



TAKSHASHILA
INSTITUTION

State of India's Geospatial Portal

Swathi Kalyani

Takshashila Report 2025-26.
Version 1.0, October 2025.

This document assesses the current geospatial portals developed by India, and their capabilities. It highlights the gaps regarding them -- especially in comparison to other global portals. It tries to highlight the challenges hampering the usability of these portals at the individual level. Finally, it makes recommendations that may be useful in enhancing and advancing their capabilities.

Recommended Citation:

Swathi Kalyani, ``State of India's Geospatial Portal'', Takshashila Report 2025-26., Version 1.0, October 2025., The Takshashila Institution

©The Takshashila Institution, 2025

Contents

Executive Summary	2
1. Introduction	2
2. Geospatial Data Management in India	3
3. Various Indian Geospatial Portals	4
3.1 Major Geospatial Portals in India	4
4. What is Limiting these Geospatial Portals	10
4.1 Lack of Integration Between Organisations	10
4.2 Shortage of Skilled Professionals	10
4.3 Limited Public Awareness	10
4.4 Technical Infrastructure Problems	11
4.5 Legal and Regulatory Barriers	11
4.6 Insufficient Funding	11
4.7 Comparison with the Geoportals of Other Nations	12
4.8 Comparison of International Investments into Geospatial Data Management	13
5. Way Forward for India	14
6. Conclusion	16
Appendix A	17

Executive Summary

The document looks into the contemporary Indian geospatial portal ecosystem. It offers an overview of the major platforms making geospatial information accessible. It analyses several major hurdles that make the portals less functional – ranging from issues in technical infrastructure, low levels of inter-agency coordination, and regulatory constraints. It draws comparisons with global counterparts, highlighting some best practices to consider for data integration and better user experience.

It suggests that for these platforms to fully capitalise on their potential, the user interface needs to be enhanced, clear legal frameworks put in place, and practicality given priority over technical complexity.

It concludes with the idea that although India is technically strong, with a good policy environment—in view of the National Geospatial Policy 2022—real achievement can be attained only when the gap between technical capabilities and user needs is bridged.

Swathi Kalyani is a Research Analyst with the Geospatial Research Programme. She can be reached at swathi@takshashila.org.in.

The author would like to express their sincere gratitude to Dr Y Nithiyanandam for his valuable feedback.

AI tools have been used for literature search and content refinement.

1. Introduction

Geospatial portals are digital platforms that provide access to location-based datasets and spatial information. They enable users to visualise, analyse, and download geographic data – ranging from satellite imagery to administrative boundaries and environmental monitoring datasets. These portals serve diverse purposes: some are primarily designed for visualisation and navigation, such as Google Maps, which displays interactive street maps and satellite imagery for everyday movements, while others function as comprehensive data repositories, like ISRO's Bhoonidhi. Bhoonidhi allows users to download raw, remotely sensed datasets, including for scientific studies and geospatial applications.

Geospatial portals serve as common digital doorways for sharing spatial data that supports decision-making across various sectors. They also simplify complex satellite imagery and geographic information into a user-friendly interface, so that all relevant stakeholders can access location intelligence. The platforms consolidate overwhelming amounts of spatial data, thus aiding scaled evidence-based planning and policy-making. Increasing visibility into the value of geospatial intelligence has made it ubiquitous across applications such as traffic monitoring, urban planning, agriculture, and disaster management.

In May 2025, the Department of Posts launched two digital geospatial platforms - 'Know Your DIGIPIN' and 'Know Your PIN Code'. IIT-Hyderabad developed them with the Department of Posts and NRSC, introducing a standardised geospatial digital address system for India.¹ The portal helps people discover the DIGIPIN for their given location. ISRO's Bhuvan NextGen portal

also came up recently with five modes (Standard, Thematic, Data Hub, Governance and Disaster) of geospatial data dissemination services.²

These recent developments exemplify how India's geospatial sector has transformed dramatically since its inception. With the first Indian satellite launched in the 1970s,³ India's geospatial capabilities have continuously evolved alongside advancements in satellite purposes and technologies. Despite the growing importance of geospatial data, India's geospatial portals face significant usability, privacy, and awareness challenges that limit their effective utilisation.

This document examines the evolution of India's geospatial infrastructure, beginning with the foundational institutions responsible for spatial data management. It then analyses existing Indian geospatial portals and platforms, the key barriers affecting their user adoption, and offers actionable recommendations to enhance their functionality and accessibility for broader public and professional use.

DIGIPIN is a nationwide geo-coded addressing system developed by India Post in collaboration with IIT Hyderabad that divides Indian territory into approximately 4m x 4m grids, assigning each grid a unique 10-character alphanumeric code based on latitude and longitude coordinates.

2. Geospatial Data Management in India

On September 1, 2008, the National Remote Sensing Centre (NRSC), originally the autonomous National Remote Sensing Agency in the Department of Space, became a full-fledged centre of the Indian Space Research Organisation (ISRO). Since then, NRSC has evolved into India's major geospatial data and infrastructure custodian – leading several data management innovations and technology lines that serve the country's strategic geospatial capabilities.

The centre was established to meet the need for Earth observation capabilities in India, thus recognising that remote sensing data could usher in new paradigms across resource mapping, environmental management, and disaster management throughout the diverse landscape of the country. The centre, therefore, became the bridge between space technology and real-world geospatial applications, accounting for geospatial data reception, processing, analysis, and dissemination, operating ground stations, and carrying out research in the remote sensing domain.

The NRSC has made substantial contributions to India's development planning.⁴ The Bhuvan Geoportal—launched by NRSC in 2009—is a notable achievement, with around five lakh registered users. It started primarily as a visualisation service but subsequently became a comprehensive site for data download, web services and applications for sectors such as agriculture, disaster response, and urban planning.⁵

The Survey of India (SOI) complements the NRSC, and is India's oldest and most authoritative mapping agency. It is responsible for ground surveys, cadastral mapping, and maintaining

India's geodetic framework. These detailed, topographically located, maps and datasets of boundary coordinates, are the backbone of India's Spatial Data Infrastructure. The organisation has also played an important role in establishing the mapping standards and coordinate systems, so that they are uniform in their uses across different geospatial applications, while managing sensitive boundary and defence-related spatial information.⁶

In addition, bodies like the Forest Survey of India (FSI),⁷ the Central Ground Water Board (CGWB),⁸ and the Indian Meteorological Department (IMD)⁹ have created domain-based geospatial portals – further contributing to India's spatial data ecosystem.

3. Various Indian Geospatial Portals

The diversification of geospatial data in India has been facilitated through various web-based portals managed by different government organisations. These portals serve diverse user communities; from researchers and policymakers, to private sector entities and citizens. This comprehensive review examines major portals' key features and functions.

The most prominent is NRSC's Bhuvan Geoportal, which provides satellite imagery, thematic datasets and disaster support capabilities. While it offers extensive downloadable data, some resources such as administrative boundary vectors, are restricted to visualisation only. India-WRIS consolidates diverse datasets within its geo-database, offering free downloads to users. The National Database for Emergency Management (NDEM) specialises in historical disaster data, and hazard assessment tools for emergency planning. MOSDAC delivers real-time meteorological and oceanographic data visualisation, though download access is typically limited to authorised users. The Survey of India (SoI) Geoportal provides digital topographic maps and cadastral data, through free and commercial licensing models. Additional platforms include the National Atlas & Thematic Mapping Organisation (NATMO) portal, which distributes various Indian maps in PDF and hard-copy formats. ISRO has also developed several mobile applications focused on information dissemination and geodata visualisation, for broader public access.

3.1 Major Geospatial Portals in India

1. Bhuvan and Bhoonidhi Portals (ISRO/NRSC)

Organisation: National Remote Sensing Centre (NRSC), Indian Space Research Organisation (ISRO)

Purpose: Bhuvan is India's premier geoportal, providing a comprehensive platform for visualising remote sensing data, downloading satellite imagery, and enabling government departments to host customised applications for effective

Cadastral Mapping: A systematic process of creating detailed maps that record land parcel boundaries, ownership details, dimensions, and property rights within a defined jurisdiction, serving as an official record for administration purposes.

Geodetic Framework: A reference system of precisely surveyed ground control points with known coordinates that establishes the mathematical foundation for mapping, surveying, and positioning activities, ensuring spatial data accuracy and consistency across a region or country.

Governance.¹⁰ Bhoonidhi portal serves as a specialised satellite data repository, enabling users to search, view, and download raw satellite imagery from over 44 satellites – including Indian and foreign remote sensing missions.

2. Water Resource Information System (India-WRIS)

Organisation: Joint initiative of ISRO and Central Water Commission (CWC), with data published by National Water Information Commission (NWIC).¹¹

Purpose: Comprehensive water resource data management and dissemination system, supporting water resource planning and management across India.¹²

3. National Database for Emergency Management (NDEM)

Organisation: ISRO/NRSC in collaboration with disaster management agencies

Purpose: National repository of multi-scale geospatial database, coupled with decision support system tools, for emergency and disaster management.¹³

4. Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC)

Organisation: Space Applications Centre (SAC), ISRO

Purpose: Archival, processing, and dissemination of meteorological and oceanographic satellite data.¹⁴

5. Survey of India (SoI) Geoportal

Organisation: Survey of India, Department of Science & Technology

Purpose: Survey of India (SoI) is the National Mapping Agency (NMA) of the country under the Department of Science & Technology, Government of India. The portal is the official repository for topographic maps and cadastral data.¹⁵

6. Specialised Atlases and Thematic Portals

National Atlas & Thematic Mapping Organisation (NATMO)

Organisation: Department of Science & Technology, Ministry of Science & Technology

Purpose: The organisation offers different services related to cartography. Agricultural atlas, environmental atlases, Indian and Asian archaeological atlas, state atlases/maps, district planning map series, etc., are all prepared and offered by NATMO for use across sectors.¹⁶

7. Mobile Applications Ecosystem Organisation: Multiple ISRO centres (VEDAS, NRSC)

Purpose: Over 10 specialised apps for various geospatial technology-based services.¹⁷

Table 1: Limitations of the portals examined under this study

Portal Name	Organisation/ Agency	Limitations
Bhuvan Portal	ISRO and NRSC	• Separate portals for visualisation and download complicate portal understanding. • High-resolution data is restricted to visualisation only, and data updating is poor. • Security restrictions without clear categorisation of sensitive areas, limit the download and wide applications of sub-meter imagery. • Complex navigation, multiple interface modes and limited mobile responsiveness can confuse users and make it less attractive. • The datasets are mainly limited to Indian territories, as it does not get data from satellites with global coverage, and as current ISRO Earth Observation satellites do not have global coverage. • Page loading and response time is slow.
India-WRIS	ISRO & CWC	• Complex data formats require GIS expertise and even for further geospatial applications, API documentation lacks detail.

ⁱ The Bhuvan platform consists of multiple portals - Bhuvan for visualisation, Bhoonidhi Vista for recent Earth Observation satellite image visualisation, Bhoonidhi for data download, and Bhoonidhi Planner to submit data requests.¹⁸

The latest satellite imagery available for visualisation on Bhuvan is dated up 2017-2018.¹⁹

According to the privacy policy of Bhuvan, download access to sub-meter satellite imagery is restricted due to security policies.²⁰

Digital infrastructure limitations across India—including limited computer availability and internet access—reduce portal accessibility.²¹

Creation of Bhuvan Lite for 'faster' experience signalling the slow server issues of Original Bhuvan Portal. The lightweight "Bhuvan Lite" portal offers only visualisation services and omits data download features to improve loading speeds.²²

Bhuvan-mapper.nrsc.gov.in analysed page load time and found that the first response time was 726 ms, and then it took 6.6 sec to load all DOM resources and completely render a web page. This is a poor result, as 80% of websites can load faster.²³

		No publicly available information on system and portal upgrades.
MOSDAC	SAC and ISRO	- Technical formats (ex: HDF5) require specialized software and complex processing. - Limited data visualization tools, poor user interface design with complex navigation structure. - Server reliability issues. - Near-real-time (NRT) access restricted to authorized users, hence creating a Dual-user category system resulting in access barriers. - Temporal latency for general users due to insufficient and inactive number of satellites. - Several inactive satellites affect data continuity. - Limited coordination with other related agencies like Indian Meteorological Department (IMD), Indian National Centre for Ocean Information Services (INCOIS), or National Disaster Management Authority (NDMA). - No user-friendly manuals available and limited technical support for users.
MOSDAC LIVE	SAC and ISRO	View-only platform with no download options, limited parameters and no offline viewing capability.

ii

ii Spatial data is available primarily in shapefile, NetCDF, and CSV file formats, requiring GIS expertise for processing.²⁴ Ground station data recordings across India, contain gaps, causing incomplete hydrological datasets.²⁵ Several datasets in India-WRIS and related portals are updated irregularly, and mostly date to prior to 2020.²⁶ The NDEM portal experiences frequent platform loading failures and stability issues.²⁷ Portal access requires user registration, with verified credentials limiting open access.²⁸ Openly available disaster management datasets have incomplete event records, limiting predictive modeling use. Satellite meteorological and oceanographic data formats—like HDF5 and NetCDF—require specialised software and programming skills for use (e.g., MATLAB, Python).²⁹ Level 1 satellite data on MOSDAC is made openly available with a three-day latency period, limiting real-time analysis.³⁰

		• No API access for developers and no user manual to understand portal capabilities. • Limited integration capabilities and restricted historical data access. • Real-time data often unavailable resulting in frequent data gaps.
Survey of India (SoI) Geoportal	Survey of India, Ministry of Science and Technology	• Lengthy registration process with bureaucratic approval requirements. • Restricted access to detailed cadastral data and requirement of commercial licensing for high-accuracy maps resulting in limited private sector collaboration. • Limited interactive mapping capabilities and poor mobile compatibility. • Inconsistent data availability. • Insufficient online help documentation and grievance redressal mechanism stemming from limited customer support infrastructure.
National Atlas & Thematic Mapping Organisation (NATMO)	Department of Science & Technology, Ministry of Science & Technology	• Report-based, document-only format with no interactive mapping¹⁶. • No access to underlying geospatial datasets and limited data download options. • No search functionality within the atlas.

iii

iii IMD and INCOIS operate independent weather dissemination systems which are not integrated with MOSDAC.³¹ Metadata (descriptive information and technical details) regarding the geospatial data is limited.³² Registration for some geospatial platforms mandates government-issued ID and verified contact details.³³ Only the Open series maps are available for free download. Access to detailed cadastral and boundary data on government portals requires bureaucratic approval, restricting open data use.³⁴ Survey of India Open Series are available mostly as older datasets, with topographic sheets dating to 2019 or earlier.³⁵ Metadata is extremely limited for the available datasets.^{36 37} Specialised atlases are distributed mainly as hard copy print versions with limited digital utility.³⁸ Maps in some portals are provided in PDF format lacking georeferencing, requiring further GIS processing.³⁹

		• Infrequent updates with limited cross-referencing capabilities • Single-agency control limits collaborative updates. • No stakeholder feedback mechanism.
ISRO Mobile Apps	ISRO	• Outdated app versions with irregular updates. • Limited device compatibility and distribution is majorly through ISRO websites. • Basic functionality only and restricted data access through mobile interface. • No offline data storage capability. • Limited user awareness and adoption due to limited marketing and promotion. • Poor user feedback mechanisms and limited technical support.

iv

^{iv} Several official mobile applications are incompatible with many device operating systems, and lack availability on major app stores.⁴⁰

International geospatial service platforms such as FIRMS NASA⁴¹ and private service providers like Cropin and vEarly Cloud⁴² have more extensive marketing and stakeholder engagement.

4. What is Limiting these Geospatial Portals

Despite the forward-thinking vision of India's National Geospatial Policy 2022,⁴³ and significant investments in building geospatial portals across various government departments, India's geospatial ecosystem remains far from reaching its full potential. While the policy aims to make geospatial data more accessible and open, several deep-rooted problems prevent effective implementation.

4.1 Lack of Integration Between Organisations

India's geospatial sector suffers from poor coordination between different agencies. Organisations like the Survey of India (SoI), National Remote Sensing Centre (NRSC), Space Applications Centre, and various state agencies work in isolation – creating duplicate databases instead of unified systems. Each agency maintains its own data standards and repositories, leading to wasted resources and incompatible datasets.⁴⁴ Valuable geospatial datasets are scattered across multiple organisations, including Survey of India (SoI), NRSC, NITI Aayog,⁴⁵ National Informatics Centre (NIC),⁴⁶ INCOIS,⁴⁷ and State Remote Sensing Centres.⁴⁸ Consolidating these datasets into a single platform would significantly improve accessibility for end users, and enhance stakeholder engagement.

4.2 Shortage of Skilled Professionals

There is also a lack of trained professionals who can handle geospatial data effectively. This field requires diverse skills – including computer science, data analysis, geography, remote sensing, urban planning, and environmental science.⁴⁹ However, India lacks proper training programs for these specialised skills. Most educational courses treat geospatial technology as a secondary subject rather than a core field of study. This creates operational challenges, where portal managers and data handlers lack the technical skills to maintain data quality and system compatibility.⁵⁰

4.3 Limited Public Awareness

Stakeholders remain unaware of the geospatial portals and services already available through government and private organisations. Sometimes, decision-makers, researchers and businesses do not know what domestic capabilities exist. Many of these portals' technical complexity and poor user interfaces make them less attractive, compared to well-known international platforms. This pushes users toward foreign geospatial services instead of Indian alternatives.

MapMyIndia,⁵¹ one of India's leading geospatial companies, created the Mappls portal as an alternative to Google Maps. The

platform integrates India Post's DIGIPIN initiative for accurate addressing. However, its adoption remains low among the public. While MapMyIndia dominates the market share in the supply of maps to the automotive sector in India, Google Maps continues to lead in consumer navigation.⁵² Both platforms offer similar accuracy levels (around 20 meters), but Mappls uses Indian servers and ISRO navigation services that offer better data security. Despite these advantages, many users stick to familiar international platforms.

4.4 Technical Infrastructure Problems

Several portals face basic technical issues – including slow data uploads, delays in data processing, and limited download formats. Poor data quality and lack of standardisation reduce the credibility and usefulness of these platforms. Users often experience frustrating technical problems that discourage regular use.⁵³

Also, most of the state-run portals face similar challenges. While most states have their own geospatial data portals, they mainly focus on basic visualisation, making them less useful for research purposes.⁵⁴

The Karnataka state GIS portal is the only exception, providing downloadable geospatial data.⁵⁵ These portals fail to create unique value propositions, and thus remain supplementary to established platforms like Google Maps and OpenStreetMap.

4.5 Legal and Regulatory Barriers

Despite policy reforms, legal uncertainties continue to limit portal capabilities. Security restrictions on high-resolution satellite imagery and maps lack clear criteria for what constitutes sensitive areas. The outcome of these restrictions is that researchers access comparable data from Earth Observation satellites and maps owned by foreign companies or agencies. Also, the accuracy of these foreign datasets cannot be validated without access to Indian data. This creates a vicious cycle: reduced usage of India-produced data increases reliance on foreign sources that may not be up to date, which reduces confidence because of lack of ground-truthing and validation. The absence of clear legal frameworks regarding data type, data exclusivity, data accuracy and usage liability makes agencies reluctant to share, or use, datasets freely,⁵⁶ reducing the relevance and acceptance of Indian geospatial data.

4.6 Insufficient Funding

The National Geospatial Mission received INR 100 crore funding in the 2025-26 budget, representing this sector's most significant dedicated investment yet.⁵⁷ However, specific funding for comprehensive geospatial portals remains limited and poorly planned. State-level portals struggle with inadequate funding, owing to dependence on central grants or limited state budgets.

The issue of lack of integration creeps in here, as separate budget allocations are made for different initiatives that rely heavily on the geospatial infrastructure.⁵⁸

4.7 Comparison with the Geoportals of Other Nations

The USGS (United States Geological Survey) Earth Explorer portal under the United States government, demonstrates what comprehensive geospatial platforms can achieve. It hosts extensive data collections, including imagery from Indian satellites like the ResourceSat series.⁵⁹ This means users do not need to visit Indian-specific portals like Bhuvan for this data, which shows how international platforms often provide better access to even Indian satellite data.

NASA took further steps regarding integrating multiple geospatial databases, so that its user community may enjoy a more uniform experience, coupled with better data access through its portals. Most of these activities are under the Earth Science Data Systems (ESDS) Program. It is responsible for overseeing the entire life cycle of NASA's Earth science data—from acquisition to distribution—to maximise scientific return.⁶⁰

Most importantly, the Integrated Digital Experience Act of the 21st Century (IDEA) has driven the need for better interfaces and integration. Enacted in 2018, the law stipulates that executive branch agencies—including NASA—must ensure that their websites conform to certain standards, have a consistent look and feel, are search-enabled, secure, mobile-friendly, and do not display redundant information.⁶¹ The outcome of bringing in this law was NASA's Web Unification Project.⁶² The larger purpose of this project is to consolidate all ESDS Program web properties into the Earthdata website by the end of 2026, with a new unified design launched in October 2024. This project further classifies functions, data, projects, and tools so that users can find, access, and visualise NASA Earth science data through various means like – text search, science topic, observation method, data resolution, data format or data processing level.

Data management practices have accompanied NASA's policy of free, complete, and open sharing of all data, tools, and ancillary information since 1994. Meanwhile, all software for data systems developed since 2015 is Open-Source Software (OSS). Significant prioritisation has been made to the Open Science and Data Management Plan, offering guidance to researchers and developers on data management, rights and use. To achieve their data standardisation and interoperability goals, the ESDS invests strategically in open data, international and interagency partnerships and standards. Earthdata Harmony also provides documentation and procedures for utilising APIs. With Harmony, one can subset, concatenate, and reproject data while offering temporary AWS S3 access credentials to support "analysis in place" without needing to download data.

Moreover, the Web Feed Discovery and Integration (WFDI) service handles georeferenced information and data, providing strong correlation capabilities between feeds. This union acts in concert with NASA in cementing a commitment to establishing the benchmark for effective, open dissemination and stewardship of Earth science data for the diverse user community.⁶³

4.8 Comparison of International Investments into Geospatial Data Management

The global geospatial market is expected to achieve a valuation of US\$100 billion by 2026. China's geospatial ecosystem alone, is projected to reach an impressive valuation of approximately US\$900 billion by 2029. This expansive growth is fuelled by significant government investment, private sector participation, and strategic initiatives such as the Belt and Road Initiative's Digital Silk Road – extending China's global geospatial influence.⁶⁴

China's comprehensive investment strategy fuels innovation and commercialisation, enabling a robust private sector ecosystem alongside state initiatives. These moves allow China to secure a significant role in the global geospatial economy, even amid competition from established players like the USA.⁶⁵

In 2024, USA had allocated US\$1.8 billion for the USGS, with targeted investments to create diverse datasets, including geothermal and critical mineral resource assessments and natural hazards information.⁶⁶

Another example in the geospatial field is the European Union's Sentinel satellite program, particularly through data access portals like the Copernicus Hub. This has an annual budget of approximately US\$ 1 billion and incurred total costs of US\$ 7 billion between 2008- 2020.⁶⁷ Copernicus also provides Land Use Land Cover datasets at resolutions of 10, 20, and 60 meters for free— key data layers that have attracted a vast user base by prioritising accessible, actionable end-use information. This has made the Copernicus Hub one of the world's most significant geospatial data portals.⁶⁸

Australia's Digital Earth Australia (DEA) had an annual budget of nearly US\$ 7 million. DEA operates an open-access platform (DEA Sandbox) and collaborates on Open Data Cube (ODC) software that reduces costs for accessing and analysing Earth observation data in support of research and policy-making.⁶⁹

The Satellite Applications Catapult (SAC) of the United Kingdom has an annual budget of US\$ 15 million. It focuses on the growth of satellite applications by connecting entrepreneurs to tools, finance, and markets while supporting government projects like the Space for Smarter Government Programme.⁷⁰

These different models underline important lessons: from strategies centred on expansive infrastructure and global influence to open, high-resolution data provisions for user engagement, India's geospatial trajectory could benefit from a

USGS is also responsible for supporting outputs such as the ShakeAlert earthquake early warning system and the National Volcano Early Warning System.

This investment by the Australian Government has produced high-quality Analysis-Ready Data (ARD) and a comprehensive suite of geospatial products including digital models for coastlines, waterbodies, intertidal elevation, surface reflectance, and bushfire monitoring.

blend of these approaches to accelerate impact and international presence.

5. Way Forward for India

Several practical measures can be implemented to address these challenges. The most obvious issue is visibility, as building excellent tools means nothing if users cannot find them. Government web development teams must understand how people search for geographic information, and optimise their platforms accordingly. Basic improvements like proper keyword optimisation, mobile-responsive designs, and enhanced search engine visibility can dramatically boost portal usage and accessibility.

The National Spatial Data Infrastructure (NSDI) portal requires immediate attention to ensure seamless accessibility and functionality. While NSDI maintains responsibility for enforcing global standards (such as Open Geospatial Consortium specifications) and national cartographic standards, establishing a dedicated national coordinating body is essential. This body can oversee cross-state compliance, mandate regular data updates, and ensure all participating agencies adhere to ISO metadata standards.

Converting the National Geospatial Policy framework into action through a unique law, with clearly defined milestones, would be helpful. A comprehensive timeline for data integration activities should specify deliverables, responsible agencies, and quality benchmarks to ensure accountability and progress tracking.

Mandatory metadata compliance with ISO standards would enhance data discoverability, usability, and credibility. This includes capturing information about data lineage, accuracy, temporal coverage, and coordinate reference systems – ultimately increasing user confidence and adoption rates across government and private sectors.

The development of India's indigenous geodetic datum, as mandated under the National Geospatial Policy 2022,⁷¹ requires urgent prioritisation. This indigenous datum is fundamental for achieving proper data standardisation across all geospatial datasets, and reducing dependency on foreign coordinate reference systems like WGS84.

Implementing automated format conversion services would ease data dissemination and its usage (such as converting between Shapefile, GeoJSON, and KML formats). Additionally, establishing automated metadata harvesting capabilities—using standards like INSPIRE (Infrastructure for Spatial Information in Europe)⁷²—would ensure comprehensive documentation of all datasets.

Many of these portals are running on shoestring budgets, evident in outdated interfaces, slow loading times, and obsolete

datasets. Geospatial infrastructure needs sustained funding—not just one-time project allocations—for maintenance, updates, and improvements. Users prefer platforms that provide the latest information with seamless access.

Most platforms are designed for geospatial professionals, making them inaccessible to non-specialists like farmers checking soil data or small business owners seeking location insights. Interfaces need redesigning with actual end users in mind—featuring simple navigation, clear dataset explanations, and intuitive search functions.

The private sector could transform this landscape, but current regulatory ambiguities create hesitation. When companies develop applications using government geospatial data, liability questions remain unanswered—who bears responsibility if something goes wrong? Unclear accountability frameworks discourage participation. The National Geospatial Policy requires legislative backing to become enforceable. Converting it into an Act would establish clear legal pathways, define accountability structures, and provide liability guidelines. This legal clarity, combined with encouraging private players to develop user-friendly applications that translate complex geospatial data into accessible insights for everyday users, would boost confidence and accelerate both private sector participation and public adoption of India's geospatial ecosystem.

Another major issue is data formats. People need data in formats they can actually use. Data in PDF files needs to be converted if it is to be used in any GIS software. Mere visualisation of data doesn't translate to data availability in a practical sense and only results in extra manual tasks for anybody who wants to use it.

Language barriers are also delaying adoption. Most of these portals are primarily in English, which immediately excludes a huge portion of the population. Regional language support can be essential for mass adoption. This includes not just translating text, but also ensuring that search functions work in local languages and that data labels make sense to regional users.

Integration with popular platforms could boost usage significantly. Partnerships with popular mapping apps, weather services, or even social media platforms could bring geospatial data to users where they already are – rather than expecting them to visit yet another website. The mobile experience needs urgent attention. Most people in India access the internet primarily through smartphones, but many geospatial portals are clearly designed for desktop computers. Mobile-first design is not just optional anymore - it should be the default. This means rethinking how data is presented, how searches work, and how users interact with maps on small screens.

Education and awareness campaigns need to be practical rather than promotional. Instead of generic advertisements about digital initiatives, people need to be shown the specific ways in

which these portals can solve their real problems. Illustrative examples of how a farmer can use soil data to improve crops, how a student can use demographic data for research, or how a local government can use flood maps for planning would resonate much better than technical features.

API access for developers could create an ecosystem of applications that make government data more accessible. When developers can easily pull data from these portals to build specialised apps, the ways people can interact with the information multiply. But APIs must be well-documented, reliable, and have clear usage guidelines.

Finally, feedback and grievance redressal mechanisms need to work better. Most existing portals have contact forms that disappear into bureaucratic black holes. Users should be able to report problems, request features, or suggest improvements through channels that deliver responses. Regular user surveys, testing programs, and stakeholder feedback sessions could help identify issues before they become major barriers to adoption.

6. Conclusion

India has made impressive progress in developing geospatial portals, despite entering this domain relatively late. However, critical gaps require urgent attention, especially as primary-level data visualisation and utilisation become central to global narratives.

The influence of accessible geospatial platforms became evident during the Russia-Ukraine conflict. An interactive map—developed by two Ukrainian citizens—emerged as the main source of information for global media and stakeholders.⁷³ Similarly, the European Space Agency's Copernicus portal's increase in user base can be credited to its offering of the most recent satellite images at no cost, thus enabling geospatial analysis. Its ability to deliver timely satellite data, even at lower resolutions, proved sufficient for mapping post-disaster scenarios, land-use changes and conflict zones – including sites affected during military operations.

These examples highlight how effective geospatial platforms can become authoritative sources during critical events, thereby underscoring the strategic importance of robust, accessible data portals in shaping global understanding of unfolding situations.

In India, the technology and data exist, with the policy framework too being largely supportive. What is missing is the bridge between the publicly available data and the ways its potential user base can utilize it. Building that bridge requires stepping out of technical silos and thinking like the citizens these portals are supposed to serve. It is not about dumbing down the technology, but about making it genuinely useful for those who could benefit most out of it.

Appendix A

Table 2: Key features and functions of various geospatial portals of India⁷⁴

Portal	Organisation	Key Features & Data Offerings	Type of Data Available	Download Capability
Bhuvan; Bhoonidhi	ISRO - NRSC	High-resolution imagery (sub-meter to 1m), CartoSat, LISS III, AWiFS, Thematic LULC datasets, Census boundaries, MGNREGA assets, and Real-time disaster maps.	GIS-ready Satellite imagery, Thematic datasets (LULC, etc.), Administrative boundaries, Disaster data.	Free download for data $\geq 5m$ resolution; visualization for high-res; commercial licensing for finer resolution via Bhoonidhi portal.
Water Resource Information System (India-WRIS)	Central Water Commission (CWC)	Time series data (rainfall, discharge), Geospatial data (boundary files, infrastructure data), River basin atlas, API catalogue.	Time series hydrological data in tabular format, geospatial layers in vector file formats, reports, and atlases in document format.	Full download capabilities for all data; API-based access for programmatic retrieval.
National Database for Emergency Management (NDEM)	NRSC	Historical disaster data (since 1998), multi-scale geospatial databases, Decision support tools, and Emergency response maps.	Historical disaster data, Geospatial databases for disaster management.	Limited public access; primarily for government/emergency response agencies. Focus is on decision support.
Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC)	ISRO - SAC	Real-time weather visualisation, Historical meteorological data, Ocean parameters, Weather alerts.	Meteorological and oceanographic satellite data.	Mixed: Real-time data for NRT (Near Real Time) users, Level-2 data for general users; raw data is in technical formats and cannot be

Portal	Organisation	Key Features & Data Offerings	Type of Data Available	Download Capability
				directly utilised for analysis.
Survey of India (SoI) Geportal	Survey of India - NIC	Digital topographic maps, Cadastral maps, and Administrative boundary data.	Topographic maps, Cadastral maps, and administrative boundaries.	Structured data is disseminated through the portal; free and commercial licensing options are available.
Specialised Atlases & Thematic Portals	NATMO, Department of Science and Technology	Landslide hazard maps (Landslide Atlas of India), Decadal nighttime light changes (NTL Portal)	Reports, atlases, thematic interactive maps.	Limited raw data access; data is primarily in report or visualisation format.
Mobile Applications Ecosystem	ISRO	Over 10 specialised Geospatial applications.	Mobile applications for specific tasks.	Direct download from ISRO websites; not available on major commercial app stores.

Endnotes

1. Department of Posts, Government of India. 2025. "Know Your DIGIPIN."
2. National Remote Sensing Centre, Government of India. "Bhuvan Geoportal."
3. Indian Space Research Organisation. "Aryabhata."
4. Indian Space Research Organisation. "National Remote Sensing Centre (NRSC)."
5. National Remote Sensing Centre, Government of India. "Bhuvan Geoportal."
6. Survey of India. "Who We Are."
7. Forest Survey of India. "Forest Survey of India."
8. Central Water Commission. "Water Resources Information System (WRIS)."
9. India Meteorological Department. "Mausam - Weather Information Portal."
10. National Remote Sensing Centre, Government of India. "Bhuvan Geoportal."
11. Central Water Commission. "Water Resources Information System (WRIS)."
12. India Water Resources Information System. "India-WRIS WebGIS."
13. YourStory. "ISRO Geoportal Bhuvan Advanced Geospatial Data." July 2024.
14. Space Applications Centre, Indian Space Research Organisation. "Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC)."
15. Survey of India. "Who We Are."
16. National Atlas & Thematic Mapping Organisation, Department of Science & Technology, Ministry of Science & Technology, Government of India. "NATMO Portal."
17. National Remote Sensing Centre, Government of India. "Bhuvan Geoportal."
18. National Remote Sensing Centre (NRSC), Indian Space Research Organisation. Bhuvan User Handbook. NRSC-ISRO.
19. Bhuvan Geoportal, NRSC- ISRO, "Bhuvan maps"
20. National Remote Sensing Centre (NRSC), Indian Space Research Organisation. Bhuvan User Handbook. NRSC-ISRO.
21. Sampath Kumar, B. T., & Shiva Kumara, S. U. "The Digital Divide in India: Use and Non-use of ICT by Rural and Urban Students." World Journal of Science, Technology and Sustainable Development, vol. 15, no. 2, 2018, pp. 156-172. Emerald Insight
22. National Remote Sensing Centre (NRSC), Indian Space Research Organisation. Bhuvan User Handbook. NRSC-ISRO.
23. Accessify. "Bhuvan Mapper – NRSC."
24. India-WRIS. 2025. User Manual: Geo-Spatial Data.

25. India Water Resources Information System. "India-WRIS WebGIS."
26. India Water Resources Information System. "India-WRIS WebGIS."
27. National Remote Sensing Centre, National Database for Emergency Management (NDEM). "All-India Weather Forecast".
28. NDEM (National Database for Emergency Management). NDEM Portal Login. National Remote Sensing Centre, ISRO.
29. MOSDAC. MOSDAC Data Guidelines (English). Space Applications Centre, ISRO.
30. MOSDAC. MOSDAC Data Guidelines (English). Space Applications Centre, ISRO.
31. India Meteorological Department. MAUSAM. Ministry of Earth Sciences, Government of India.
32. MOSDAC (India). "MOSDAC Live - India." Space Applications Centre, ISRO.
33. Survey of India. "Digital Product Show."
34. Survey of India, "Guidelines for Acquiring and Producing Geospatial Data and Geospatial Data Services including Maps," Department of Science and Technology, Government of India.
35. Survey of India. "Digital Product Show."
36. Survey of India. "Data Catalogue-GIS2." March 1, 2024.
37. National Atlas and Thematic Mapping Organisation (NATMO), "Home," Department of Science & Technology, Ministry of Science & Technology, Government of India.
38. National Atlas and Thematic Mapping Organisation (NATMO), "Home," Department of Science & Technology, Ministry of Science & Technology, Government of India.
39. North Eastern Spatial Data Repository (NeSDR), North Eastern Space Applications Centre (NESAC), Department of Space, Government of India.
40. Indian Space Research Organisation (ISRO), "Mobile Apps," Department of Space, Government of India.
41. NASA LANCE FIRMS.Fire Information for Resource Management System (FIRMS). "About FIRMS."
42. Cropin Technology Solutions Private Limited. 2025. Cropin. ;Strava Technologies® (P) Ltd. 2025. "vEarly Cloud™ – A Multi Hazard Early Warning System."
43. Survey of India, Department of Science & Technology, Government of India. "National Geospatial Policy 2022."
44. Garg, Adya. "Legal Challenges to Mapping in India #1 - Laws, Policies, and Cases." Centre for Internet and Society.
45. NITI Aayog, India Climate & Energy Dashboard.
46. Government of India, Ministry of Electronics & Information Technology, National Informatics Centre. National Portal of India.
47. Indian National Centre for Ocean Information Services. 2025. "Ocean Data and Information System (ODIS) - Joint Portal."

-
48. National Informatics Centre. 2025. "State GIS Portal."
 49. Department of Science and Technology and Bharati Vidyapeeth Deemed University. 2025. "India Geospatial Education - DST-IGET Portal."
 50. Singh, Sakshi. "Geospatial Skill Development in India – Challenges & Recommendations." AGI India, June 27, 2022.
 51. MapmyIndia. "Automotive." MapmyIndia Solutions: Industries.
 52. Vallecha, Shivam. "CE Info Systems." Recipe: Premium Stock Research, Finology, July 9, 2025.
 53. Solomon, Nissy. "Challenges in Geospatial Information Management." Centre for Public Policy Research, September 6, 2022.
 54. Choudhary, Mahashreveta. "State Spatial Data Infrastructures in India – Challenges and Recommendations." Geospatial World, June 19, 2017.
 55. Survey of India. "Data Catalogue-GIS2." March 1, 2024.
 56. Survey of India, Department of Science & Technology, Government of India. "National Geospatial Policy 2022."
 57. Ministry of Science & Technology, Government of India. "Parliament Question: National Geospatial Mission." Press Information Bureau, March 26, 2025.
 58. Department of Science & Technology, Government of India. "General Information on Research and Development Funding Schemes of Central Government Departments & Agencies." Last updated March 17, 2023.
 59. Earth Resources Observation and Science (EROS) Center. "USGS EROS Archive - ISRO Resourcesat-1 and Resourcesat-2 - LISS-3." U.S. Geological Survey, July 19, 2018.
 60. NASA Earthdata. "Web Feed Discovery & Integration Service."
 61. U.S. Congress. Public Law 115-336: 21st Century Integrated Digital Experience Act. 115th Cong., 2nd sess., December 20, 2018. Statutes at Large 132, 5025.
 62. NASA Earthdata. "Web Unification Project."
 63. NASA Earthdata. "Harmony Documentation", 2025.
 64. Williams, Evan. "China's Digital Silk Road Taking Its Shot at the Global Stage." East Asia Forum, May 9, 2024.
 65. Bingen, Kari A., David Gauthier, and Madeleine Chang. Gold Rush: The 2024 Commercial Remote Sensing Global Rankings. A collaboration between the Center for Strategic and International Studies, Taylor Geospatial Institute, Taylor Geospatial Engine, and United States Geospatial Intelligence Foundation. Washington, DC: CSIS, October 2024.
 66. Applegate, David. "USGS Budget: Examining the President's Fiscal Year 2024 Budget Request for the U.S. Geological Survey." Statement before the House Committee on Natural Resources Subcommittee on Energy and Mineral Resources, April 26, 2023.
 67. Kaleagasi, Bartu, Sean McCarthy, and Peter Beaumont. Geospatial Public Policy: Global Best Practices for Harnessing the Potential of Satellite Technologies and Applications. Washington, DC: Inter-American Development Bank, 2022.
 68. Trovatiello, Marco. "Earth Observation: Copernicus Sentinel Satellite Data." European Space Agency Open Access, February 4, 2017.
 69. Kaleagasi, Bartu, Sean McCarthy, and Peter Beaumont. Geospatial Public Policy: Global Best Practices for Harnessing the Potential of Satellite Technologies and Applications. Washington, DC: Inter-American Development Bank, 2022.

70. Kaleagasi, Bartu, Sean McCarthy, and Peter Beaumont. Geospatial Public Policy: Global Best Practices for Harnessing the Potential of Satellite Technologies and Applications. Washington, DC: Inter-American Development Bank, 2022.
71. Survey of India, Department of Science & Technology, Government of India. "National Geospatial Policy 2022."
72. European Parliament and Council of the European Union. Directive 2007/2/EC of 14 March 2007 Establishing an Infrastructure for Spatial Information in the European Community (INSPIRE). Official Journal of the European Union L 108 (25 April 2007): 1–14.
73. Deep State UA. "DeepStateMap.Live."
74. Survey of India. "Data Catalogue-GIS2." March 1, 2024.



TAKSHASHILA
INSTITUTION

The Takshashila Institution is an independent centre for research and education in public policy. It is a non-partisan, non-profit organisation that advocates the values of freedom, openness, tolerance, pluralism, and responsible citizenship. It seeks to transform India through better public policies, bridging the governance gap by developing better public servants, civil society leaders, professionals, and informed citizens.

Takshashila creates change by connecting good people, to good ideas and good networks. It produces independent policy research in a number of areas of governance, it grooms civic leaders through its online education programmes and engages in public discourse through its publications and digital media.

©The Takshashila Institution, 2025