

# **BHUVAN Geospatial Services**

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BGWSA/NRSC/ISRO

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# Bhuvan – ISRO Geoportal

*Bhuvan (means earth in sanskrit) is a Geoportal platform of ISRO - hosts wide range of services that cover visualization of multi-date, multi-platform, multi-sensor satellite data, thematic maps, free data downloads, near real-time disaster services, apps for crowd sourcing and diverse geospatial applications.*

- Geoportal launched in 2009 with imagery and map visualization services.
- Open Geospatial Consortium(OGC) compliance in 2010
- Versatile viewing platform with capabilities 2D/2.5D/3D.
- Free data downloads from Data Archive (NOEDA)
- Interactive thematic services as OGC Services - Disaster Services, Special Applications
- Evolved in to *g-Governance* platform using Open Source Solutions
- Moving towards web analytics and data science platform



# Bhuvan –ISRO Geoportal

Mobile Apps (70) &  
Crowd Sourcing (100 Mn-POIs)

Information  
Services  
Geo Portals  
(195)

Sharing of  
Open Data & Services  
(100 Themes)

Satellite  
Data  
(60 TB)

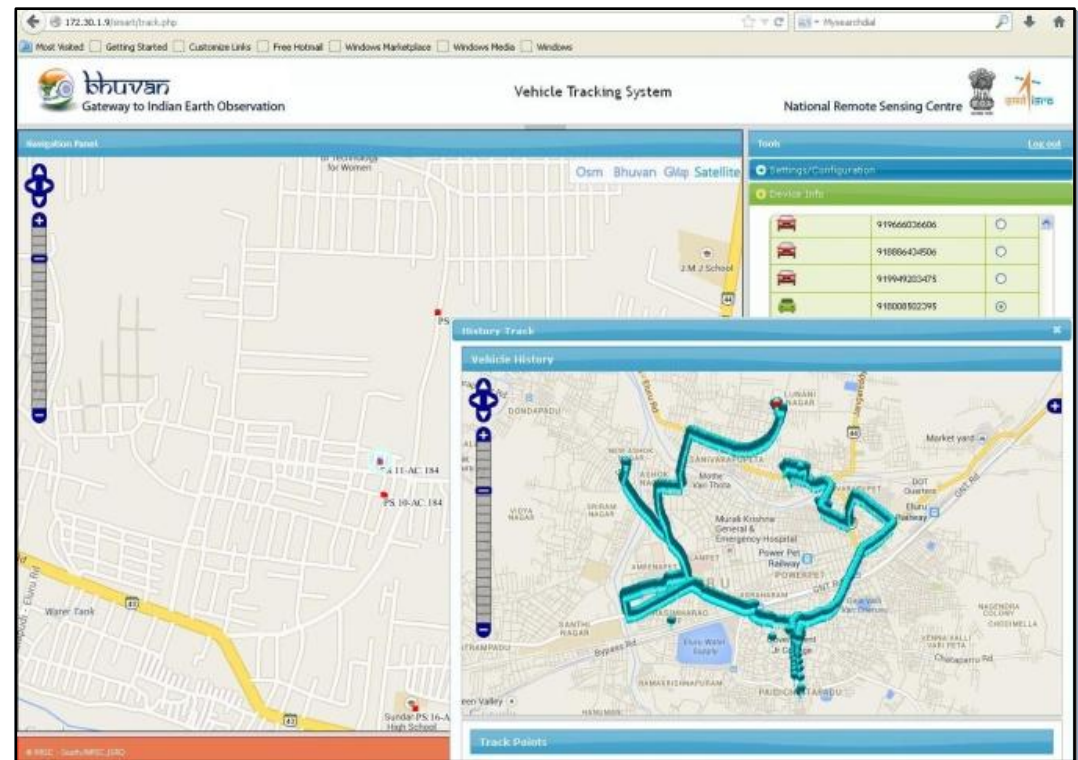
Future Plans

( API, Analytics Dash Board  
500 Servers, 49 Nodes)

“Interoperability”

# Capabilities / Tools

- Visualisation – 2D, 2.5D, 3D, Panoramic View, 360° View, 3D Models
- Data Clearing House
- Services – Thematic, Disaster, Weather, Ocean – OGC Compliance
- Asset Mapping and Inventory Creations
- Planning and Development
- Monitoring & Evaluation
- Decision Making
- Reporting & Advisory
- Resources Management
- Location Based Services



# Capabilities / Tools

## Citizen Centric Tools

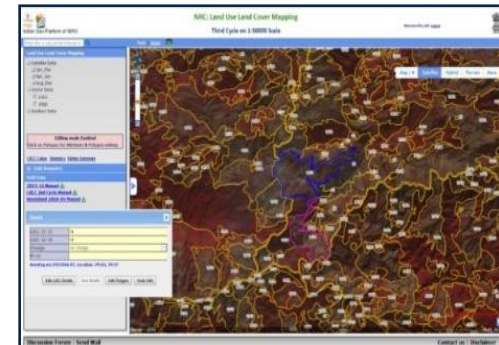
- Routing / Navigation
- Proximity / What's here – **Post, AP Health**
- Multi-Lingual
- GIS Viewer (Text to Map)
- Add Layer – Shape, KML, WMS, Raster
- Clip & Ship, Terrain Profile
- Mobile Apps – Offline Cache, Panoramic View, 3D tile services

## Decision Support Capabilities

- Vehicle Tracking – **Election Commission, Rythu Bazar**
- Decision Support Dashboard – **Planner, Bihar Health**
- Dynamic Print / Report – **Bihar, JSA, Tripura Forest**
- Near Real Time SMS Alerts – **Forest Fire**

## Platform for Mapping and Crowdsourcing:

- Online Mapping – Digitization, Editing, **NR Census Map**
- Mapper and Online shapefile Creation, Canal Progress monitoring - **AIBP**
- Customized mappers for **KFD, Postal, IWMP, NCERT**



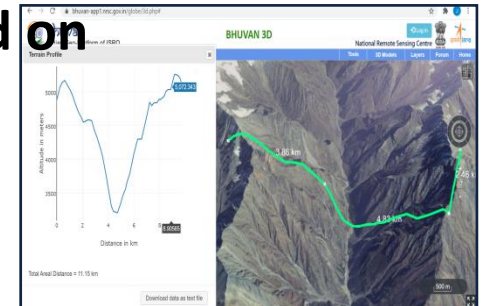
# Capabilities / Tools

## Geoprocessing Capabilities: Raster and Vector Analysis

- Analytics – **Dashboards, Citizen Information Board, Grid**
- Raster Geoprocessing – **Bio Energy, Clean Ganga**
- Time Series – Temporal data, Transparency, Swipe, VIC
- On Demand EO Services - **NDVI**
- Geoprocessing – AOI, Query shell – **Thematic Services**

## Framework for Collaborations and Mashup

- **API** – Proximity, Routing, Geocoding, Reverse Geocoding, Maps, Thematic Statistics, Trends based on theme/AOI, Geoid
- Collaborative Mapping – **School Bhuvan, Disaster**
- Framework – State, Country, International
  - State Portals, Mashups with State Dept.
  - SAARC Portal, Srilanka Data Viewer
- Grid based data to Spatial platform (**VIC, IMD, NARL, Heatwave**)



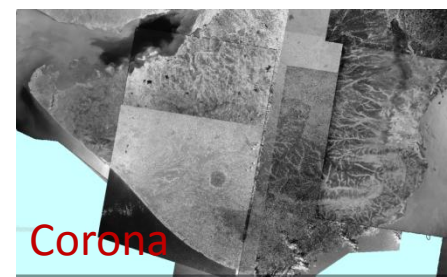
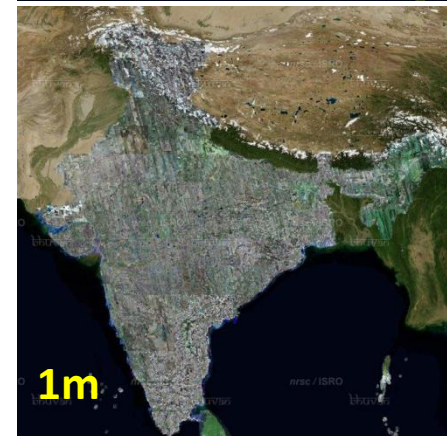
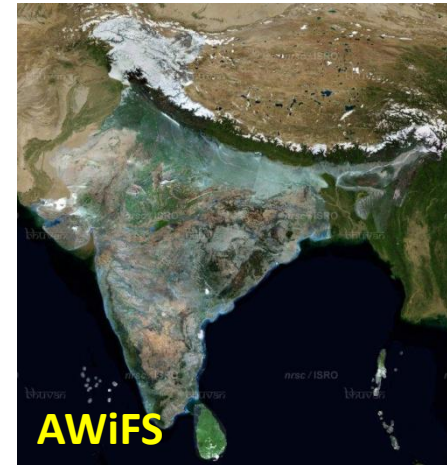
## Support to Strategic Sectors

# Data & Services

- **Satellite Imageries visualization: 1 - 360 m, CartoSat- 1 & 2, LISS-IV, LISS-III, AWiFS, OCM, ScatSat,**
- **Administrative Boundaries: International, State, District, Taluk, Village, Cadastral**
- **Infrastructure: Golden Quadrilateral, NH, SH, DH, Village, Cart Track, Foot Path; Railway Tracks & Stations**
- **Hydrological datasets: Basin, Subbasin, watershed, Micro watershed, Drainage; Reservoir, Lakes**
- **Multi scale thematic data & maps (250K to 4K scale): Country to Town : 14 themes; Disaster**
- **Point of Interest: ATM, Banks, Post Office, Worship Places etc.(24+ Categories with more than 10 M)**
- **Data download: Satellite, Thematic & Project specific 75+ products, 14L+ downloads**

- **OGC Compliance 10K+ Services**
- **Interoperable, Scalable, Customizable**
- **Load balanced & High Availability**

Resolution	#layers
1m	3 Nos
1.5m	In Progress
2.5m	2 Nos
5m	2 Nos
25m	3 Nos
50m	10 Nos
Corona	1 No

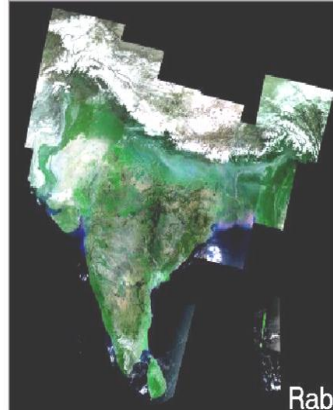


# Bhuvan : Satellite images for Visualization

- Indian Remote Sensing Satellites Images of 56m to 1m spatial resolution
- Satellite Photographic Block adjustment for high planimetric accuracy of CE90 5m using GCP Library.
- Seamless country mosaics with feature continuity across Indian region for online mapping

## SATELLITE DATA

Sl.No	Layer Name	Quantity
1	AWIFS	14 Layers
2	LISS-III	5 Layers
3	AWIFS Ortho Tiles	47 Layers
4	LISS-III Ortho Tiles	21 layers
5	LISS-IV	2 Layers
6	Cartosat-1 + LISS-IV MX (2.5m)	2 layers
7	Cartosat-2S (1.5m)	1 layer
8	HR Data - 1m	3 Layers
9	HR Data - 0.5m	1 layer
10	Cartosat-3 (0.3m)	1 layer partial
11	Corona - Historical data	1 Layer



IRS: AWIFS

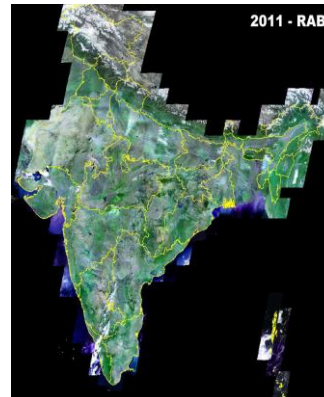


IRS:LISS-IV



HR Satellite Data

○ 1m spatial Res.

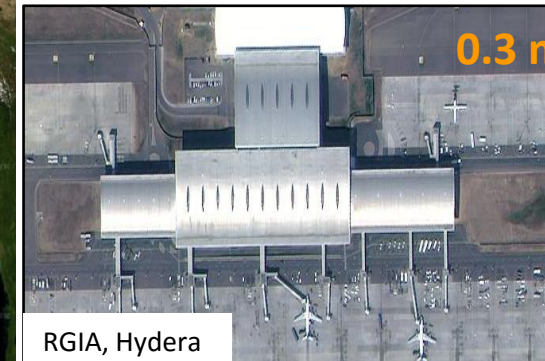


IRS: LISS-III



IRS:Cartosat-1

○ 2.5m spatial Res.



RGIA, Hydera bad

VHR Satellite Data

0.3m spatial Res

“Number of hits of High resolution Satellite data is **707+ million numbers of hits** in year 2021”



# NRSC Open EO Data Archive(NOEDA) : Free Download Data & Products

Unified Portal for providing free downloads of Project Specific, Theme specific and Satellite Data

## Products

Gateway for dissemination of NRSC in house generated products

NOEDA Free Satellite data download is Orthorectified Image Tiles, with out contrast enhancement , as per SOI OSM series map..

### NICES (62 Products)

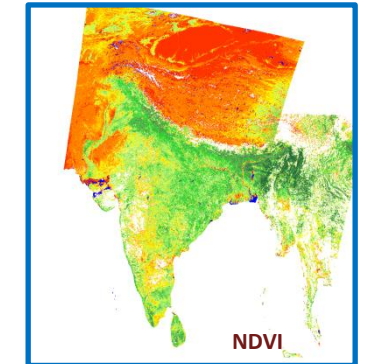
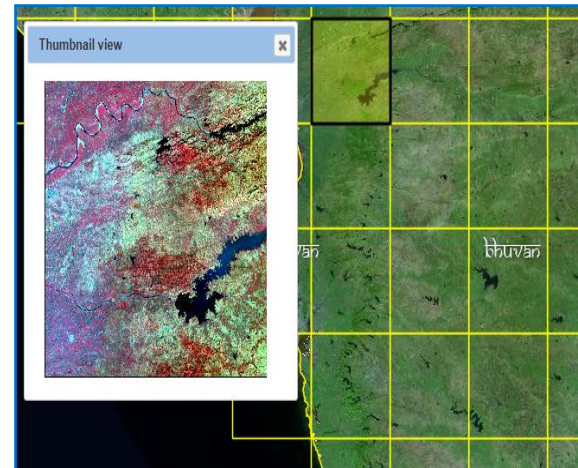
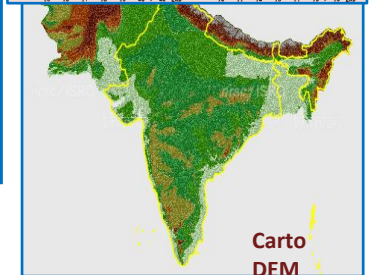
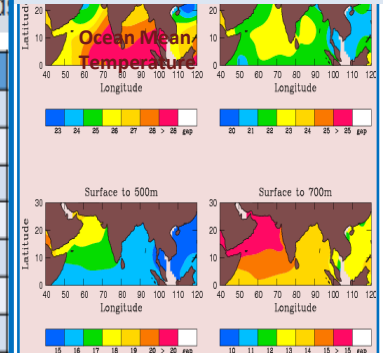
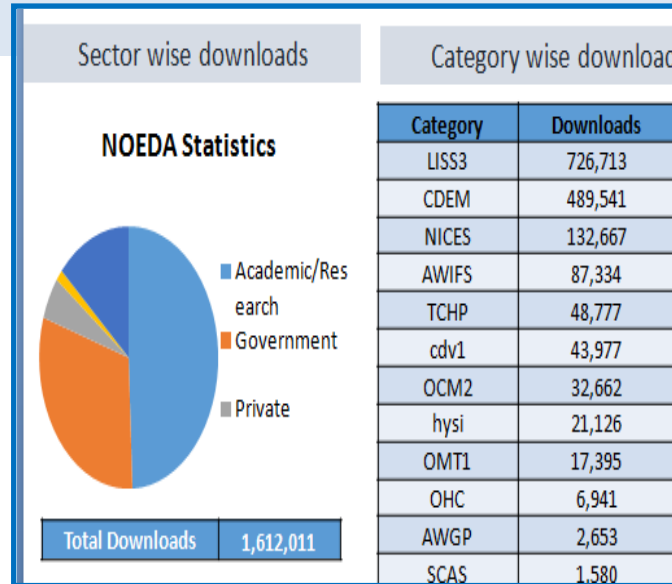
- Terrestrial Products – 25
- Ocean Sciences Products – 30
- Atmospheric and Climate products – 4
- Cryospheric Products – 3

### Digital Elevation Model

- Three Versions of DEM

### Satellite Free data download

- AWiFS, LISS-III and Hysi



❖ Total of 1,612,011 products were downloaded by users  
(2,47,244 NICES products, 8,29,052 Satellite data tiles, 5,54,179 CartoDEM tiles)

# ECVs- Environment and Climate Variables



Terrestrial Sciences

Ocean Sciences

Atmospheric Sciences

Model Derived Products

Cryospheric Products

**Bhuvan**  
Gateway to Indian Earth Observation

Welcome User [Login](#)

National Remote Sensing Centre

Open Data Archive:

[FAQ](#) [Policy](#) [Disclaimer](#) [Feedback](#)

[Backlog](#) | [Download List](#) | [Tools](#) | [Updates](#) | [Bhuvan Store](#) | [Help](#) | [Home](#)

NRSC/SRO Open data and product archive facilitates the user to select, browse and download data from this portal

Select Category :  Satellite/Sensor  Theme/Products  Program/Projects

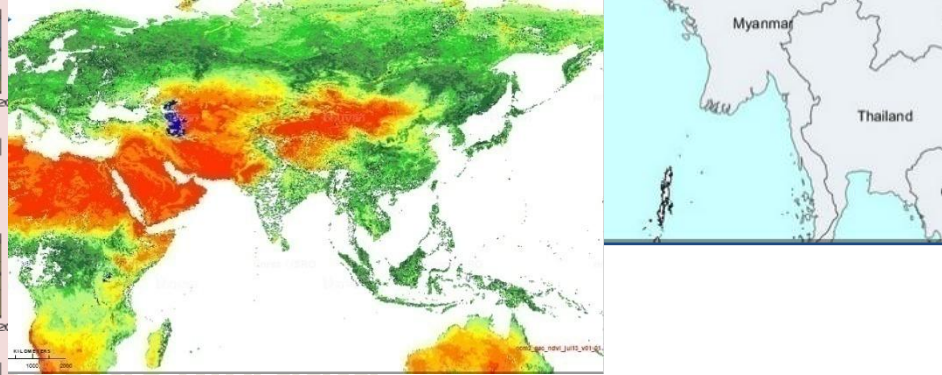
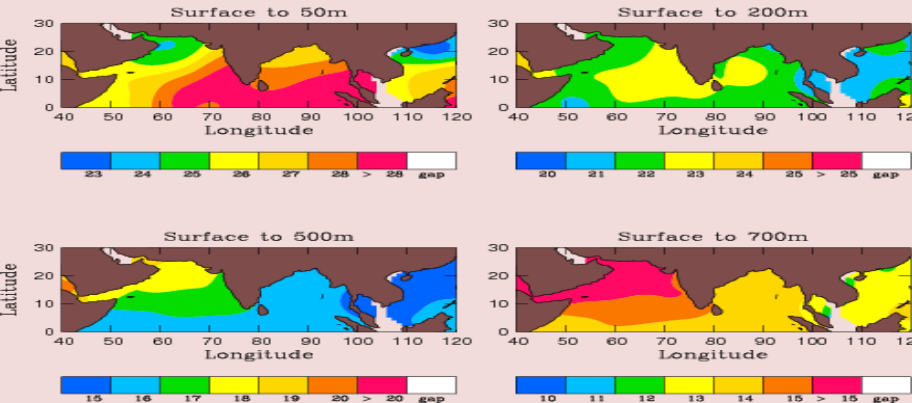
Select Project : National Information System for Clim

Select Group : Atmospheric and Climate Sciences

Select Product :  
Atmospheric and Climate Sciences  
Ocean Sciences  
Terrestrial Sciences



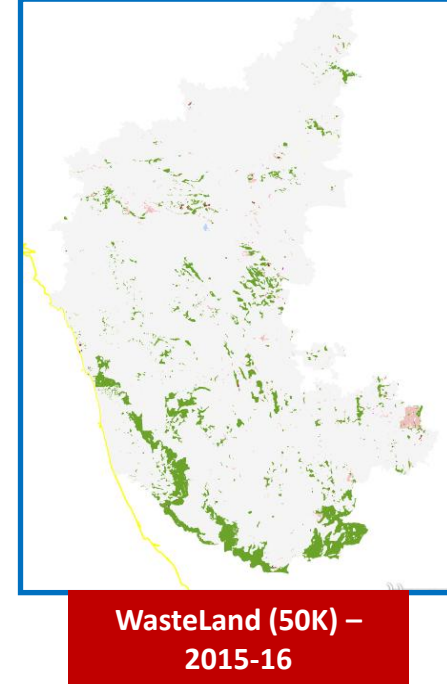
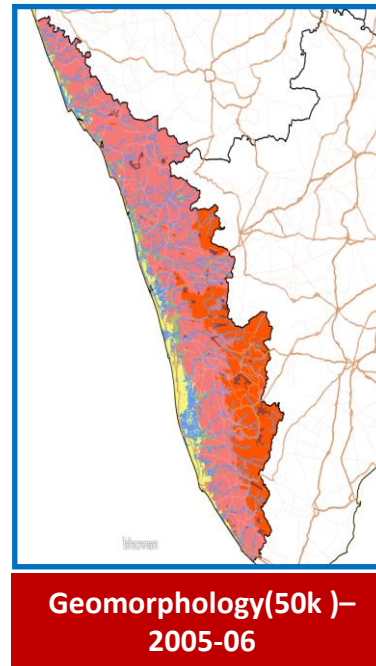
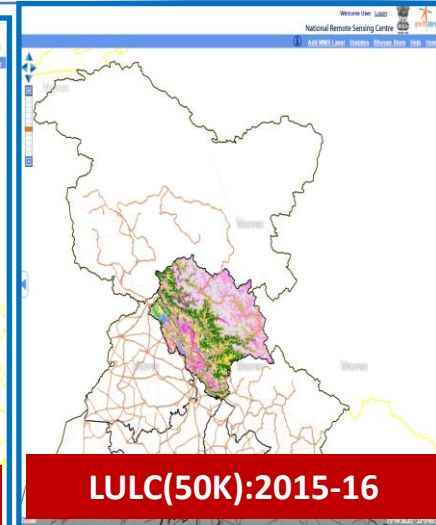
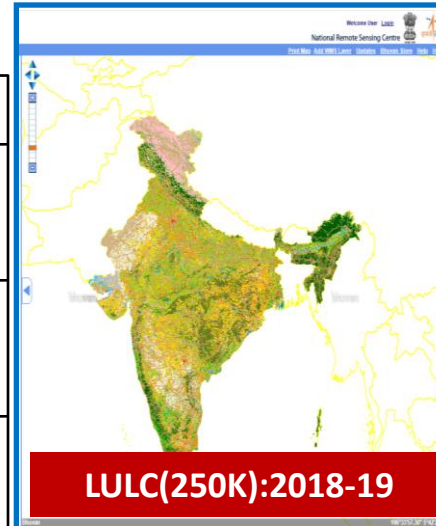
Ocean Mean Temperature (°C)  
2015 02 03



# THEMATIC DATA SERVICES

## THEMATIC LAYERS

S.No	Layer Name	Scale	Year
1	<u>Land Use Land Cover –LISS-3</u>	1:50000	2005-06 / 2011-12/2015-16
2	<u>Land Use Land Cover - AWiFS</u>	1:250000	2004-05 to 2018-19
3	<u>Land Use Land Cover- Carto L3</u>	1:10000	2009-11
4	<u>Land Degradation –LISS-3</u>	1:50000	2005 - 06 / 2015/16
5	<u>Urban Land Use - NUIS</u>	1:10000	2006-07
6	<u>Wastelands Monitoring</u>	1:50000	2008-09 / 2015-16
7	<u>Glacial Lakes / Water Bodies</u>	1:250000	Indian Himalayas
8	<u>Geomorphology</u>	1:50000	2005-06
9	<u>Lineament</u>	1:50000	
10	<u>Flood Hazard</u>	1:250000	1998-2007
11	<u>Flood Annual Layers</u>	1:250000	1999 - 2010



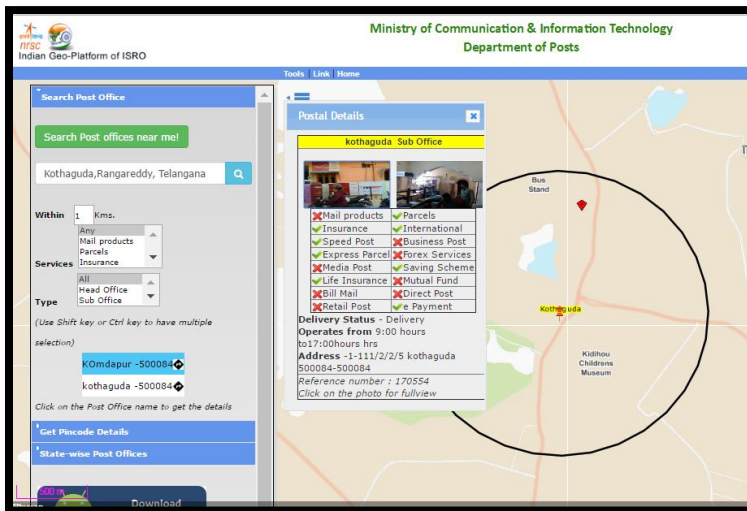
❖ Users to select, browse and query the Thematic Datasets

❖ Users can consume Thematic Datasets and integrate into their systems as OGC Web Services

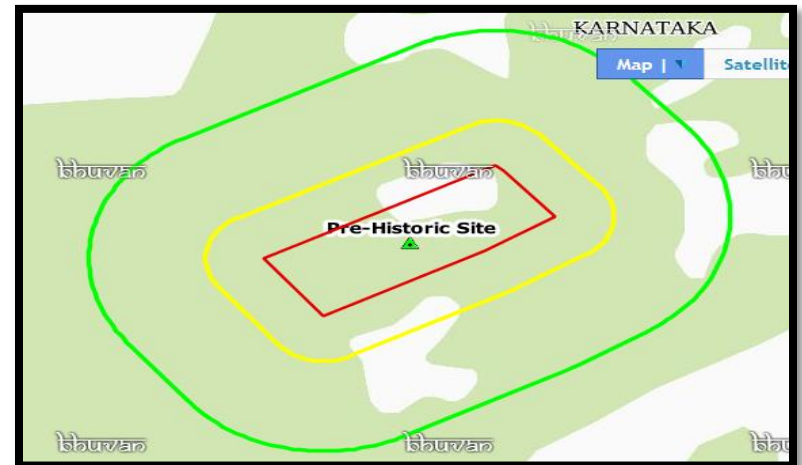
❖ **2,07,362 hits** in Year 2021

# Location Based Services

- Vaccination centers with COWIN APIs
- Citizen centric Application : Locate post offices, services, pin code search, AP CM Health Scheme (Hospital, Blood Bank)
- Election GIS : Polling booth location, Basic Minimum Facilities, Vehicle Tracking
- Geoprocessing for monument Authority of India
- Aadhaar/UIADI 2.0



Post office search



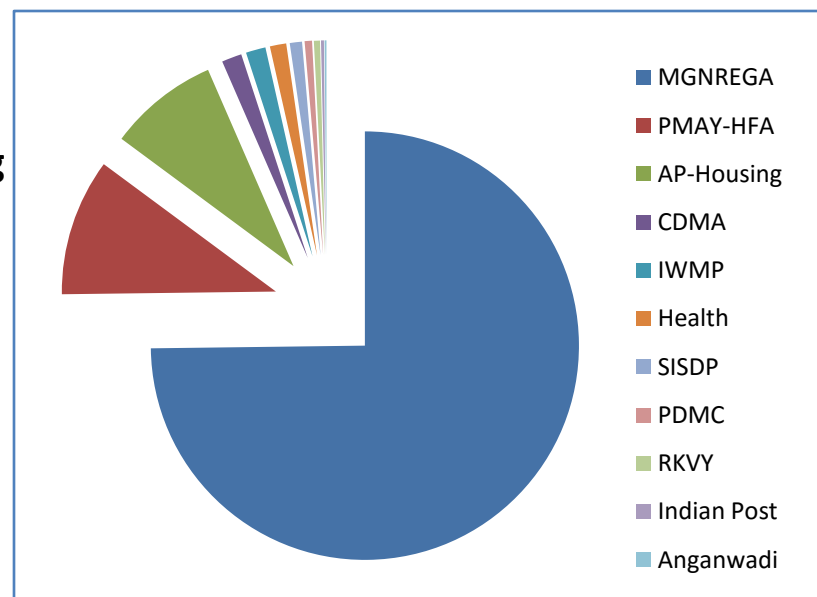
Archaeological Survey of India  
Online Processing (Protected, Prohibited, Regulated)

# Bhuvan –ISRO Geoportal

## Mobile Apps (70) & Crowd Sourcing (100 Million)

<b>MGNREGA</b>	<b>61144034</b>	<b>Inventory, Monitoring – Before, During , After</b>
<b>PMAY-HFA</b>	<b>8452386</b>	<b>Monitoring – Direct Benefit Transfer</b>
<b>AP-Housing</b>	<b>6803541</b>	<b>Inventory, Repair Works</b>
<b>CDMA</b>	<b>1235143</b>	<b>Un Assessed, Under Assessed properties for taxation</b>
<b>IWMP</b>	<b>1218896</b>	<b>Monitoring and Impact Assessment</b>
<b>Health</b>	<b>1008745</b>	<b>Health Establishment Inventory – Public / Private</b>
<b>SISDP</b>	<b>752898</b>	<b>Asset Inventory for Gram Panchayat Dev Planning</b>
<b>PDMC</b>	<b>455067</b>	<b>Irrigation Infrastructure</b>
<b>RKVY</b>	<b>377290</b>	<b>Agriculture Dev Programs</b>
<b>Indian Post</b>	<b>179981</b>	<b>Inventory, Beat Mapping</b>
<b>Anganwadi</b>	<b>116172</b>	<b>Inventory and Optimal Planning</b>

<b>Projects</b>	<b>3 months</b>	<b>1 year</b>
<b>MGNREGA</b>	<b>32,52,293</b>	<b>1,47,67,112</b>
<b>PMAY-HFA</b>	<b>4,39,804</b>	<b>38,07,896</b>
<b>IWMP</b>	<b>26,677</b>	<b>2,80,297</b>
<b>RKVY</b>	<b>13,806</b>	<b>1,46,287</b>



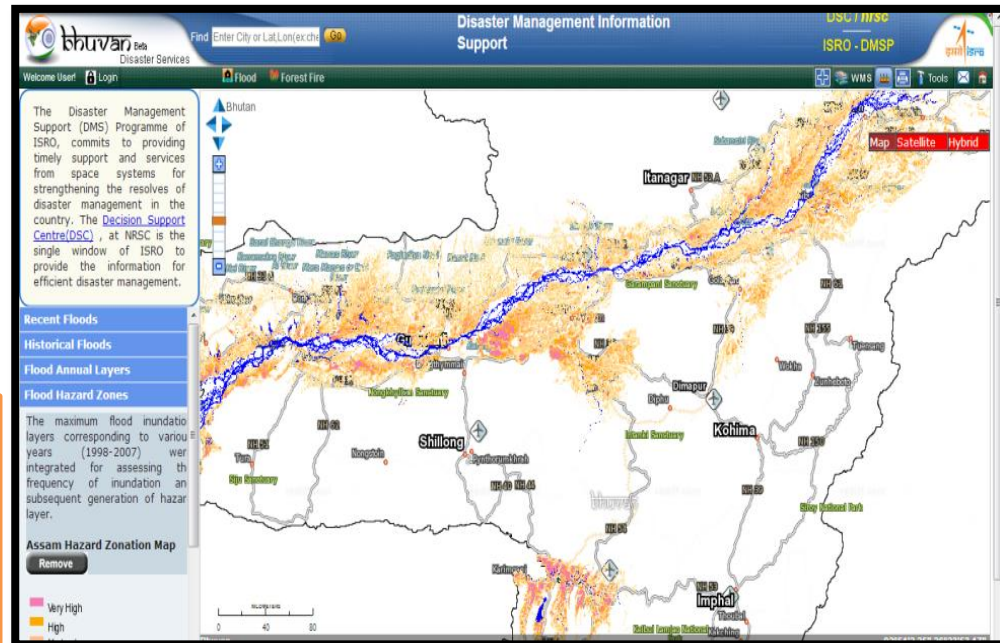
# Bhuvan – Disaster Services

*“Disaster Management Information Support”*

Disaster Management Support from space systems for strengthening the disaster management in the country.

- Flood (2008 onwards- 792 maps )
- Forest Fire (2008 onwards, MODIS, SNPP, JPSS)
- Drought (Spatio, meteorological Indicators)
- Landslide
- Cyclone
- Earthquake (Magnitude GT 6)

- Content Management System – Flood
- Framework for POI categorization
- Forest/Agriculture Fire Alert (SMS, Excel)
- Experimental Landslide Early Warning System - Alerts
- Configuration Online Mapper for Damage Assessment – Flood, Earthquake



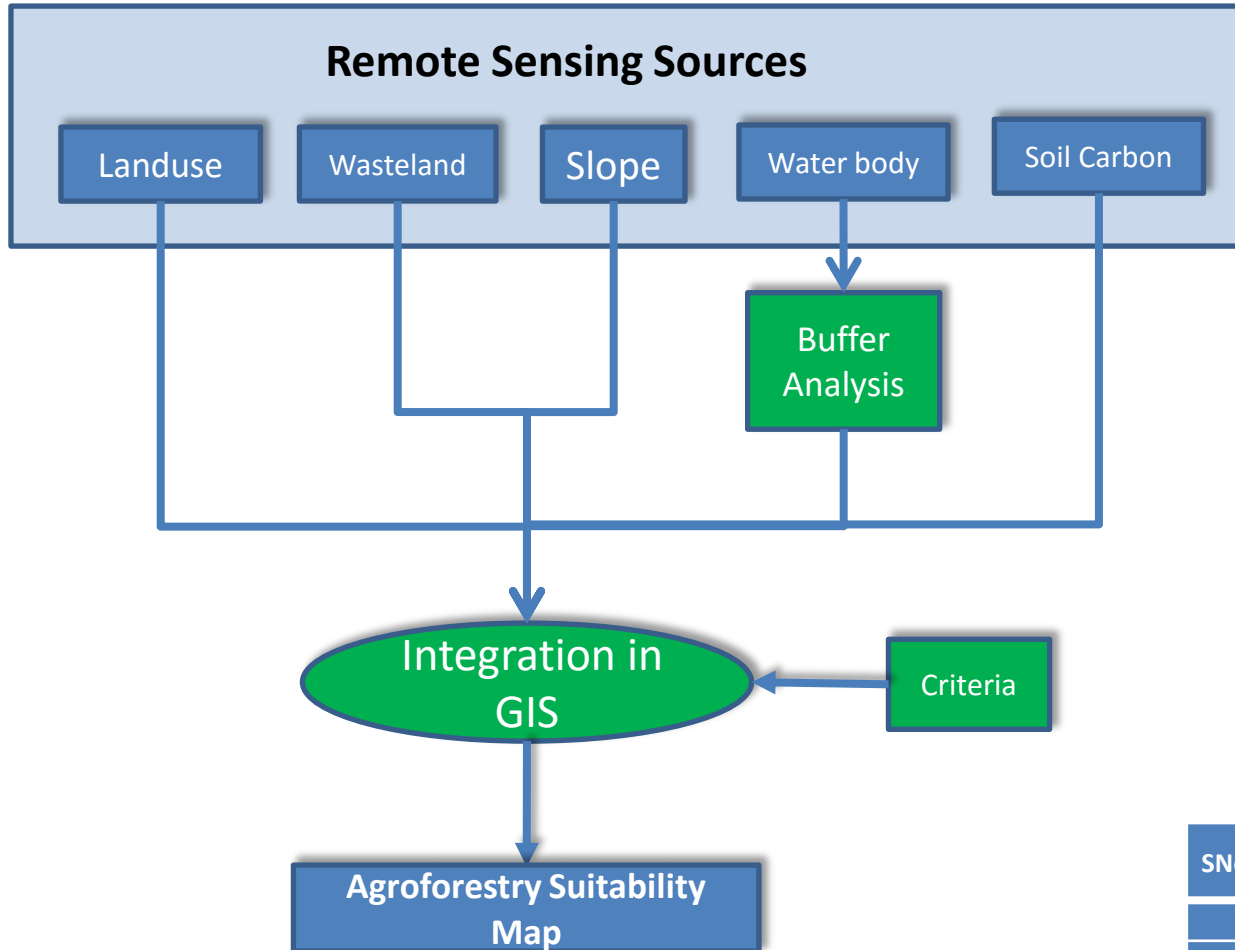
<https://bhuvan-app1.nrsc.gov.in/bhuvandisaster/>

# Ministry Applications – Central /State

- **Agriculture**
- **Water Resources**
- **Culture**
- **Mines**
- **Communication & Information Technology**
- **Consumer Affairs, Food, Public Distribution**
- **Drinking Water supply and sanitation**
- **Earth Science**
- **Environment, Forest and Climate Change, Deltas**
- **Commerce and Industry**
- **Election Commission of India**
- **Finance**
- **Petroleum and Natural resources**
- **Ministry of Home Affairs**

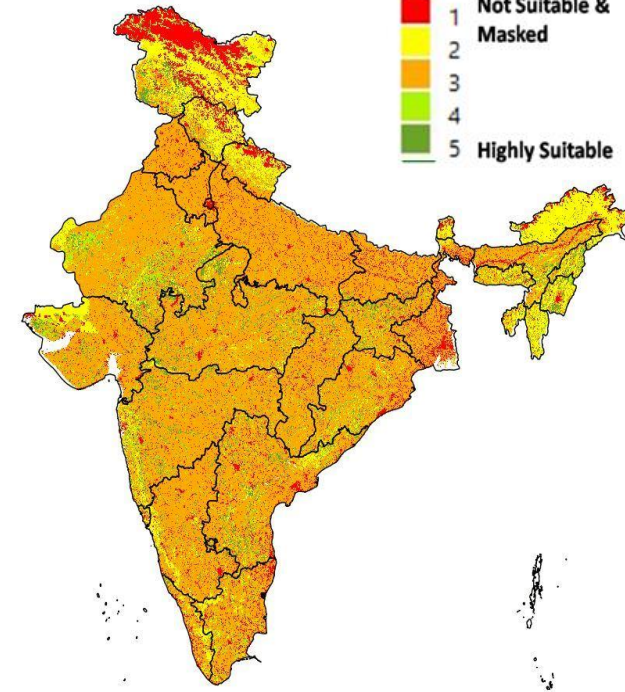
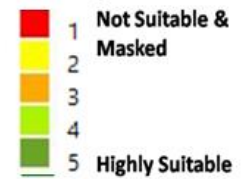
- **Ministry of Education**
- **Ministry of Health and Family Welfare**
- **Housing and Urban Affairs**
- **Rural Development**
- **Jal Shakti**
- **Law & Justice**
- **Labour and Employment**
- **Minority Affairs**
- **Panchayati Raj**
- **Road Transport and Highways**
- **Science and Technology**
- **Statistics and Program Implementation**
- **Shipping**
- **Space**
- **Tribal Welfare**
- **Tourism**
- **Women & Child Development**
- **Youth Affairs & Sports**

# NITI AAYOG: Agro Forestry Site Suitability Index (ASI)



Suitability Index value

Legend



SNo	Parameter	Criteria Weights
1	Land use / Land cover	0.3
2	Wasteland	0.4
3	Slope	0.1
4	Distance from Surface Water body	0.1
5	Soil Organic Carbon	0.1
	Total	1

“Highly Suitable-6%, Mod Suitable-5%, Less Suitable-65%,Veryless Suitable-13%, Not Suitable -11%”



- Citizen enablement platform from ISRO in collaboration with Industry
- Device agnostic – An app for your favourite mobiles, tabs and desktops.
- Greater user experience – Rich information at finger tips with optimised search
- Routing with ETA – Routes with ETA based alternates. 📍
- Locate and Connect with social media. 📍
- Direct Use – No Learning curve



Cached Seamless High Resolution satellite data across India



### Progressive Web App

- Secure
- Mobile & Desktop Compatible
- Native App Experience
- Offline Application Availability



### Satellite Image Services

- Visualization up to 1 meter
- PAN India coverage



### Geo-tracking

- Geo-location (Desktop & Mobile)
- Geo-tracking (Mobile)



### Route Direction

- Alternate Routes
- Time Sorted Routes
- Direction Advices

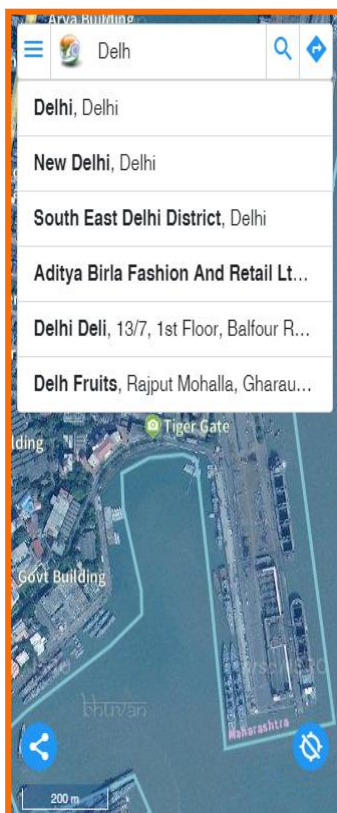


### Location Share

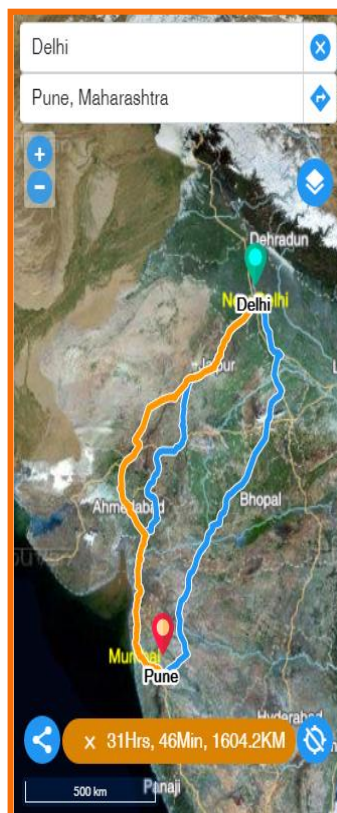
- Social Media Platforms (Twitter, Facebook, Koo etc)
- Email
- Copy Link



High Resolution Imagery + POI



Location Search + Suggestions



Route Directions

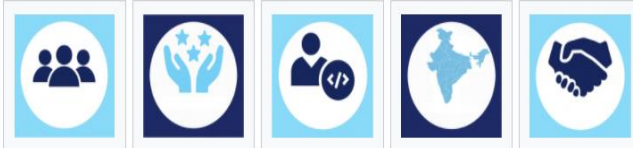


Location Share

<https://bhuvan.nrsc.gov.in/wiki>

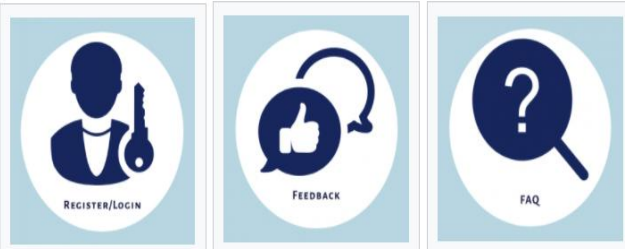
A repository of knowledge related to Bhuvan Data, Services and Applications

## Help Information



Bhuvan at the first glance    Bhuvan Web GIS Applications    Bhuvan Portal Development info    Statewise Geospatial Layers    Bhuvan Collaborators

## Stay Connected with Us



Contribute to Bhuvan Wiki    Feedback    Frequently asked questions

## Bhuvan wiki functionalities



### Bhuvan at the first glance:

Explains the applications related to Visualization and Free Downloads

### Bhuvan Web GIS Applications

Explains the various applications related to Various sectors (Planning and Development, Resource Management ,etc)

### Collaborators:

Explains list of Bhuvan Collaborator as well as information on How to collaborate with Bhuvan

### Quick Guide:

For most asked tools or Geo-processing tools for students and research community

### Developers

Explains the technology used for developing the portal and its applications

# Applications in Progress

## Central Ministry

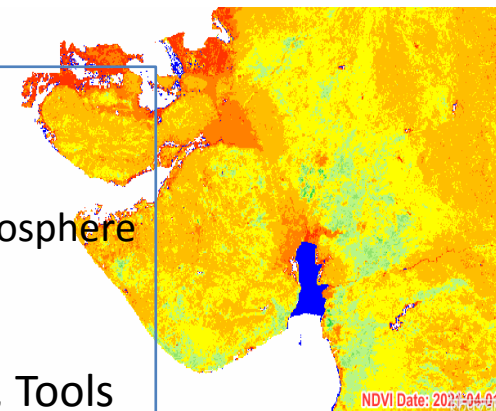
- **Aadhar 2.0**
  - MoU in Progress to locate and navigate to Aadhar Centres and Admin module for inspection
- **PMJVK – Ministry of Minority Affairs**
  - Mapping of Assets and Integration with MIS
- **UMANG**
  - API for UMANG Mobile App & Integration of Direct Benefit Transfer (DBT) schemes
- **Water Body Information System 2.0**
  - Adding Daily Data and Quality Information
- **Agroforestry Site Suitability Index – NITI Aayog**
  - Multi Criteria Decision Analysis (MCDA)

## States

- **Swachh Auto Trolley (SAT) Tracking,**
  - Planning and Tracking – SAT; 134 ULBs
- **Udhampur Water Resources Information System**
- **Gujarat WRIS**
  - Mapping of Water Resources Infrastructure (Canal, Structures)
- **Tumkur GIS**
  - MoU in progress with IIM Bangalore for Village Resources Development Plan

## User Centric

- **Time Lapse**
  - AWiFS, LISS III, NDVI, VF, LULC 250K, Snow Fraction, Atmosphere River, Flood
- **My Bhuvan,**
  - Customizable user specific project with Plug & Play Layers, Tools



# DATA SCIENCE AND MACHINE LEARNING RESEARCH INITIATIVES

## Topics identified

Sustainable Development Goal (SDG) Indicators Mapping

Hotspot Analysis using temporal land use maps

Land Use Dynamics @ Village Level – 9 fold Classification

Know Your Natural Resources - Citizen Centric App

Feature Extraction – TOF, Wind Mills, Drainage Interventions, ESS

Correlating MGNREGA Interventions with SOM and CI

[Mapping the Dynamics of Settlement Areas]  
[Climate Data Analysis]

## Citizen Centric Services on Natural Resources

### Integration of Natural Resources, Project Specific and Thematic Data

LULC 50, 10K

Assets Information from different flagship programs

Soil, Cadastral, Infrastructure

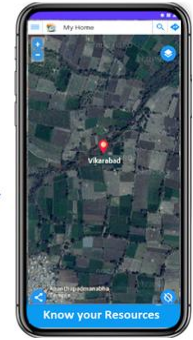
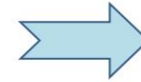
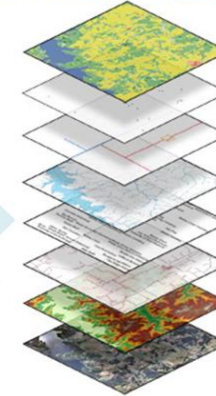
Watershed, Drainage, River, Hydrological Boundaries

Project Specific (Property Tax, Forestry, Irrigation Projects) Data

Geomorphology, Wasteland, Land Degradation, Ground Water

Slope, DEM

HRS Satellite Data



Citizen Centric Mobile Application As a Service for Bhuvan Applications

- Data Warehouse of Geospatial Data
- Service to all Bhuvan Applications
- Citizen Centric App

- Potential of Natural Resources
- Useful for Planning for Government Agencies
- Natural Resources Management
- Augmenting service to Citizen Centric Apps

## LULC Hotspot Analysis

The hotspot analysis finds statistically significant spatial clusters that have very low probability of spatial randomness

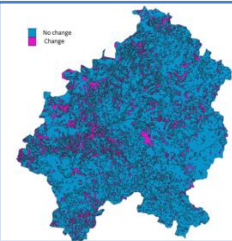
### Potential Applications:

- Identification of Areas with Dynamic Changes
- Identifying suitable measures for strengthening Natural Resources

Change Analysis - Highest change from  
- Barren to Agriculture  
- Fallow to Cropland

2005-06	2015-16			
	Cropland	Plantation	Fallow	
Cropland	99.30	0.25	0.45	
Plantation	0.66	99.34	0.00	
Fallow	55.05	0.24	44.70	
Agriculture Subclasses	Cropland	Plantation	Fallow	

2005-06	2015-16					
	Agriculture	Barren / Unculturable Wastelands	Builtup	Forest	Wetland / Waterbodies	
Agriculture	97.62	1.23	1.01	0.12	0.02	
Barren / Unculturable Wastelands	14.03	85.19	0.41	0.37	0.00	
Builtup	0.27	2.31	96.43	0.99	0.00	
Forest	3.49	0.69	0.00	95.80	0.01	
Wetland / Waterbodies	0.07	0.19	0.09	0.22	99.43	
Level - I Class	Agriculture	Barren / Unculturable Wastelands	Builtup	Forest	Wetland / Waterbodies	



Way forward:  
Hotspot analysis to find statistically significant spatial clusters to fulfill the potential applications using 1:250,000 LULC data over 14 years.

# Support through Bhuvan during COVID-19

Projects

Users

COVID 19 Dashboard

Ministry of Health and Family Welfare

COVID-19 Containment strategy

Bihar Health Department



## Tamil Nadu COVID Beds



**Vacant Beds Information**

State: Tamil Nadu

District: All Districts

Category:

Government  Private

Severity:

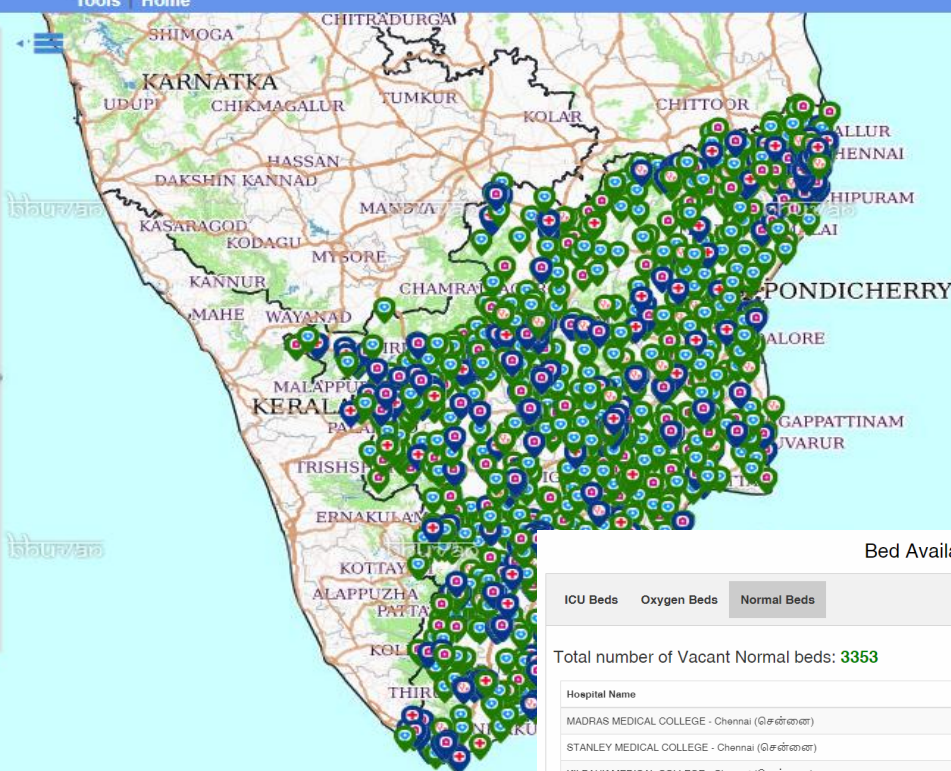
COVID Hospitals (For Severe Cases)

COVID Health Centres (For Moderate Cases)

COVID Care Centres (For Mild Cases)

Interim COVID Care Centres (For Mild Cases)

Show Only Hospitals with :



Bed Availability Details

ICU Beds   Oxygen Beds   **Normal Beds**

Total number of Vacant Normal beds: **3353**

Hospital Name	Vacant Normal Beds
MADRAS MEDICAL COLLEGE - Chennai (சென்னை)	502
STANLEY MEDICAL COLLEGE - Chennai (சென்னை)	445
KILPAUK MEDICAL COLLEGE - Chennai (சென்னை)	191
MIOT HOSPITALS PRIVATE LIMITED - Chennai (சென்னை)	191

# Plan for enhanced outreach of Bhuvan Geoportal

- **Improvement in Bhuvan web page through Industry**
- **Mass Outreach :** Lecture in Popular Social media (Facebook, Twitter, You Tube) – Nov 2020
- **Digital Marketing :** Search engines, websites, social media, email, and mobile apps (Google marketing insights - 48% of consumers start their inquiries on search engines, 33% look to brand websites and 26% search within mobile applications.)
- **Regular Training Programme :** 6 Overview training / year
- **Customized training to user departments**
- **NITI Aayog:** Reviving Interaction with ministry and series of workshop to all ministries
- **Ideation:** Interaction with Academics on latest trends
- Similar like **NCERT** syllabus, **UGC, AICTE** (Mappathon , Hackathon with IITB, AICTE)
- All ministry pages are having Citizen view – **JanMGNREGA** provides input to Ministry
- **Collaboration & Cooperation with Industry and Start-ups :** Mechanism is being worked out for doing ease of business.

**Thanks !!!**