

HOW TO USE THE BHUVAN PORTAL STEP BY STEP

Tools, Features, Applications, and Use Cases in Remote Sensing and GIS Projects

INTRODUCTION

The Bhuvan Portal is an Indian Geo-Platform developed by ISRO (Indian Space Research Organisation) and managed by NRSC (National Remote Sensing Centre). It is India's answer to Google Earth, offering a wide range of satellite data visualization, analysis, and mapping services.

Bhuvan integrates 2D, 3D, and thematic data visualization, along with online GIS tools, data downloads, and analytical features, making it a vital platform for remote sensing and GIS applications in governance, research, and development.

The portal is designed to provide spatial data visualization, analysis, and sharing capabilities to both experts and the general public. It supports multiple thematic layers such as land use/land cover, water resources, wasteland, urban sprawl, geology, and disaster management.

OVERVIEW OF THE BHUVAN PLATFORM

Bhuvan offers access to satellite imagery and thematic data derived from various Indian Remote Sensing (IRS) missions such as Resourcesat, Cartosat, Oceansat, and RISAT series.

It supports:

- 2D/3D visualization
- Online GIS mapping
- Thematic layer analysis

- Data download services

Decision support tools for disaster management, urban planning, agriculture, and more

Major Components of Bhuvan

1. Bhuvan 2D/3D Viewer – For visualization, overlay, and navigation of satellite imagery.
2. GIS Viewer – For thematic mapping, choropleth generation, and spatial analysis.
3. Bhuvan Mapper – For community participation, editing, and shapefile creation.
4. Data Hub – For downloading satellite data and value-added products.
5. Thematic and Governance Services – For sector-wise applications (agriculture, water, urban, etc.).
6. Disaster Services – For monitoring floods, droughts, forest fires, and cyclones.



STEP-BY- STEP GUIDE TO USING THE BHUVAN PORTAL

Step 1: Access the Bhuvan Website

- Open the official Bhuvan portal: <https://bhuvan.nrsc.gov.in>
- Choose your desired platform: 2D Viewer, 3D Viewer, GIS Viewer, or Mapper.

Step 2: Explore the Bhuvan 2D / 3D Viewer

- Navigate using pan, zoom, and rotate tools.
- Search for a location by place name or coordinates.
- Overlay multiple layers such as LULC maps, administrative boundaries, or DEM data.
- Use online editing tools to mark, annotate, and measure features on the map.

Step 3: Using the Bhuvan GIS Viewer

(URL- <http://bhuvan.nrsc.gov.in/gisviewer/>)

This tool enables users to create maps from tabular or text data.

Features

1. Generate Choropleth Maps using census data.
2. Upload text/CSV files containing state, district, or attribute values.
3. Visualize maps based on:
4. Equal interval classification for numeric columns.
5. Unique value classification for categorical columns.
6. Edit color ranges, legends, and class intervals.
7. Print or download your generated thematic map.

Steps

1. Click on Upload File and choose your .txt or .csv dataset.
2. Select the geographic level (State, District, etc.).
3. Choose the classification type and color scheme.
4. Click Generate Map to visualize data.
5. Save or print the final map output.

Step 4: Using the Bhuvan Mapper

(URL: <https://bhuvan-mapper1.nrsc.gov.in/>)

- This section promotes Volunteered Geographic Information (VGI).
- Users can add their own observations, draw features, or contribute to government and research projects.

Capabilities

- Add point, line, and polygon features.
- Edit or attribute spatial data online.
- Save outputs as shapefiles.
- Participate in community mapping initiatives.

Step 5: Using the Bhuvan Data Hub

The Data Hub provides access to free and open satellite datasets.

Available Datasets

Resourcesat-1 (AWiFS, LISS III, LISS IV)

Cartosat (1 & 2 Series)

Oceansat (OCM, OCM2)

Microwave and DEM data

Steps to Download

1. Open Data Hub from the Bhuvan portal.
2. Select area of interest (AOI) using bounding box or coordinates.
3. Choose the sensor and time period.
4. Add to cart and download the available product.

KEY TOOLS AND FEATURES

TOOL	PURPOSE	FUNCTION
2D/3D Viewer	Visualization	Pan, zoom, measure, overlay multiple datasets
GIS Viewer	Thematic mapping	Create choropleths and points maps
Mapper	User participation	Draw, annotate, and upload features
Data Hub	Data access	Download satellite data and products
Governance Services	Sectoral tools	Agriculture, Urban, Water, Panchayat
Disaster Services	Emergency support	Floods, Cyclones, Droughts, Earthquakes

Unique Features

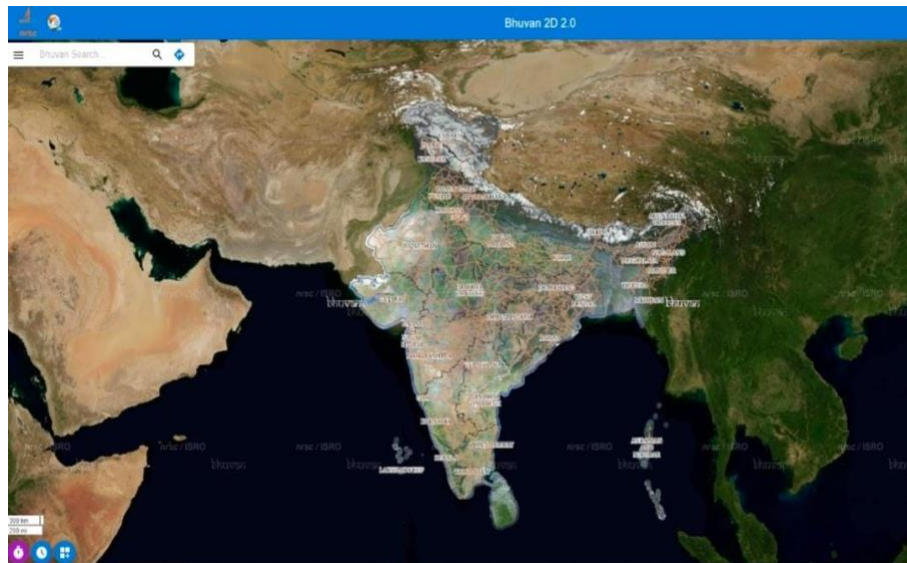
1. High-resolution uniform satellite data.
2. Multi-sensor, multi-temporal datasets.
3. Thematic maps (LULC, Wasteland, Waterlogging, Geomorphology).
4. Online shapefile creation and editing.
5. Mobile compatibility (Android, iOS, Windows).
6. WMS/WMTS support for interoperability.
7. Multi-lingual interface (EN, HI, TA, TE).



APPLICATIONS IN REMOTE SENSING AND GIS PROJECTS

Urban Sector

- Municipal GIS – Mapping of properties, roads, and civic infrastructure (e.g., Ludhiana).
- Urban Growth Monitoring – Detecting changes using multi-temporal imagery for cities like Bengaluru, Cochin, and Mysore.



Tourism

Tourism Web GIS – For Amritsar, Hampi, and Nalanda; helps in location search, route planning, and proximity analysis.

Forestry

Karnataka Forest Portal – Identifying forest types, fire regimes, and change monitoring.

Agriculture

- RKVY Plantation Inventory – Geo-tagging of agricultural fields and tea gardens in Assam and West Bengal.
- Pest and Disease Surveillance using field data and imagery.

Rural and Water Resources

- Watershed Monitoring – Activity planning and implementation tracking.
- Groundwater Prospect Mapping – Identifying lithology, geomorphology, and yield zones.

Disaster Management

- Real-time data on droughts, floods, landslides, earthquakes, forest fires, and cyclones.
- Provides decision support for relief planning.

Advanced Functionalities — Bhuvan Towards Data Science

Based on BhuvanDataScience.pdf (NRSC, 2024), Bhuvan now integrates Data Science, AI, and Machine Learning for advanced geospatial analysis.

Key Innovations

1. Multi-Sensor and Multi-Temporal Co-Registration – Using FFT for translation, rotation, and scaling correction.
2. Atmospheric Corrections – Removing effects of AOD, water vapour, and ozone.
3. Composite Product Generation – Producing cloud-free images using median or maximum composites.

Data Science Applications

Classification and Regression

Feature Extraction (Edge detection using Laplacian, Sobel, Canny filters)

Dimensionality Reduction (PCA, Autoencoders)

Anomaly and Change Detection

Hotspot and Time-Series Analysis

Example Use Cases

A. Decadal Hotspot Analysis

- Detects land use and land cover changes over a decade at 1:250,000 scale.
- Focuses on agriculture, built-up, fallow, and wasteland transitions.
- Uses bimodal distribution and Getis-Ord G_i^* metrics for hotspot identification.

B. Tree Outside Forest Mapping

- Uses deep learning (UNet, CNN) to delineate trees in non-forest areas.
- Employs entropy-based classification to differentiate vegetation.
- Accuracy achieved: >90% precision and recall.

C. Land Cover Classification Using AI/ML

- Conducted over Vikarabad District, Telangana.
- Data Used: LISS-IV imagery (5-year dataset).
- Algorithms: Random Forest (RF) and Convolutional Neural Networks (CNN).
- Accuracy: Training – 99.6%, Testing – 99.2%.
- RF effectively identifies broad vegetation, while CNN provides detailed subclass delineation

Benefits and Limitations

Benefits

1. Free access to India's satellite imagery and thematic data.
2. User-friendly visualization tools for researchers and planners.
3. Supports open-source interoperability (OGC WMS/WFS).
4. Promotes participatory mapping and open data policy.
5. Integrates AI/ML for advanced analytics.

Limitations

1. Limited coverage for some historical datasets.
2. Requires stable internet for high-resolution 3D viewing.
3. Some data restricted to authorized users.

Conclusion

The Bhuvan Portal stands as India's most comprehensive geospatial data and analysis platform. It integrates remote sensing, GIS, and data science capabilities into a single environment that supports visualization, analysis, and decision-making.

From mapping and data download to AI-powered analytics, Bhuvan is a crucial tool for researchers, students, urban planners, and government agencies. Its continual integration with AI/ML and cloud computing ensures its growing importance in the digital and geospatial transformation of India.

References

1. ISRO – National Remote Sensing Centre (NRSC), BhuvanDataScience Training Document (2024).
2. NRSC Official Tutorial, Bhuvan Training on General, Mapper, GIS Viewer, and Web Services.

3. Bhuvan Official Portal: <https://bhuvan.nrsc.gov.in>
4. MacroEdTech YouTube Channel – Bhuvan Training Series.