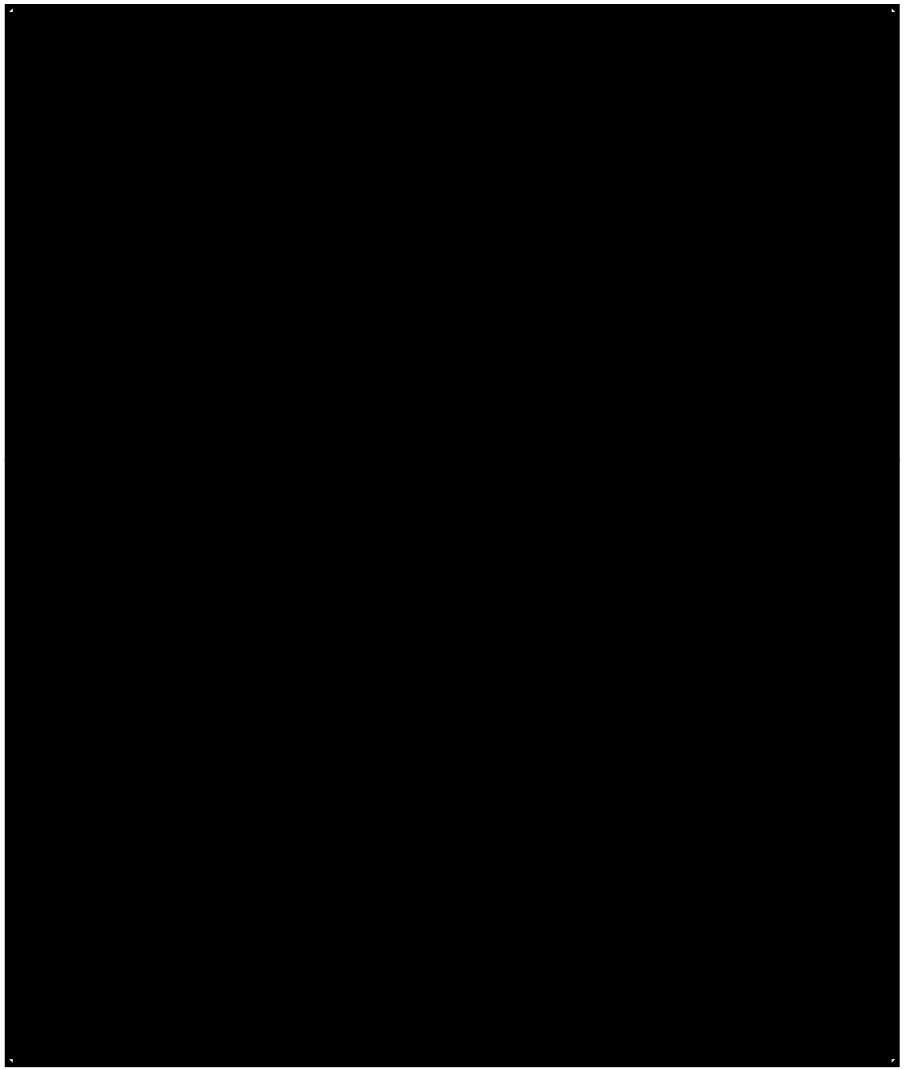
National Application Mission Projects

Land Use/Land Cover (1:250,000)	• 9 cycles completed (2004-05 to 2012-13) • Temporal analysis to find consistently cropped and fallow areas
Land Use/Land Cover (1:50,000)	• 1st Cycle (2005-06) Completed; Published in Bhuvan ; Atlas Released • 2nd cycle (2011-12); completed and being hosted on Bhuvan
Land Degradation (1:50,000)	• Erosion Mapping (2005-06) • Salinity and Waterlogging
Geomorphology and Lineament (1:50,000) *In association with GSI*	• Mapping (2005-06) in progress • 5,100 map sheets completed out of a total of 5,580 • Database for 17 states is hosted in Bhuvan and GSI portals
Indian Forest Cover Change Alert System using IRS Multi Sensor Data	• Pilot study in Yawal region of Maharashtra (Jalagaon Dist) completed • Analysis for 6 states (Andhra Pradesh, Chattisgarh, Himachal Pradesh, Maharashtra, Madhya Pradesh, Karnataka) is in progress





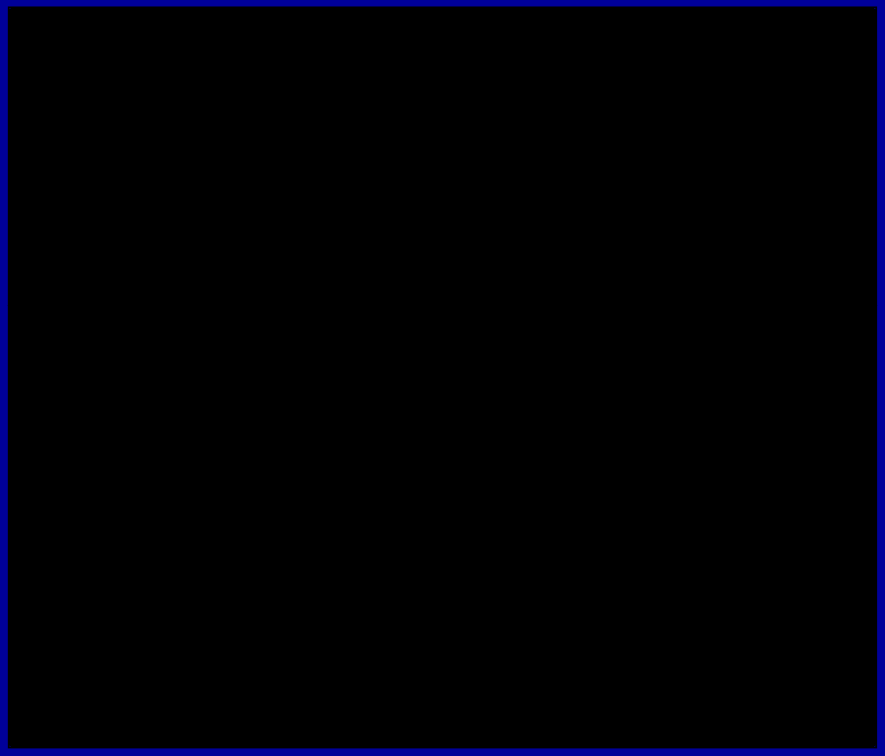
LAND USE/LAND COVER MAP – 1:50K (2005-06)



S. No	Category	Area in M Ha	% to TGA
1	Built-Up	8.94	2.72
2	Agriculture	181.04	55.07
3	Forest	70.62	21.48
4	Grass/ Grazing lands	3.37	1.03
5	Wastelands	32.71	9.94
6	Wetlands	2.02	0.61
7	Waterbodies	10.29	3.13
8	Snow/ Glacial Area	4.78	1.45
9	Shifting Cultivation	0.88	0.27
10	Rann (Kutch)	1.98	0.60
11	Area not Mapped in J & K	12.09	3.68

Net Sown Area	144.33	43.91 %
Cropping Intensity	143.45%	

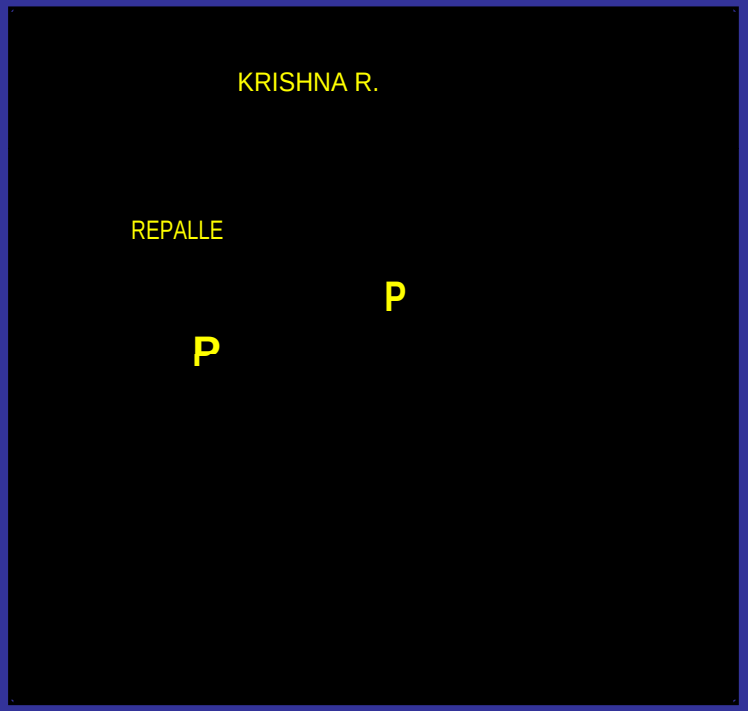
LAND TRANSFORMATIONS - LULC



IRS 1C, LISS – III FEBRUARY, 1997

IRS P6 AWiFS, FEBRUARY, 2004

Aquaculture in Coastal Areas



IRS-1B LISS-I
1992

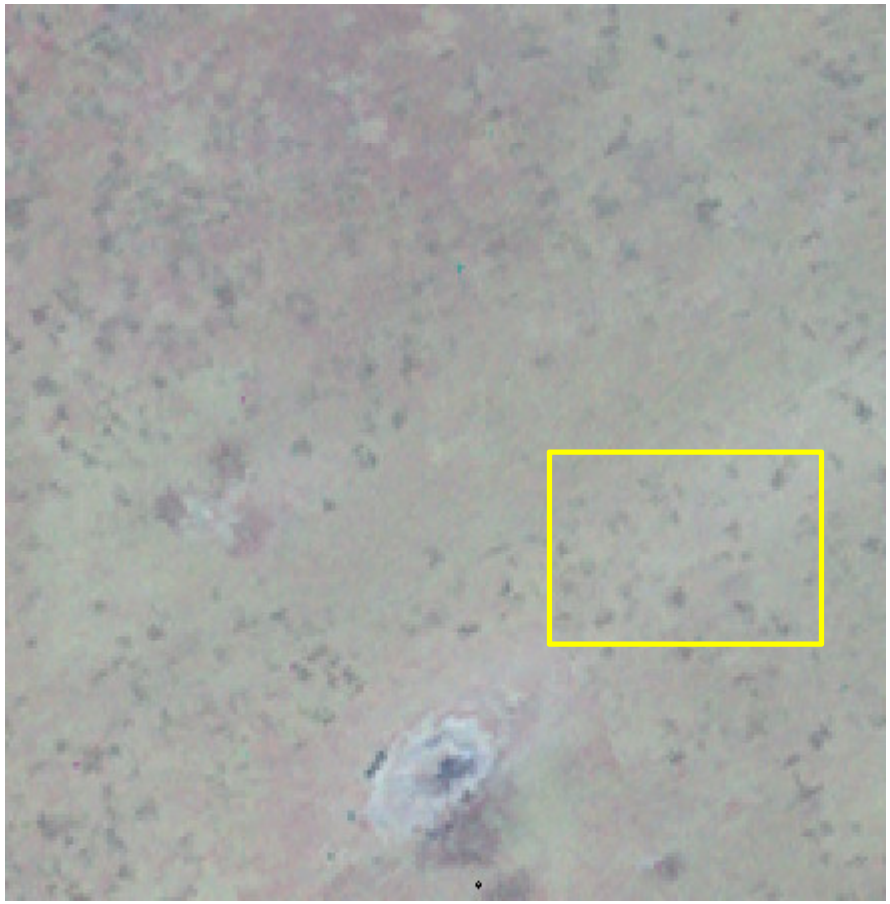
Resourcesat -2 LISS-III
2012

P = Prawn cultivation

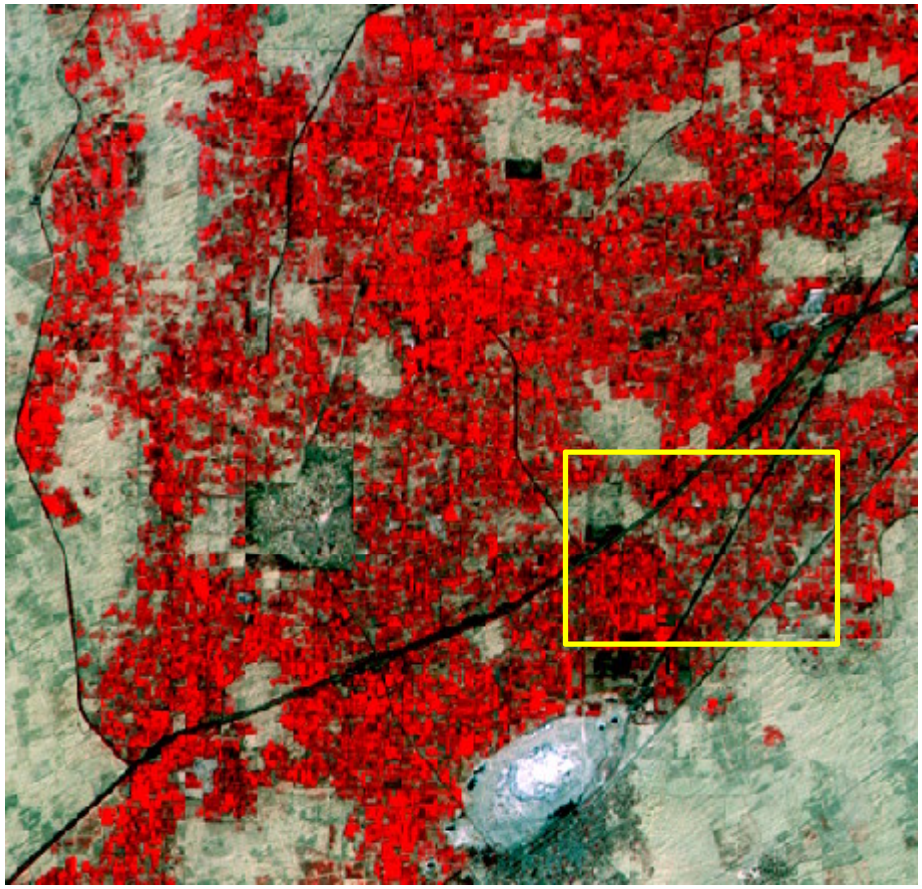
Transformation of Desert Areas , Near Bikaner, Rajasthan

Period: 30 years

Increase in crop areas

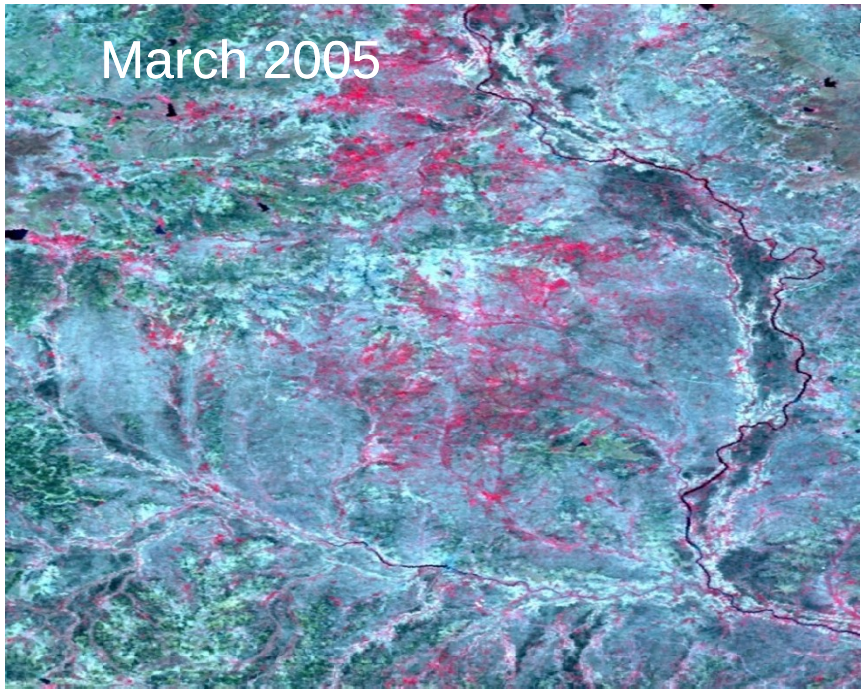


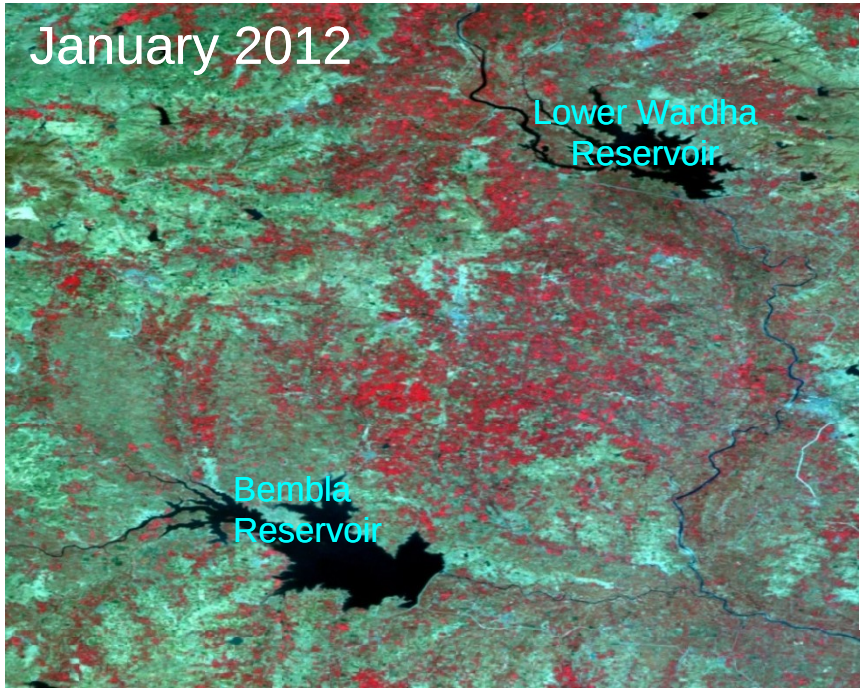
LANDSAT MSS 12 Dec 1975



IRS LISS-III 23 Jan 2006

formation of new res



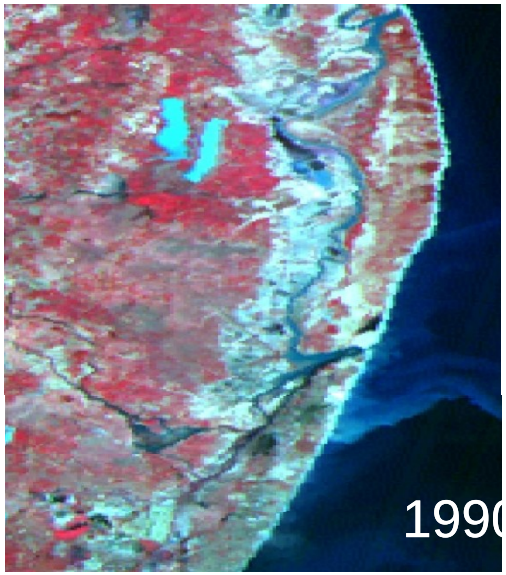


Satellite: **RS-1** ***Sensor:*** **AWiFS** ***Path-Row*****: 99-59**
Date of Pass: **04.03.2005**

Satellite: **RS-2** ***Sensor:*** **AWiFS** ***Path-Row*****: 100-59**
Date of Pass: **20.01.2012**

The rise in the demand-supply gap necessitated higher investments in power generation projects. Bembla reservoir is one such hydro-electric and irrigation project. The reservoir is located at Khadaksawanga village in Yavatmal district of Maharashtra.

Wardha and Yavatmal districts, Maharashtra

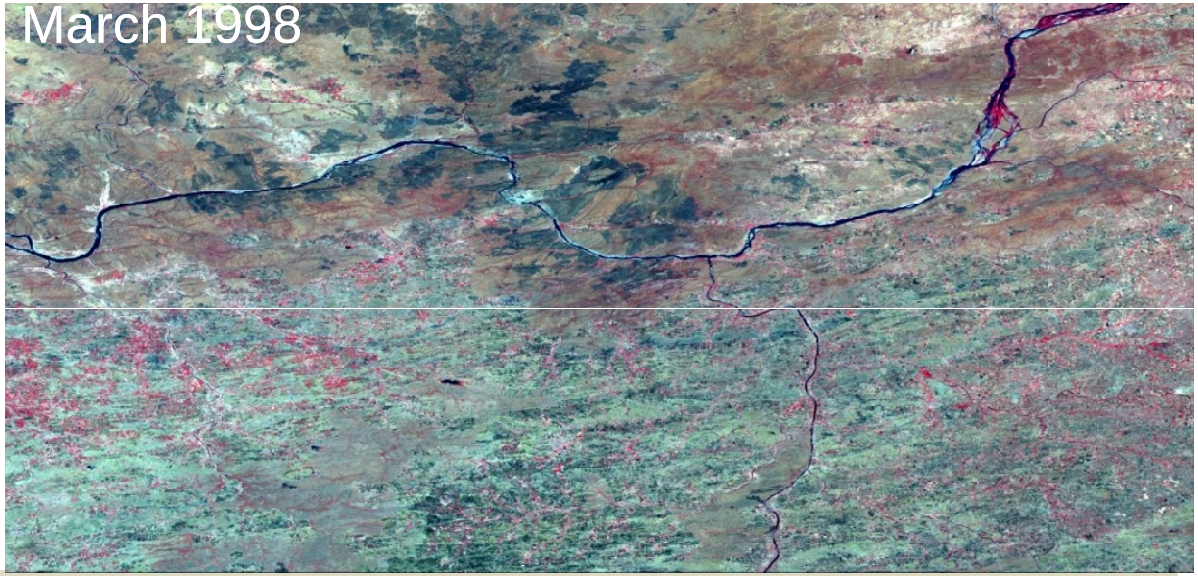


Satellite: IRS-1A
Sensor: LISS-I
Path-Row: 23-59 *Date of Pass:* 21.01.1990

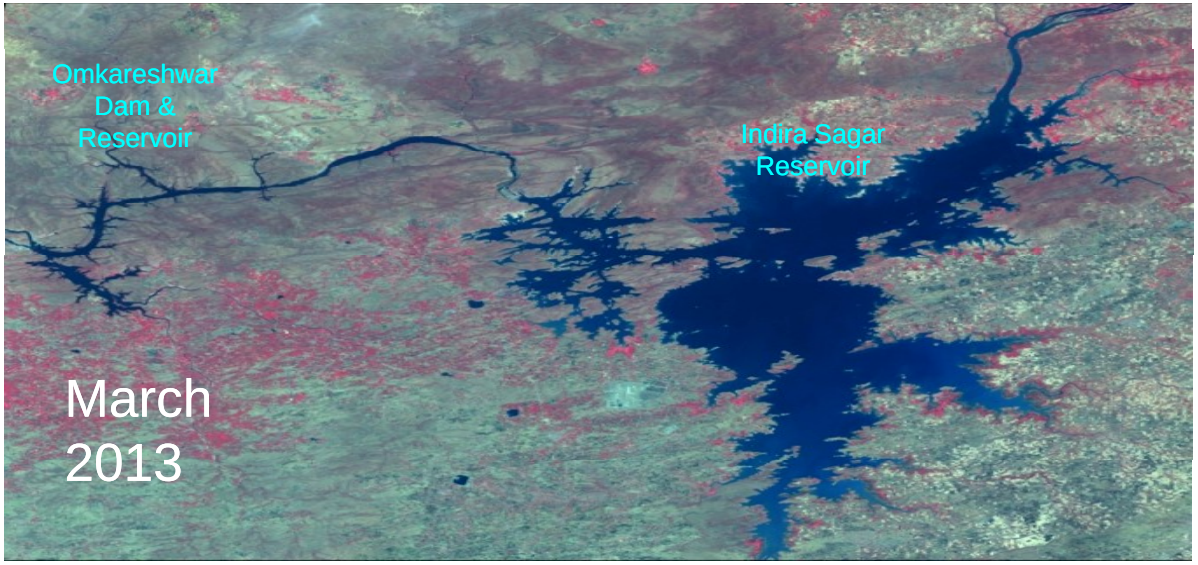
Satellite: IRS-1C
Sensor: LISS-III
Path-Row: 102-62 *Date of Pass:* 14.04.2000

Satellite: Resourcesat-1
Sensor: LISS-III
Path-Row: 102-62 *Date of Pass:* 10.07.2011

Ennore port is located on the east coast of India in Tiruvallur district, about 24 km north of Chennai. Initially envisaged for decongesting the busy Chennai port, this artificial port has now become the 12th largest port of India, and is still expanding.



Satellite: **IRS-1C** ***Sensor:*** **LISS-III** ***Path-Row*****: 96-56**
Date of Pass: **31.03.1998**

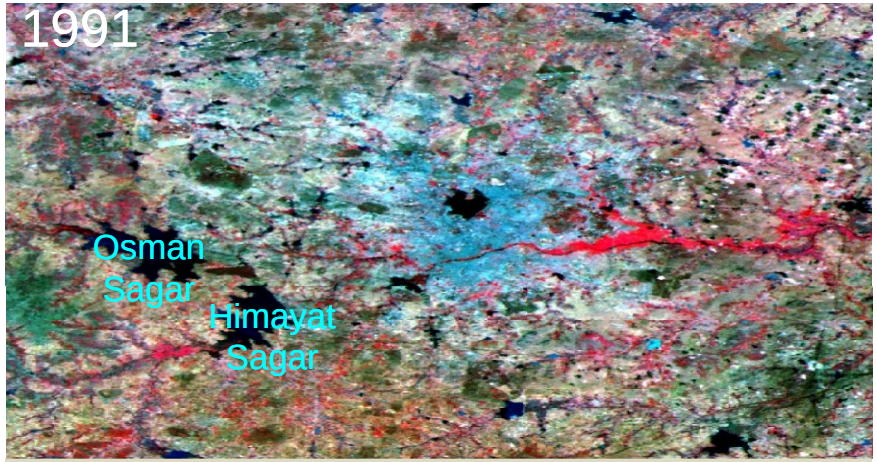


Satellite: **Resourcesat-1** ***Sensor:*** **LISS-III** ***Path-Row*****: 97-56**
Date of Pass: **12.03.2013**

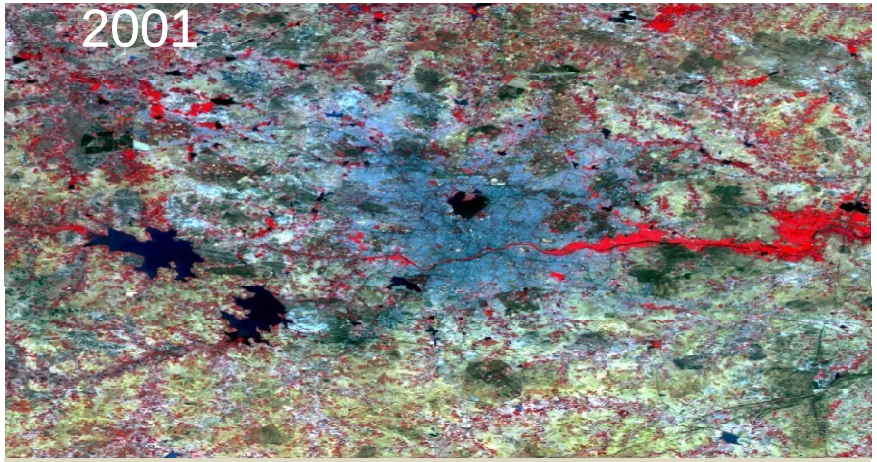
The Narmada is the largest westward flowing river, rising near Amarkantak range of mountains in Madhya Pradesh.

The images here depict the pre and post-construction terrain conditions of Omkareshwar and Indira Sagar projects. The twin projects store 13.207 BCM, providing annual irrigation service over 4.12 lakh hectares and generating 1520 MW power.

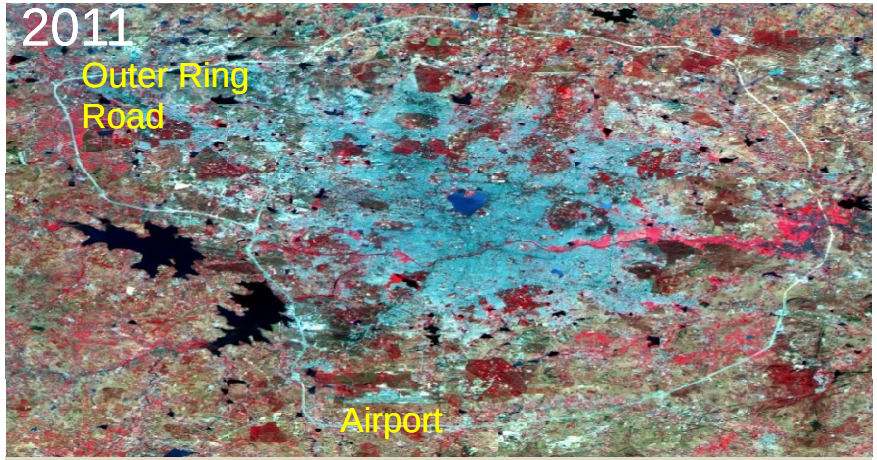
Narmada basin, Madhya Pradesh



Satellite: IRS-1A *Sensor:* LISS-I *Path-Row*: 25-56 *Date of Pass*: 10.01.1991



Satellite: IRS-1D *Sensor:* LISS-III *Path-Row*: 100-60 *Date of Pass*: 18.02.2001

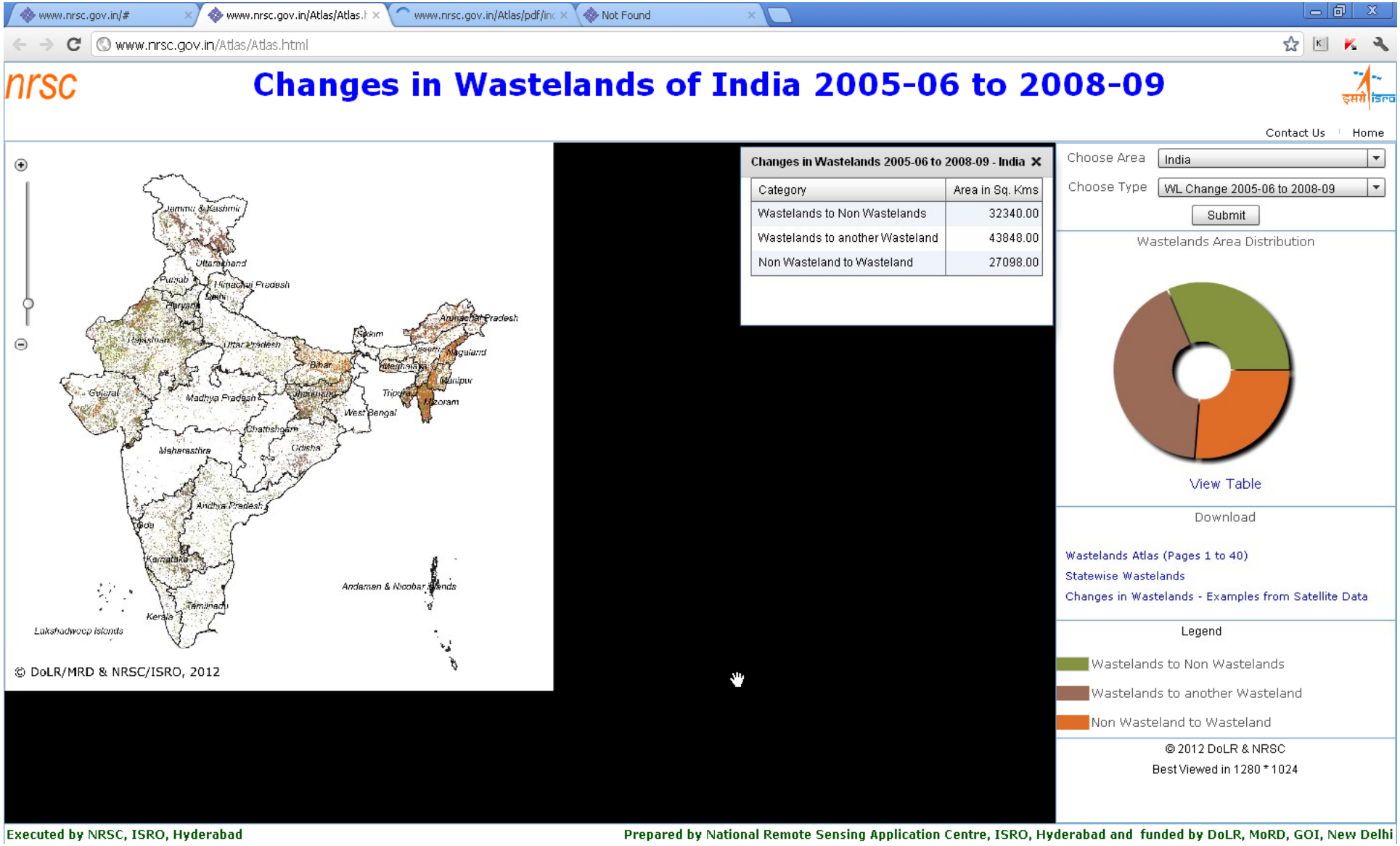


Satellite: Resourcesat-1 *Sensor:* LISS-III *Path-Row*: 100-60 *Date of Pass*: 13.01.2011

Hyderabad – a 400-year old city The past two decades have seen rapid development in Hyderabad, which is expanding at its fringes. LISS-I and LISS-III sensor images from 1991 to 2011 bring out the changes in the land use in Hyderabad city and its surroundings. Among the major infrastructural changes that are clearly seen on the images are the Outer Ring Road and the Hyderabad airport in 2011 image.

Hyderabad and Surroundings, Andhra Pradesh

Visualization of All India Waste land Maps



HIGHLIGHTS OF THE STUDY

- **Total Wasteland area decreased by about 32,000 Sq. Km.(32.00 lakh hectares) during 2005-06 and 2008-09.**

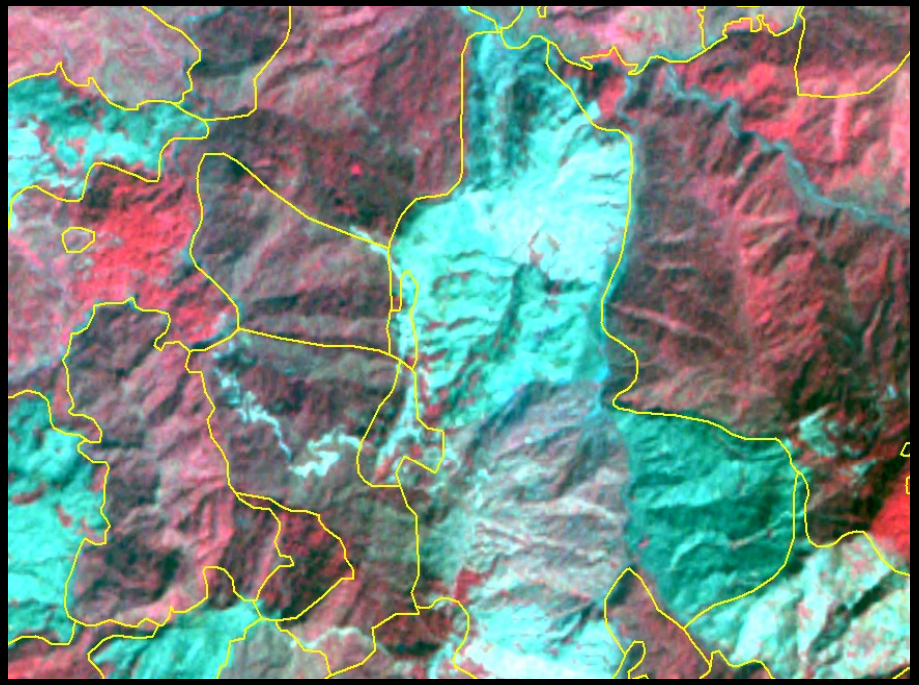
- **The declining trend observed in 21 states of the country – mainly in Rajasthan(10264 sq.km), Mizoram(2669 sq.km.), Manipur(2391 sq.km.), Gujarat (2858 sq.km.), Bihar(1895 sq.km.), Karnataka(1478 sq.km.), Andhra Pradesh(1682 sq.km.) and Uttar Pradesh(1269 sq.km.).**

- **Majority of wasteland area (20,000 Sq. Km) changed into 'cropland' (including 'fallow') class.**

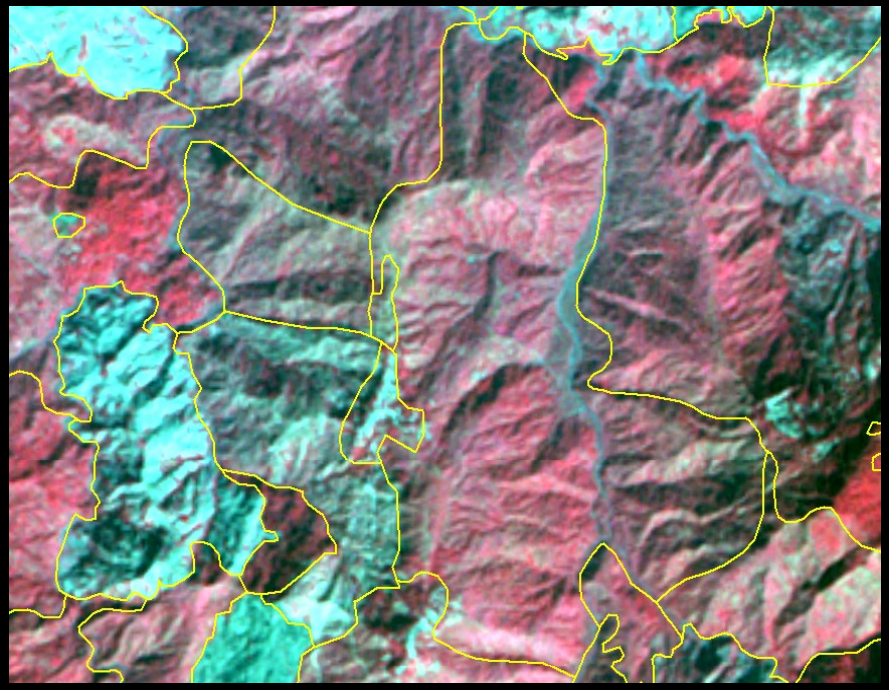
- **Change also noticed from 'degraded forest - scrub dominant' to 'forest-dense / open' & 'forest plantation' classes (9,600 Sq. Km.).**

- **About 800 Sq. Km. of wasteland has been converted into other plantations.**

Forest (Open/Dense) to Shifting cultivation
Tirap District, Arunachal Pradesh

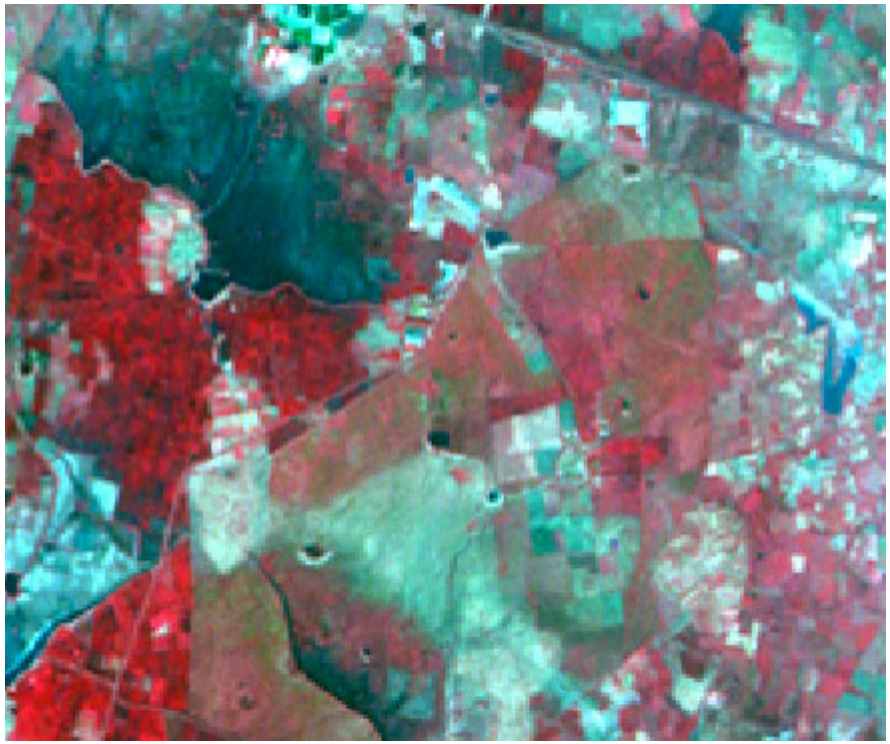


Feb 2006



Feb 2009

WASTELAND CHANGES



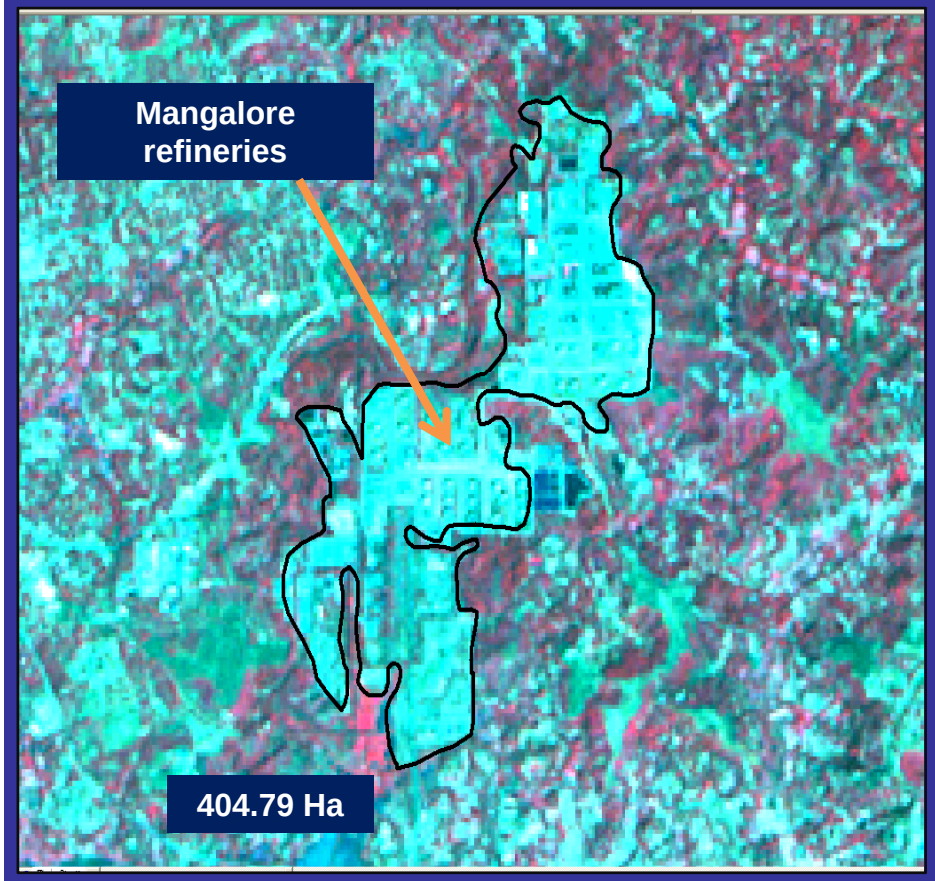
Oct 2006

Ahmedabad District, Gujarat

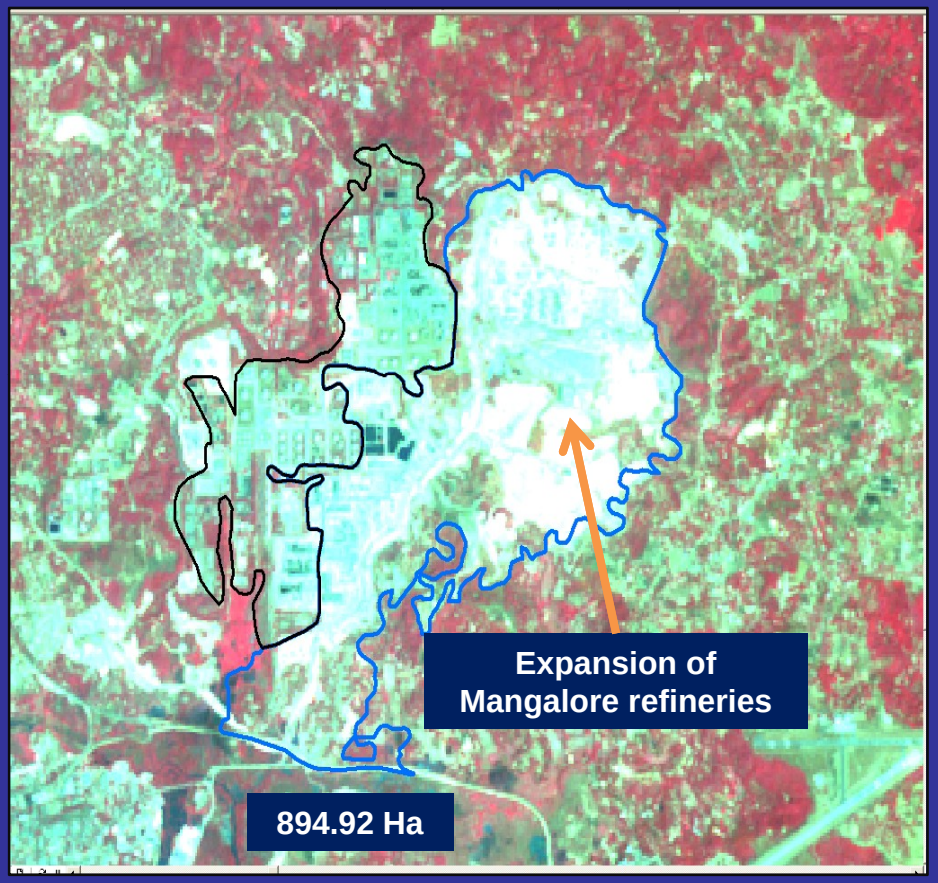
Scrub land to Industrial

Oct 2009

Sample change areas – Dakshin Kannada, Karnataka



2005-06 Rabi Image



2011-12 Rabi Image

Scrub land (Dense area) to Industrial Area (CC)

GT Photographs – Dakshin Kannada, Karnataka

Industrial Area (Expansion of Mangalore Refinery)

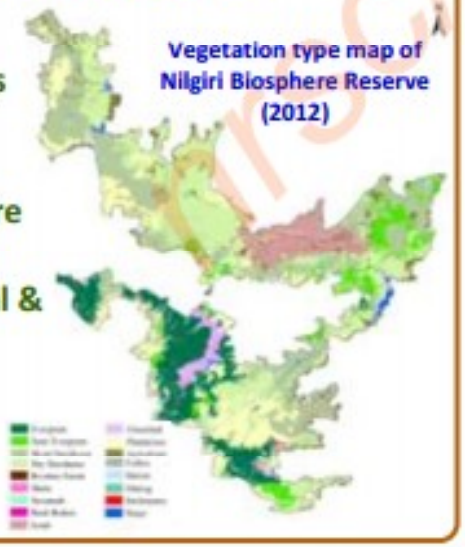
Remote Sensing Applications - User Projects

Ground Water Prospects Mapping under RGNDWM - Phase IV

- Ground Water Prospects & Sustainability mapping of entire country is completed
- Final EQC is finalised for NE Sates and UTs & Islands, DB organisation/ Info. System on Bhuvan
- National and Regional level trainings for about 1800 officials.
- Ground Water Quality mappingfor 9 States.

National Inventory and Monitoring of Four Biosphere Reserves

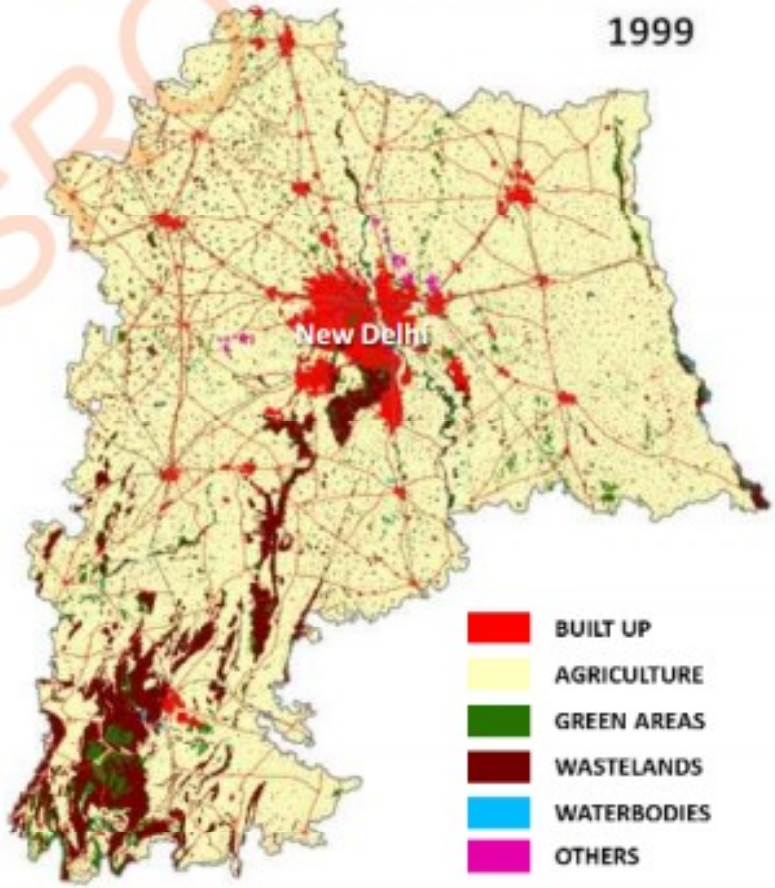
- Monitoring of Land use/land cover changes with a focus on vegetation types after declaration as biosphere reserve in Nilgiri, Agasthyamala, Similipal & Rann of Kachchh
- Conservation prioritisation of forest landscapes.



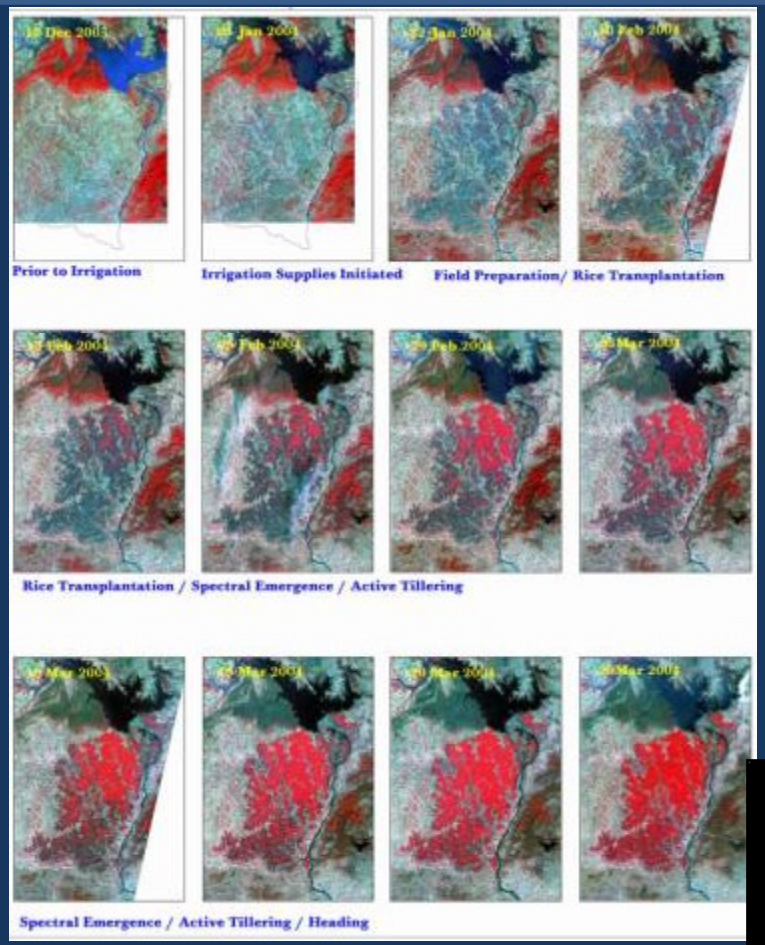
Vegetation type map of Nilgiri Biosphere Reserve (2012)

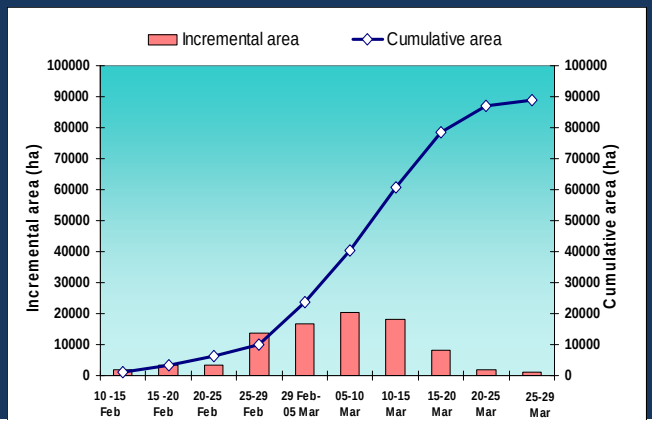
National Capital Region

- Change in Land use/cover (1999-2012)
- Built up increased by 2.8%.
- Agriculture & Green areas reduced by 1.5%



In-Season Inputs for Improved Water Distribution





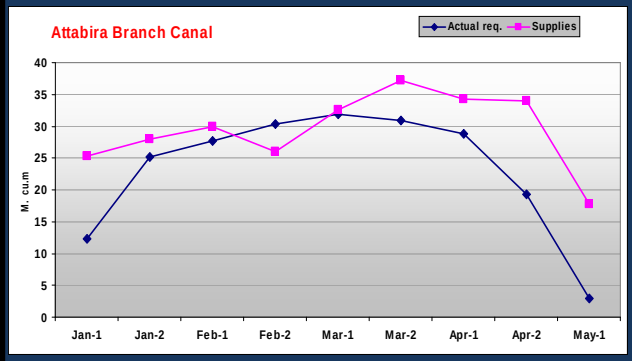
Impact of Improvement Interventions

1993

1995

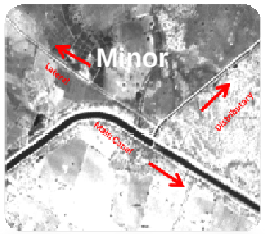
2002

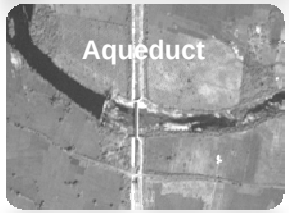
2007



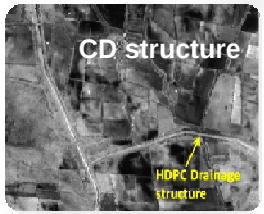
Inventory of Irrigation Infrastructure

Canal network

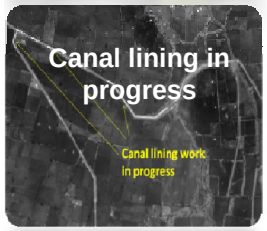




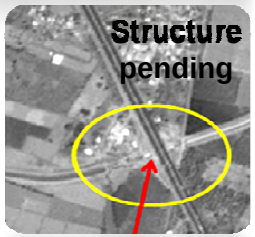
Structures

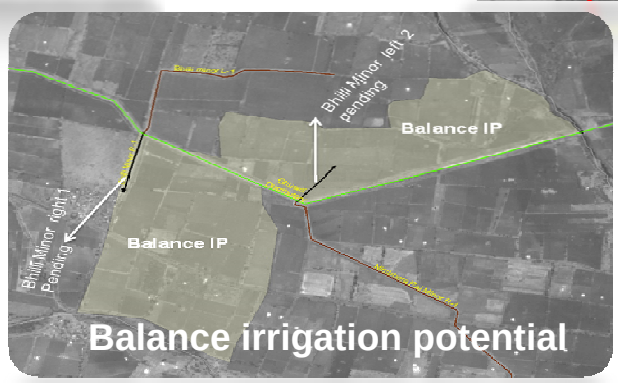


Physical status of canals



Critical gaps





Assessment of Irrigation Potential

Assessment of Irrigation Potential created is estimated by comparing the canal network in terms of nos., lengths, its status together with information and status on irrigation and drainage structures with the planned / executed works

- % physical progress
- Critical gap areas
- Irrig.potential created

Remote Sensing Applications - User Projects

Technology Transfer to User through Bhuvan Applications

- **Assessment of Irrigation Potential created in AIBP Projects - Phase-II completed in December 2012 - 50 AIBP projects in 14 states covering 0.85 M.ha; Online monitoring of AIBP projects using BHUVAN web services**
- **National Urban Information System (NUIS) - 150 towns database hosted in Bhuvan; web based application developed for preparation of master plan by town local bodeis**

Monitoring of Glacial Lakes/Water Bodies

- **Inventory completed using AWiFS (2009) for Himalayan river basins** *(503 - glacial lakes & 1525 - water bodies)*
- **Monitoring carried out during** *Jun-Oct for the years 2011, 2012 and 2013*

Snow melt runoff modelling

NRSC provides operational seasonal forecast (Apr to June) and experimental short term forecast (16-days) of snow melt runoff to CWC for 5 basins

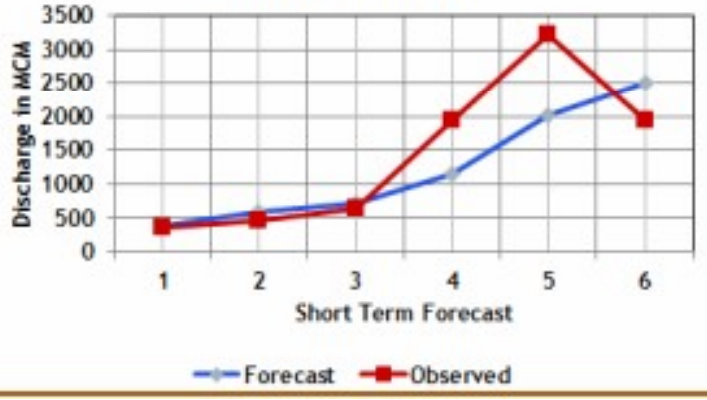
Seasonal forecast results

Basin	Forecast (MCM)	Observed (MCM)	Deviation (%)
Sutlej	3700	5173	-28.47
Beas	800	897	-10.81
Yamuna	960	4764	-79.85
Ganga - Bhagirathi	1040	968*	7.44
Ganga - Alaknanda	2320	3373*	-31.22
Chenab	6250	8527	-26.70

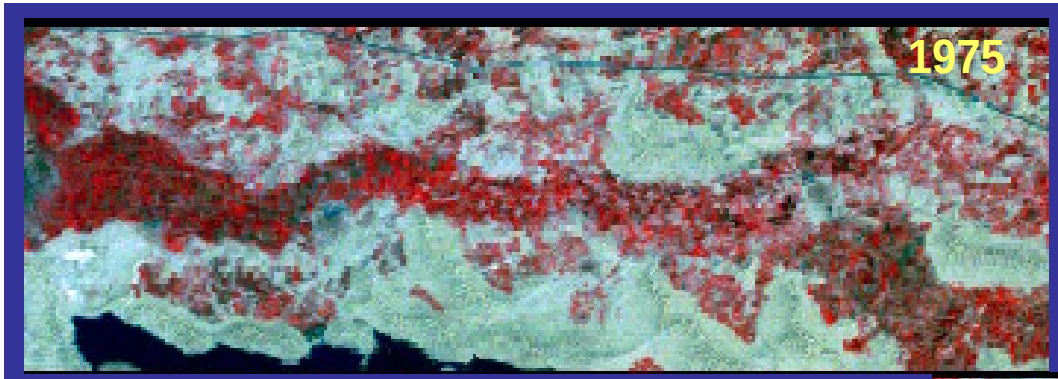
* Observed discharge data is available only till 15 Jun 2013 at Uttarkashi & Mandakini

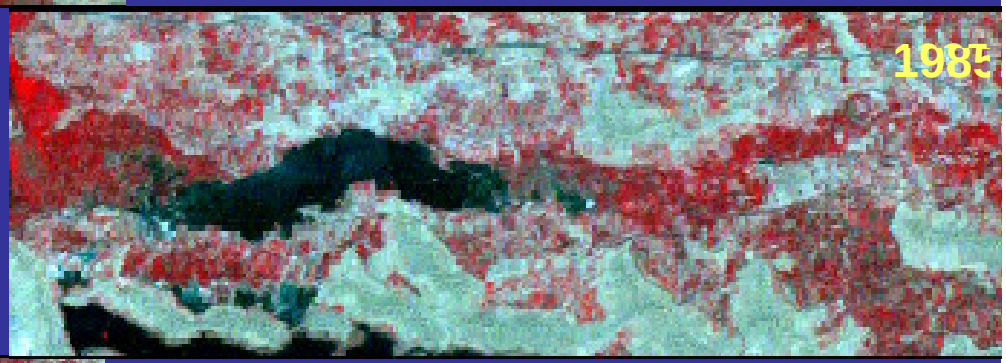
Short term forecast results

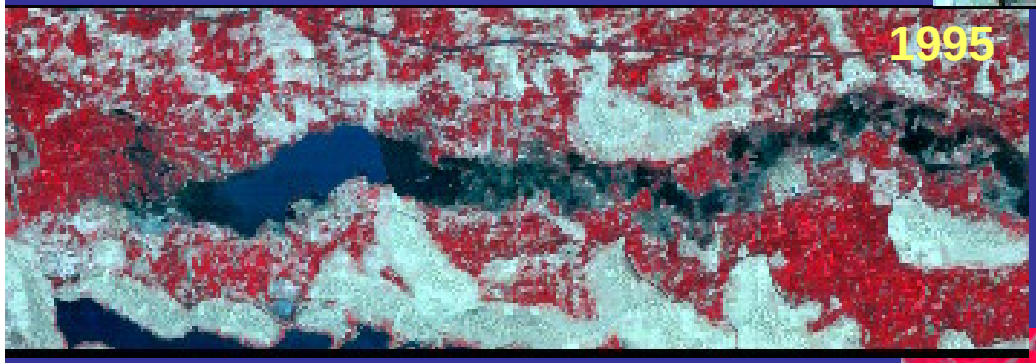
Chenab Basin

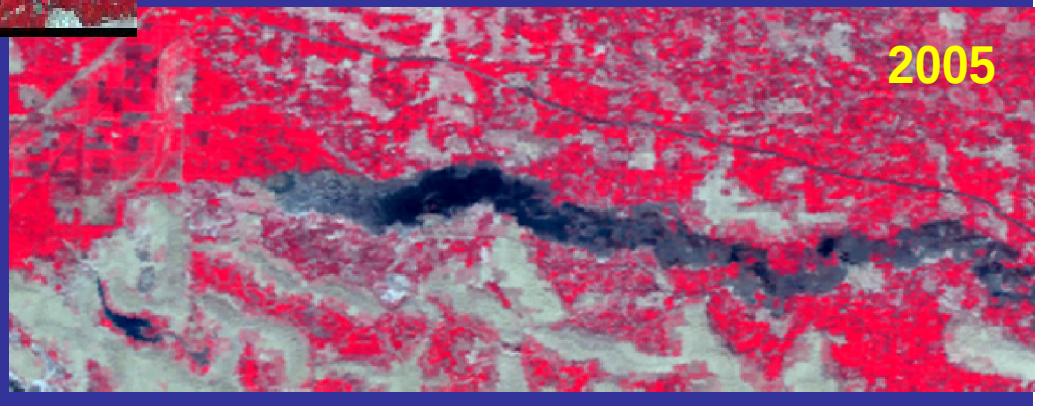


WATERLOGGING





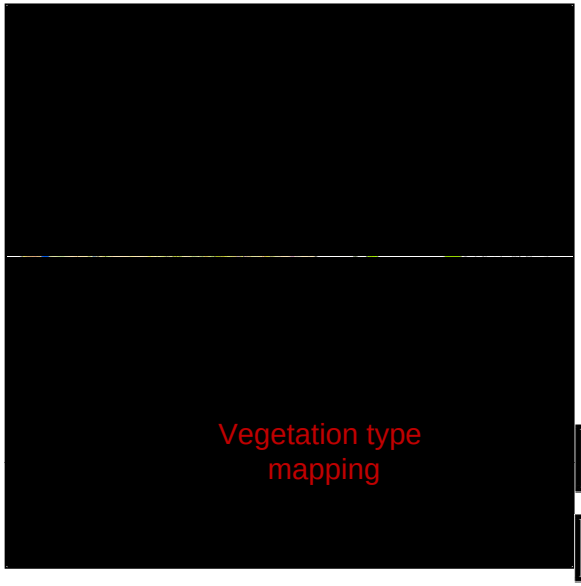


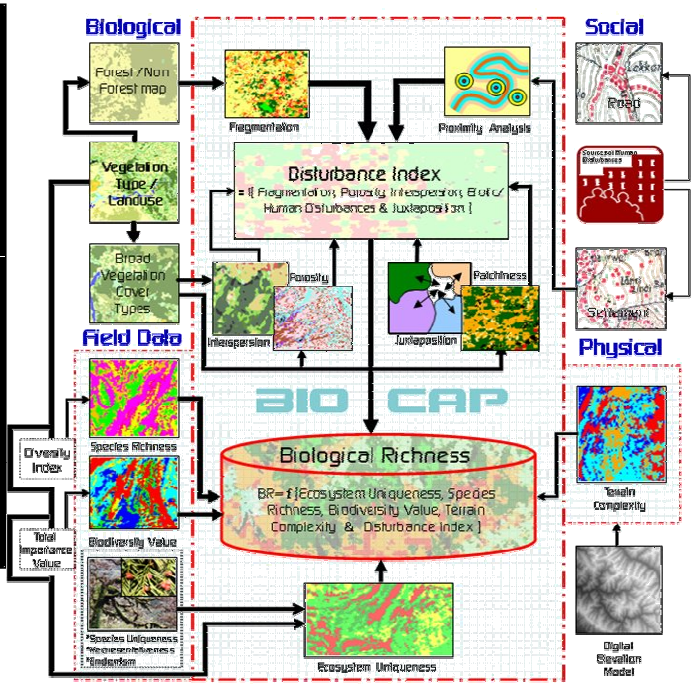


Part of Indira Gandhi Canal Command Area
(Badopal, Gaganagar, Rajasthan)

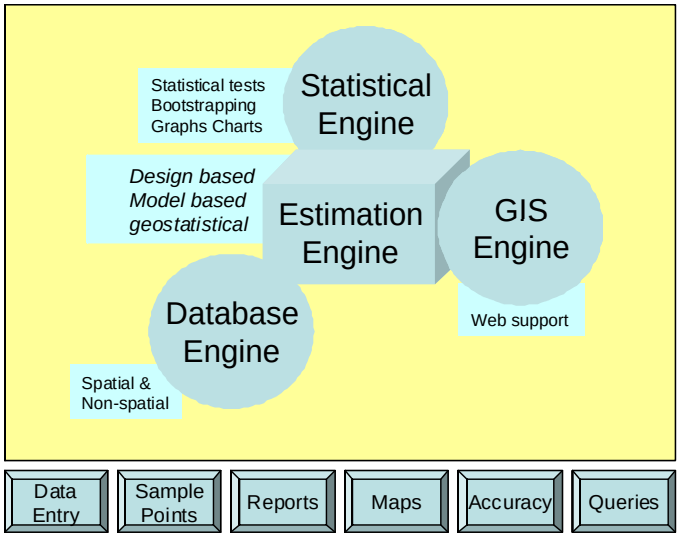
Forestry Applications

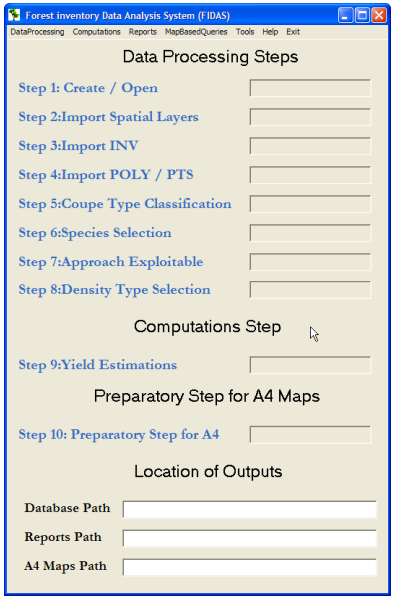
- **Forest Cover**
- **Biodiversity Characterisation**
- **Trees Outside Forests**
- **Environmental Impact:**
  Vegetation and Land cover
- **Forestry Forest Fire monitoring**
- **CDM – Afforestation and Deforestation**
- **Climate Change – NAPCC Working Plan**

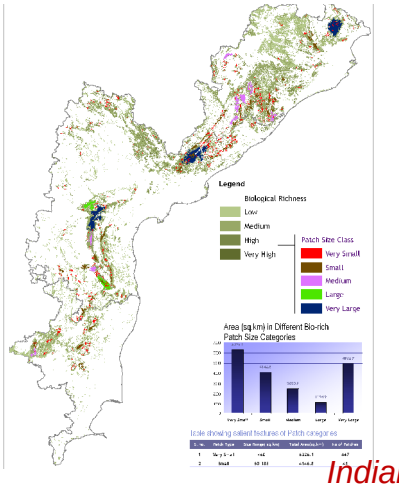


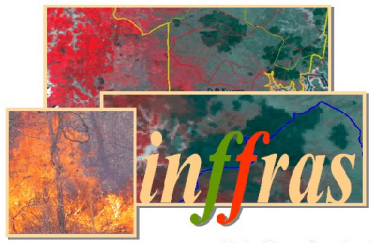


Biodiversity characterization at landscape level



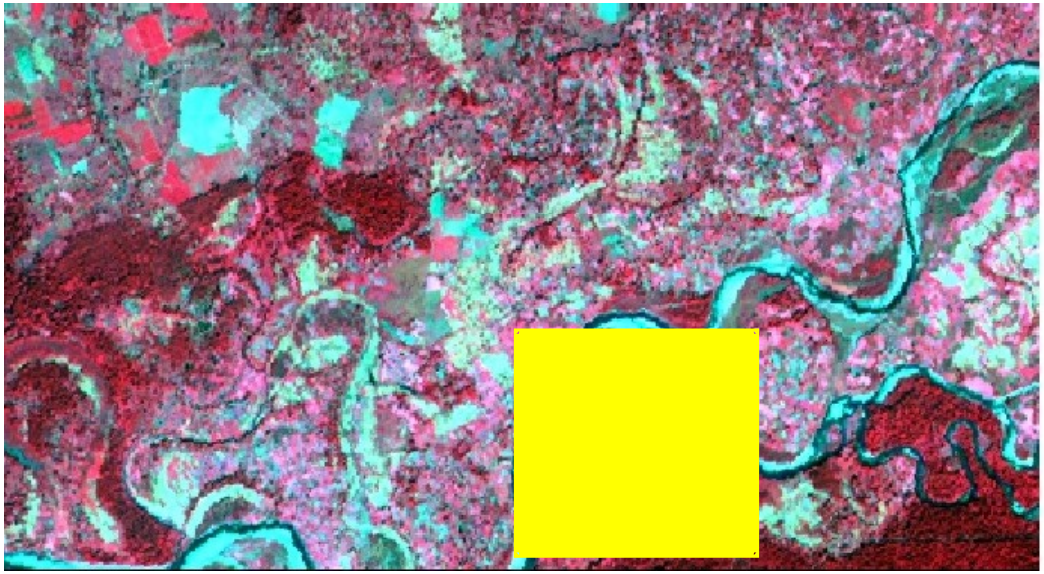






Indian Forest Fire Response & Assessment System

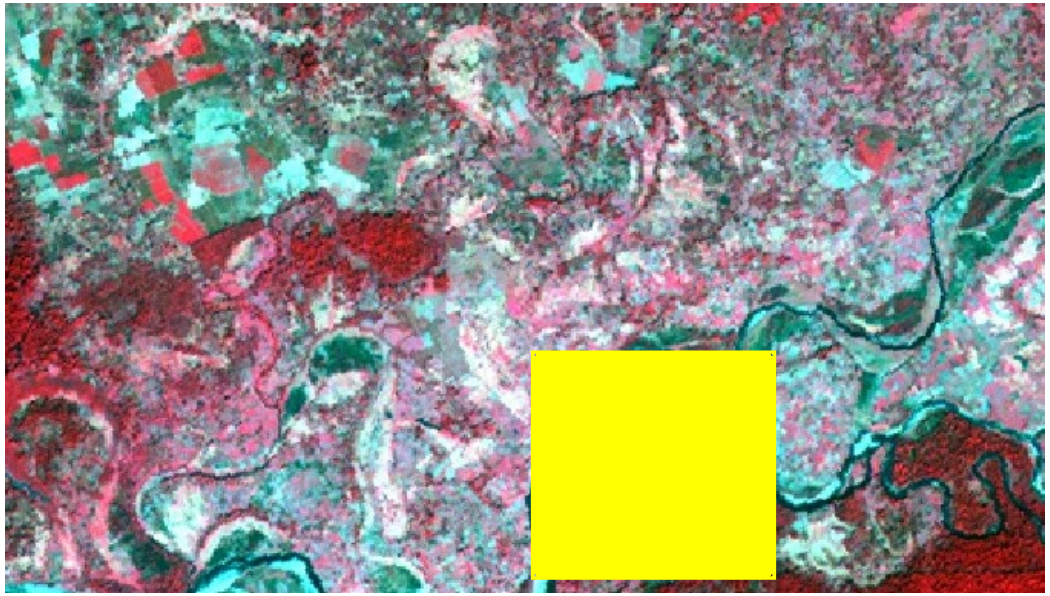
LAND TRANSFORMATIONS - FORESTS



Felling and Degradation

1998

2001



Daily Active Forest Fire Alerts During Feb-June Every Year based on TERRA/AQUA MODIS Data

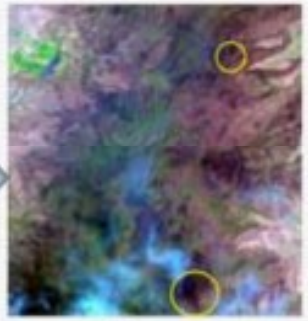
nrsc

Daily acquisition of TERRA/AQUA MODIS data

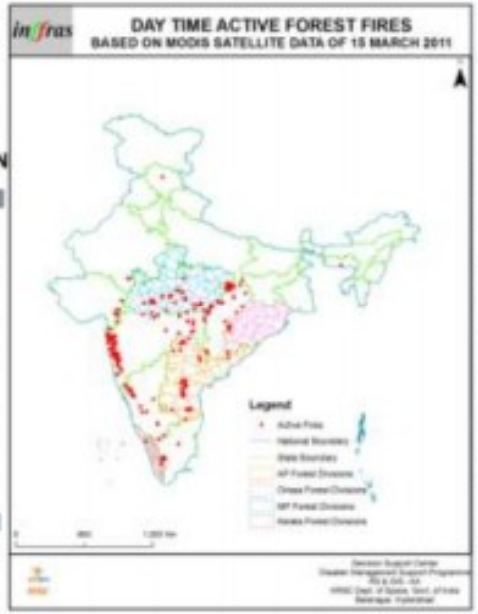
Day & Nighttime passes

Generation of ~ 4 daily Active Fire Alerts

MODIS contextual Fire Algorithm- MOD14



Value additions
- Forest Mask
- Forest Admin. overlay



2D and 3D Visualization through BHUVAN

Disaster Management Support Programme

Decision Support Center

Indian Forest Fire Response and Assessment System (INFFRAS)

Feedback

Information to ground personnel for fire mitigation

Email Dissemination to ~400 nodal officers

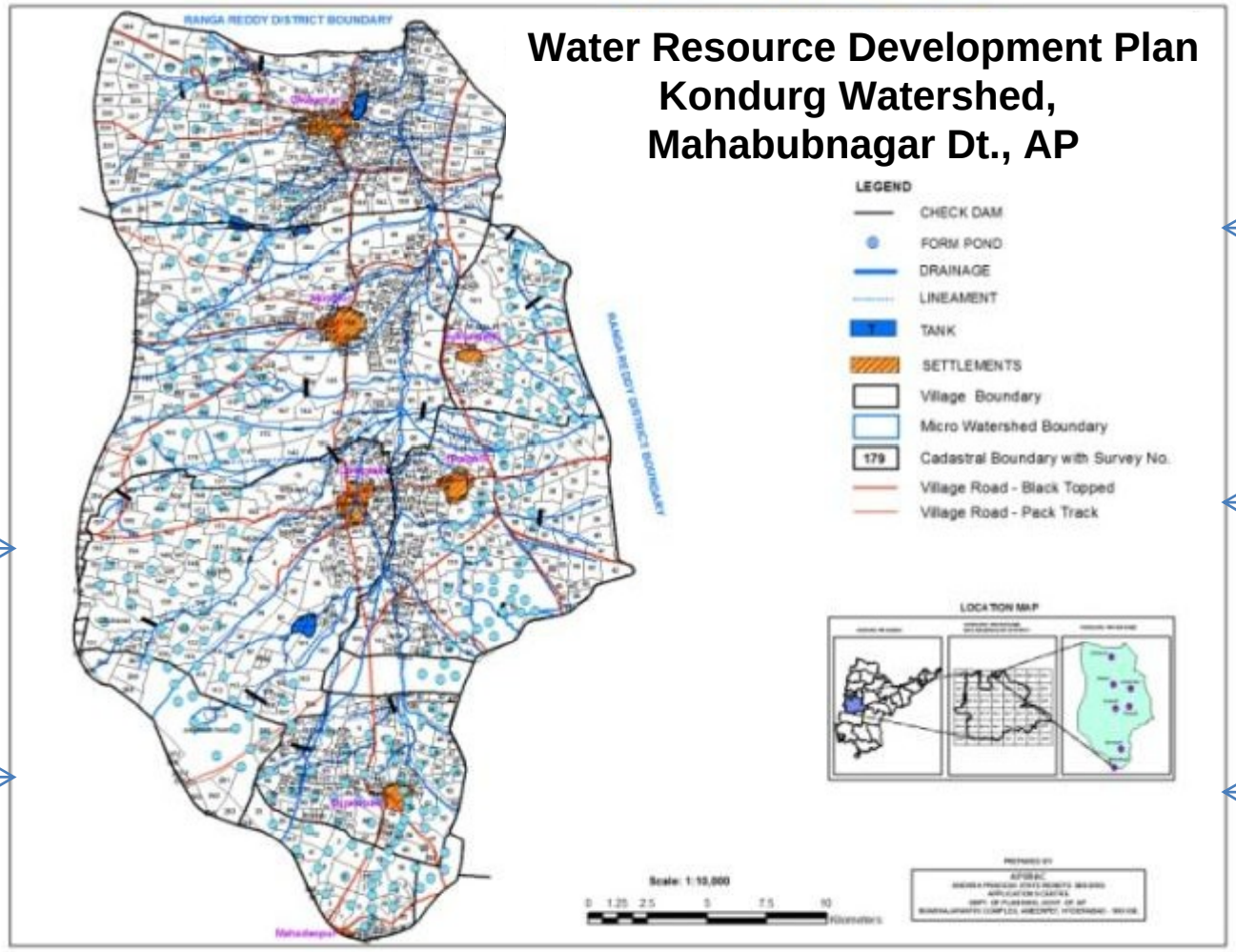
Turn-around time of less than 1/2 hr from satellite overpass

REMOTE SENSING AS TOOL FOR DEVELOPMENTAL PLANNING

Drainage

Watershed

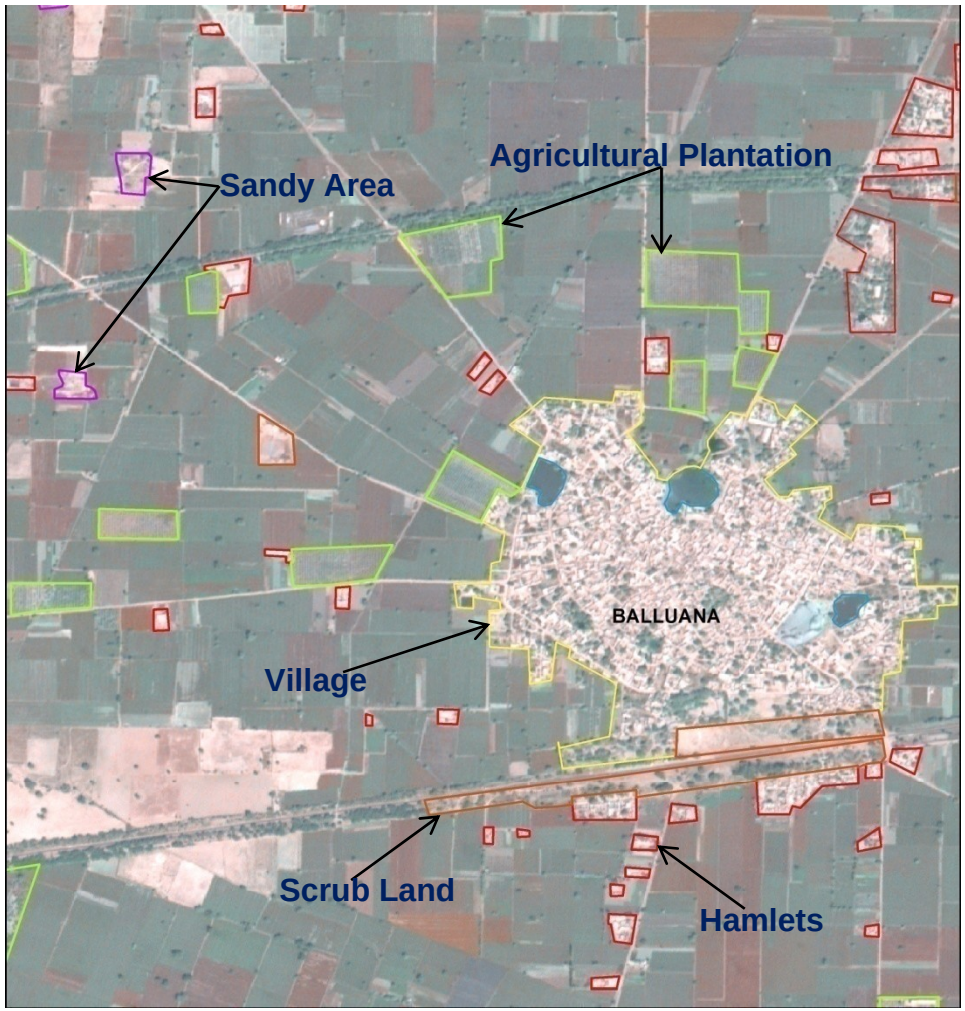
Road, Settlement

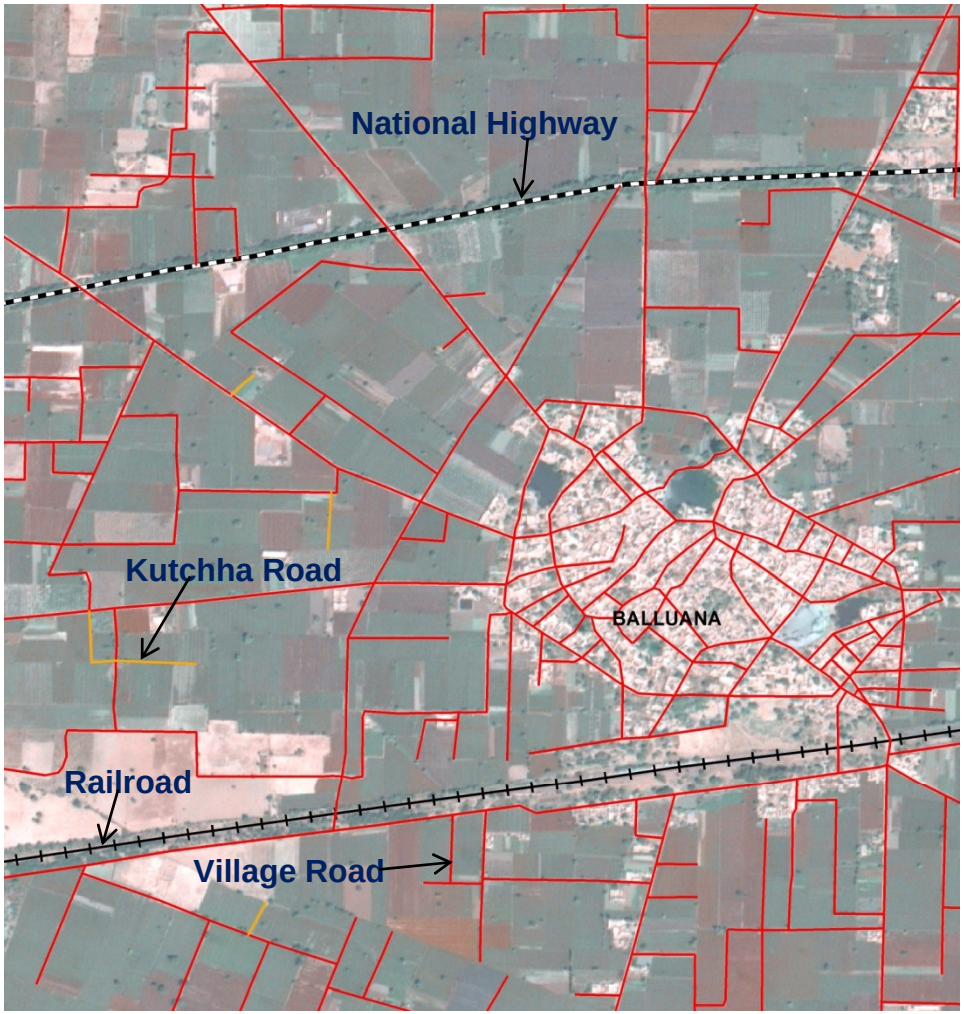


Soil

Land use Land Cover

Slope





Legend

- Aquaculture
- Crop Land
- Agricultural Plantation
- Built Up
- Forest
- Forest Plantation
- Canal
- Lakes / Ponds
- River / Stream / Drain
- Sandy Area
- Scrub Land Dense
- Scrub Land Open
- Waterlogged

Legend

- Branch Canal
- Distributary Canal
- Main Canal
- River
- Stream
- Kutchha Road
- City Road
- District Road
- National Highway
- State Highway
- Village Road
- Railroad


nrsc / ISRO
Lohgarh

High Resolution Satellite Data Showing Siltation of Tanks in Raipur Dist, Chhattisgarh

SERVICES FOR OUTREACH FREE DOWNLOADS

Implemented free access to thro Bhuvan - NOEDA

S.No.	SENSOR	ACCESS ENABLED	AVAILABILITY	DOWNLOADS
1	LISS-III	Jan-12	1 cycle	116269
2	AWiFS	Sep-11	4 seasons 2008, 2009 & 2011 Rabi 2010 Kharif,	18352
3	Carto DEM	Sep-11	1 set	47273
4	NDVI, VF	May-12	Every 15 days	1952
5	HySI	Jul-13	1 set	1025
6	OCM - GAC	Nov-10	Every 8 days	18404
7	Scatterometer	Apr-11	Daily	405443

Major National Mission Programmes

Spatial

Digital

Temporal

Societal

Information

Solutions

(Landuse / Cover , land degradation, wasteland, geomorphology, snow & glaciers, soil, forest, wetlands, biodiversity)

Irrigation infrastructure assessment under AIBP projects

National Urban Information System

Information Support Services (G to G)

Spatio-temporal thematic data base on Natural Resources

ICT enabled geospatial platform

Infrastructure Projects

Execution of Recharge Structures

Urban Planning

Information Support for Relief & Rehabilitation

Convergence of Geospatial Technologies

nrsc

GIS

RS

ICT

GPS

LBS

Band width

Photo-grammetry

Convergence

ALTM

Total Station

Total Turnkey Solutions

...cutting edge technologies

NR Census Basic Concepts

- Ability to map very high level of details (tailored to the inherent characteristics of each state maintaining at the same time a regional harmonization.

- The data-base starts from local/district level to be later assembled at state/national level.

Quote …

At the end of the day, what good is a great technology if no one wants to use it ? Geospatial technology can resolve many of the great challenges that mankind has to face in the next 20 years, but to be able to do that, we need to re-define the language, because we selling this selling this technology to people who are not experts.

More relevant to Rural Development as the users are from rural environmental set-up with typical socio-economic-political-resource constraint background

bhuvan Beta

INDIAN EARTH OBSERVATION VISUALISATION

Department of Space
Government of India

About Bhuvan | Features | FAQ | Feed Back

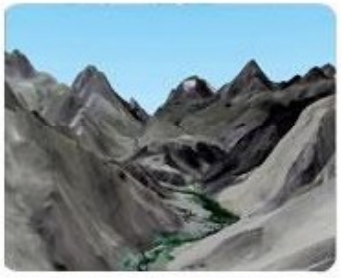
.58/15.76°C Khurda 29.79/22.90°C Kullu 14.98/6.96°C Lonavala 30.08/19.87°C Ludhiana 16.89/9.85°C Mt. Abu 26.96/

Multi Resolution Terrain

New Update

AWiFS Images (56 m) of Indonesia, Kazakhstan and Europe

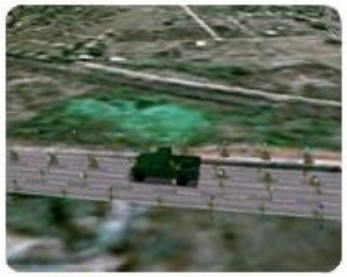
LISS IV MX Images (5.8 m) of Ahmedabad and Surroundings



Seamless Fly Throughs

Societal Applications

Thematic Vectors



3D Geographic Models

Interactive 3D Environment

Welcome to Bhuvan!

A Geoportal of Indian Space Research Organisation showcasing Indian Imaging Capabilities in Multi-sensor, Multi-platform and Multi-temporal domain. The portal gives a gateway to explore and discover virtual earth in 3D space with specific emphasis on Indian region.

WAY AHEAD .....

- Strength:
  - Ortho-corrected High Resolution Satellite Data Availability for the Country
  - Interpreted Data:
    - Wasteland, Land Degradation, Groundwater Potential, Soil, Land use….
  - Watershed and Drainage
- Gap:
  - Socioeconomic Data (Non-workers, Marginal Workers etc.): Field Input needed
  - Cadastral Overlay:

    Effective Implementation of Beneficiary Oriented Schemes

    Availabie for 4 States (Chhattisgarh, Maharashtra, Gujarat, Karnataka)

    Partially for: Andhra Pradesh, Haryana, Assam, Kerala, West Bengal, Jharkhand
- Capacity Building:
  - Through: State Remote Sensing Application Centres, RCs/NRSC, NESAC

    Government Departments and NGOs

    District and State Level Development Boards
- Concurrent Monitoring, Evaluation and Impact Assessment
- Role of NRSC/ISRO: Data (Satellite, NR), Technical Guidance, Data Dissemination through Bhuvan, WebGIS Platform and WebGIS Technical Support

Thank you