

GEOSPATIAL

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Indian Geospatial Market, Economy
and Industrial Development Strategy

Under the Aegis:
National Think Tank on Geospatial Strategy for New India

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FOREWORD



A.S. KIRAN KUMAR

Member Space Commission, Department of Space

Chair, National Think Tank on Geospatial Strategy for New India

The process of identifying how things are taking place in any economic activity of national and global scale, to enable an understanding of what is driving and limiting the economy's growth is an activity undertaken by forums to provide inputs to the various stakeholders. This process can, definitely, do a very competent job of seeing how things are happening till now, those constraints, hurdles, and limiting factors that affect the outcome, and identifying effective solutions is always a more difficult task. While one could argue that once you identify a problem, you can always find a solution. However, in reality, there could be more than one way of addressing the problem, and what gets adopted could lead to new, unanticipated scenarios.

Further, when trying to propose and suggest approaches to changes that could help stakeholders contribute to economic growth, one attempts to paint a picture of the anticipated changes and what impact the proposed changes will bring. Such endeavours are based on certain assumptions and prediction models used and limitations of visualizing all the impacts a change could bring about. Notwithstanding all such limitations, reports like the current one brought out by the Geospatial world has the potential to significantly influence the thought processes of multifarious stakeholders of the Geospatial domain in India and abroad.

The corona pandemic has not only disrupted the world economy it has also brought about very significant changes in the outlook of governments and humanity. The way the nations have dealt with the health disaster has thrown up new alignments, and the interruptions in the supply chain has made nations rethink the existing approaches of depending on other countries for key inputs. This disruption has opened new opportunities. In this context, the effort of Geospatial World to look at the role of the geospatial technology on the Indian economy, its performance, and inability to break through and grow at rates commensurate to its potential. The changing scenario emerging out of significant policy changes addressing the current constraints, differences in access to enabling technologies, and access to funding have all been factored in the analysis. The effort to show the impact of policy changes on the anvil on the economy, and an effort to look at mechanisms needed to provide an enabling environment to allow the geospatial enterprises in the country to meet the demands of the country and to become a significant contributor to export activities is noteworthy.

I am sure that this effort of Geospatial World will bring a wealth of information and insight to the various stakeholders in the domain, a way to deal with their plans to address their current and future activities in this era of rapidly changing technologies, rapidly changing international relations, rapidly changing work culture and the need to provide efficient and sustainable life on this planet will be welcomed.

FOREWORD



AGENDRA KUMAR

Managing Director
Esri India Technologies Pvt. Ltd.

The Geospatial Artha: The report on Indian Market, Economy and Industrial Development Strategy comes at a time when the Indian geospatial industry is undergoing a transition from data to knowledge, supported by the significant policy reforms announced by the Government of India earlier this year. While India has been at the forefront of geospatial applications and services globally, it is now that we feel bullish about investments in India and the opportunity to create significant value through the adoption of geospatial technologies.

The Geospatial Artha report encapsulates the true picture of the geospatial industry ecosystem, the value, and the potential impact of geospatial technologies on India's economic growth. The report analyses the effect of policies and brings together the interesting projections for the geospatial economy of India. In times when data and analytics are crucial in decision-making, the new liberal mapping guidelines issued by the Government of India will commercialize and democratize the use of geospatial data in the country. With the freedom to collect, generate, disseminate, publish, and digitize geoinformation, the Artha report forecasts the Indian Geospatial Economy to reach INR 63,100 crore in 2025 at a growth rate of 12.8%. Infrastructure development, Agriculture, Water resources, Land management, Utilities and Urban development are some of the sectors that are expected to drive the growth of geospatial economy of the country.

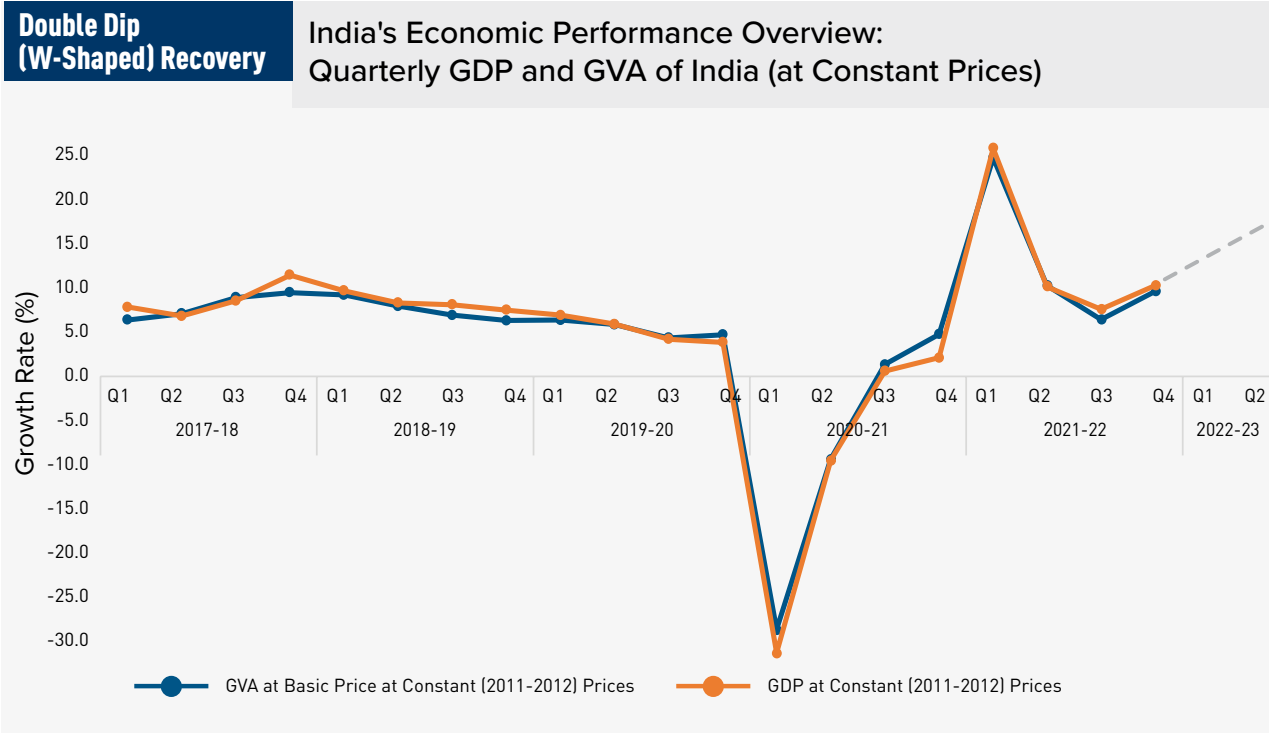
The report has also clearly emphasised the need for having a Geospatial Industrial Development Strategy for India which could further expand the geospatial economy of India to reach INR 80,000 crore by 2025 with at least 18 lakh people employed in the geospatial ecosystem. It will be important to implement the strategic recommendations outlined in the report and to map what needs to be done by all players, so that the country can reap the benefits of geospatial industry's development much more effectively and achieve a global position in the Fourth Industrial Revolution. The integrated and comprehensive approach presented in the report would help the Indian geospatial ecosystem to improve productivity and bring higher returns on national investments and generate significant social and economic value.

Esri India is proud to be associated with Geospatial World in development and release of this report. I personally appreciate the initiative taken by Sanjay Kumar, CEO, Geospatial World to convene the National Geospatial Strategy Think Tank, which is a group of eminent stakeholders of the geospatial sector in the country. This Think Tank has provided the much-needed guidance and direction for creating a narrative for the growth of geospatial economy of India. I compliment the Geospatial World team for developing the Artha report and hope that the entire geospatial community and the government policy makers will use this report as a blueprint for taking actions to expand the geospatial ecosystem of the country which will help in fulfilling India's vision of five trillion-dollar economy.

Indian Economy at a Glance

The Indian Economy is set to re-emerge as one of the fastest-growing economies of the world. The country’s economic recovery is driven by the Indian government’s visible strategic reforms and impetus to all economic sectors, accelerated and sustained efforts to provide vaccination coverage against COVID-19 to all the citizens, and significant improvement in overall monetary and credit conditions.

India’s economy is projected to grow by 9.5% in 2021 and 8.5% in 2022 (IMF). The economy at present, in the context of quarterly performance, is on a **W-shaped recovery** or in the double-dip phase, after which the country is estimated to maintain a sustained economic growth of 8% from 2023. The recovery is forecasted on the basis of the strategic reforms of the Government of India, particularly the government’s production-linked incentive (PLI) scheme to boost Foreign Direct Investment (FDI), labour reforms, digital transformation initiatives (including geospatial technologies), infrastructure investment drive, National Monetisation Pipeline, and accelerated vaccination drives across the country. Encouragingly, post the second wave of the COVID-19 pandemic, India’s domestic activity has had a significant upward momentum, almost nearing the pre-second wave economic growth trajectory.



Source: Reserve Bank of India (RBI) Publication, Government of India; Geospatial World Analysis

India's ArthaShashtra

India's Population (2021)
1.39 Billion

Real Gross Domestic Product (GDP)
at constant (2011-12) prices in the
year 2020-21
₹135.13 lakh crore

India's Rising Inflation Rate – 2021
5.56%

India's Exports at a record high in April-
September 2021 (led by oil products, gems and
jewelry, steel, pharmaceuticals, and chemicals)
₹14.6 lakh crore

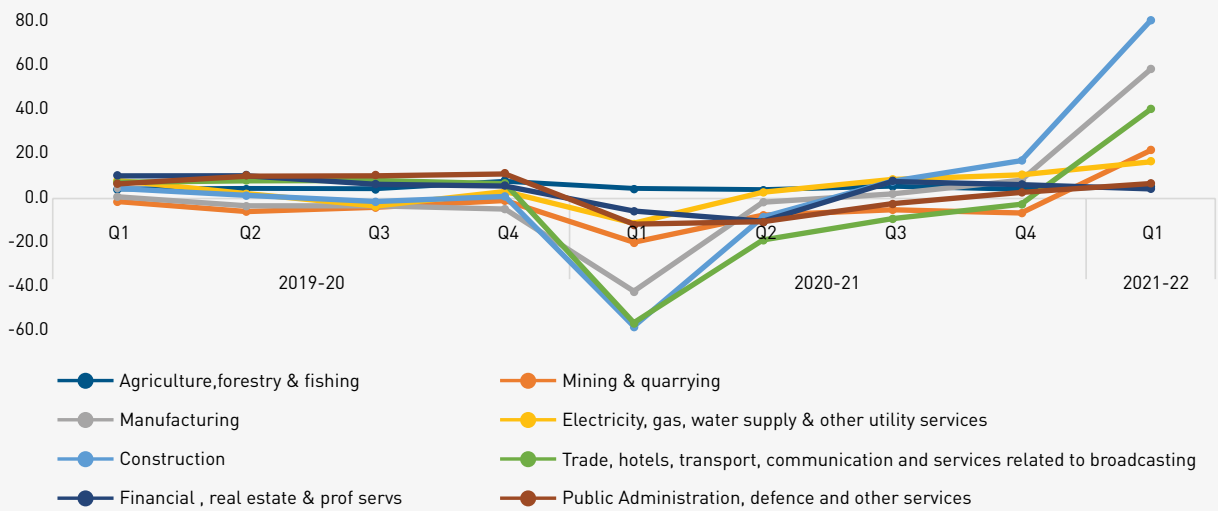
Source: World Economic Forum

Macro-economic progress

The pandemic triggered a unique economic shock in India, resulting in increased uncertainty, lower confidence, curtailment of spending options, restricted movement of labor, and supply chain disruptions, among other things. The spread and intensity of the COVID-19 pandemic captured through the dampened shock in India's output/Gross Value Added (GVA) in 2020-Q1 highlights the intensity of the induced economic shock across every sector. While the agriculture sector was largely insulated from the lockdown, supply chain disruptions impacted the flow of agricultural goods leading to high food inflation and a fall in major agricultural exports. Construction, manufacturing, and services sectors were hit the hardest due to the pandemic-induced requirements of social distancing and long-stretched lockdowns.

V-Shaped Recovery

India's Economic Performance across Economic Sectors: Quarter-wise GVA at Constant Prices (2011-12) 2019 (Q1 to Q4) - 2021 (Q1)



Source: Reserve Bank of India (RBI) Publication, Government of India; Geospatial World Analysis

India's GVA grew at 18.8% in the April-June 2021 quarter, even when the country was amid a national lockdown. At present, the country's sectors showcase a resilient V-shaped economic recovery driven by the continuous drop in daily cases, accelerated vaccination doses, and the government's sectoral stimulus packages and initiatives. Agriculture output remained resilient, while construction and manufacturing activity picked up significantly due to less stringent localized restrictions. Additionally, trade and tourism also picked up in Q1 of 2021 as vaccination and testing facilities improved across the country.



Vision: India's Five Trillion Dollar Economy

At the beginning of 2019, the Indian Government laid out Vision 2030 to become a 5 trillion dollar economy by 2025 and with an aspiration to become a 10 trillion dollar economy by 2030. Even with the Indian economy in recovery mode, and the Government undertaking strategic reforms, several sectors have rallied unequally. In such a scenario, agriculture and labour reforms along with a strategic push for infrastructure and manufacturing can drive change and achieve self reliance.



National Infrastructure Pipeline

₹111 lakh crore



Production Linked Incentive Scheme

₹1.97 lakh crore



एक कदम स्वच्छता की ओर

Urban Swachh Bharat Mission
2.0 (5 years)

₹1.4 lakh crore



PM-Aatma Nirbhar Swasth
Bharat Yojana (5 years)

₹64,180 crore



Har Ghar Jal

Jal Jeevan Mission (5 years)

₹2.87 lakh crore



Gati Shakti National Master
Plan for Infrastructure

₹100 lakh crore



Health and
Well-Being

₹2.23 lakh crore



Mahatma Gandhi National
Rural Employment Guarantee
Scheme (MGNREGA)

₹73,000 crore



PM-KISAN Scheme

₹65,000 crore



Clean Air Mission

₹2,217 crore

Public Policy Reforms Advancing India's Economic Growth Story

Public policy reforms are imperative to stimulate and develop any economy's growth story. In FY 2020-21 and in early quarters of 2021, the Government of India deepened its structural reforms in the area of infrastructure, health, and service delivery, which will play a critical role in enhancing and sustaining India's growth story in the next five years. In particular, to reverse the economic impact of COVID-19, India's economic story currently is supported by prudent macroeconomic policy: targeting inflation, energy subsidy reforms, higher quality of public expenditure, digital transformation initiatives, significant inflows of foreign direct investment (FDI), and improvement in credit behaviour.

1

India's Monetary Policy (Four-stage monetary policy normalization)

Currently, the Government of India maintains an 'accommodative stance' concerning India's Monetary Policy. Foreseeing a surge in infections, the persistence of pandemic-related supply chain, and several other uncertainties, the government will focus on providing continued monetary support until the economic recovery process takes firmer roots. A gradual, calibrated shift towards an aggressive monetary policy is expected in the December meeting.

- Repo Rate remains at 4%
- Reverse- Repo Rate is at 3.35 %
- Marginal Standing Facility (MSF) rate and the bank rate is at 4.25 %

2

Strategic Disinvestment Policy

The government of India has announced the Policy on Strategic Disinvestment to finance various social sector and development programs to infuse private capital, technology, and best management practices in Central Government Public Sector Enterprises in all strategic and non-strategic sectors.

- Government has signed the Share Purchase Agreement (SPA) with Tata Group for Air India and its subsidiaries disinvestment in an INR 18000-crore deal
- Strategic disinvestment of Bharat Petroleum Corporation (BPCL), Shipping Corporation of India, Container Corporation of India, IDBI Bank, BEML Limited, Pawan Hans, etc., to be completed in 2021-22
- Incentives to states for disinvestment of their Public Sector Companies, using central funds.

3

Foreign Trade Policy

While the Government of India has extended the Foreign Trade Policy (FTP) announcement from October 1, 2021 to 1st April 2022 the Commerce and Industry Ministry has set a target of USD 400 billion for the year 2021-2022 to take the Make in India initiative global.

- Export community has been advised to target USD 2 trillion exports by 2030, of which USD 1 trillion merchandise exports and USD 1 trillion services exports
- The India-US Trade Policy Forum (TPF) is being re-launched after four years to resolve trade and investment issues between the two countries. TPF will focus on five focus areas – agriculture, investment, innovation, and creativity (IPR), services, and tariff and non-tariff barriers.

4

Sectoral FDI Guidelines

The Indian government has taken strategic measures to increase India's FDI inflow as the country banks on an investment and infrastructure-led economic recovery. Significant measures have been taken to facilitate investment across sectors via FDI policy reforms.

The government has announced FDI reforms in –

- **Energy sector** – FDI investment in renewable energy via automatic route,
- **Insurance** - an increase of FDI cap from 49% to 74%,
- **Telecom** - sectoral cap raised from 49% to 100% via automatic route,
- **Defense** - proposed to increase FDI cap to 74% via automatic route, and
- **Space** - FDI up to 100% in satellites-establishment and operation subject to sectoral guidelines of the Department of Space/ISRO under the government route

GEOSPATIAL INDUSTRY AND DIGITAL ECONOMY

Geospatial technologies are a nation's digital currency for evidence-based decision-making. Geospatial technologies refer to the varied range of modern tools and technologies that help in geographic mapping of the earth's surface and provide context to the collected spatial data via intelligence and analytics. In simple words, geospatial technology is defined as any technology that enables the creation, management, analysis, and visualization of geospatial data.

Geospatial Technology Ecosystem

Today, the geospatial technology ecosystem is a complex entity of multiple interactive components, inclusive of geospatial data sourced from various technologies broadly segmented into four categories – Geographic Information System (GIS), earth observation (satellite, aerial, and street imagery), and scanning tools and technologies (LiDAR, RADAR and Ground Penetrating Radar). The geospatial information collected from these sources is presented in many forms and mediums, including digital maps, satellite imagery, point clouds, and aerial imagery. The spatial data reinforces the importance of the 'location' reference frame, which facilitates societal, economic, and environmental use across government systems and other national development initiatives.

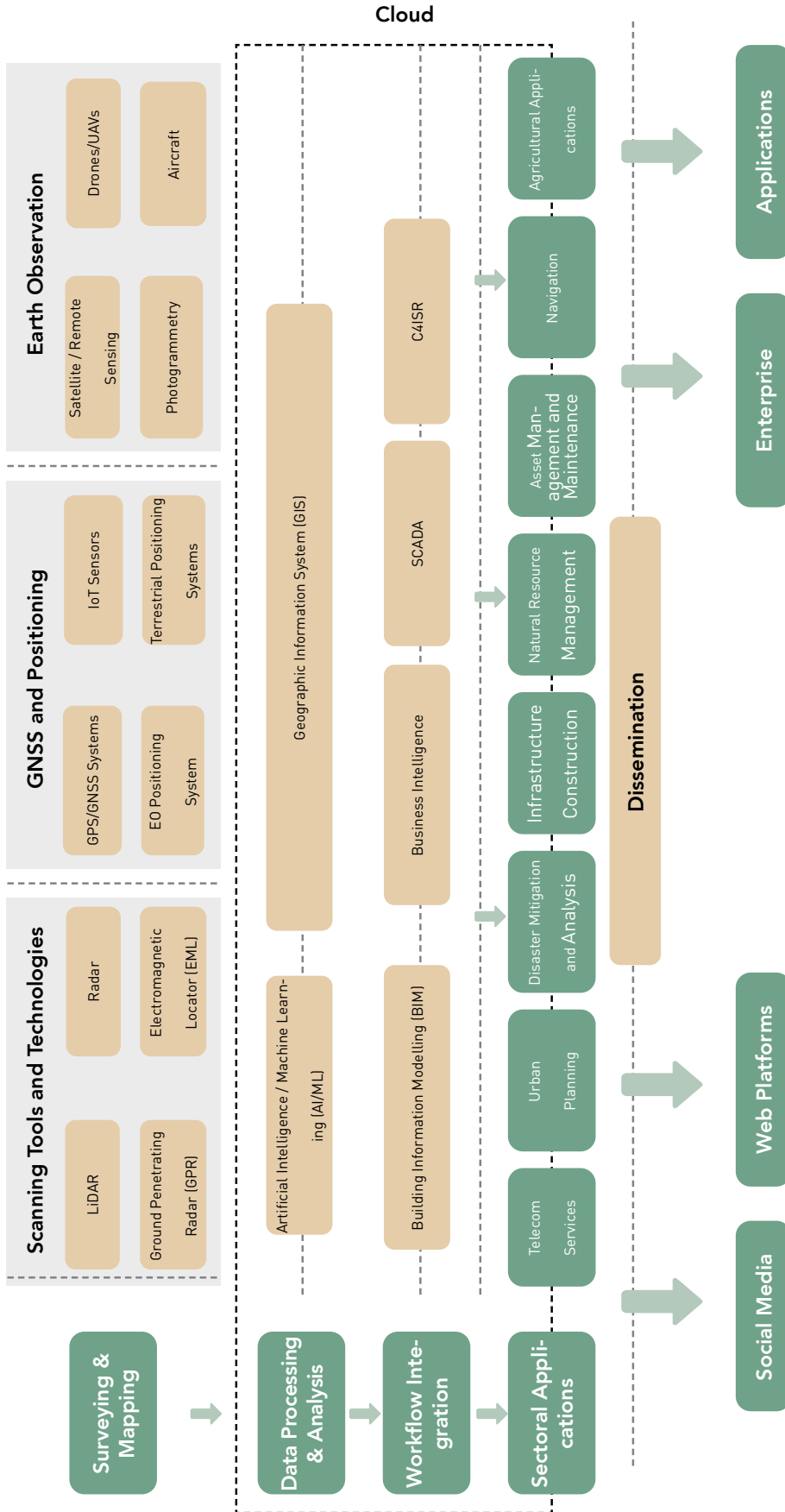
Geospatial Technology and Fourth Industrial Revolution

With the onset of the fourth industrial revolution (4IR), the availability of huge volumes of structured and unstructured data has given rise to the digital economy, which encompasses 4IR technologies, such as cloud, big data, Internet of Things (IoT), Artificial Intelligence (AI), Machine Learning (ML), automation, robotics, edge computing, Digital Twin, blockchain, and other revolutionary technologies. Today, in the digital transformation era, these digital technologies into the countless aspects of the world economy have also impacted the geospatial industry. Since the world is currently deluged with geospatial data, the impact of digital technologies on the geospatial is profound and evolving with greater velocity affecting varied sectors and countries worldwide.

Geospatial Industry Value Chain

The geospatial industry value chain is dynamic – as it translates data into knowledge for contribution to the world economy and society. The geospatial industry value chain involves data collection through surveying and mapping activities – using scanning tools and technologies, GNSS and positioning systems, and earth observation data sources. The abundant data so collected is further processed using artificial intelligence/machine learning, and geographic information system (GIS) to derive insights. The data is further integrated with different technologies such as Building Information Modelling (BIM), Business Intelligence, SCADA, etc., for enhanced workflow integration and easy application into multiple sectors – telecom services, urban planning, disaster mitigation, infrastructure, natural resources, asset management, and maintenance, among other sectors. Lastly, the insights are disseminated using social media platforms, web platforms, enterprise solutions, and applications, which significantly impact the world economy and society.

Geospatial Industry Value Chain



Contributing to World Economy and Society

Source: Geospatial World Analysis

Integrated Geospatial Policy Framework

An integrated and inclusive geospatial policy framework is critical for strengthening the national geospatial infrastructure, facilitating geospatial industry growth, and maximizing the utilization and implementation of geospatial data for socio-economic development.

Geographic or geospatial information continues to evolve as a ‘common language’ for more than seven billion people worldwide within just 50 years. Today, it is increasingly recognized as the ‘new capital’ of the global economy as governments, businesses, development organizations, and citizens exploit geospatial information to address the socio-economic realities of the world. With the onset of the Fourth Industrial Revolution (4IR) — driven by artificial intelligence (AI), Internet of Things (IoT), Big Data and Cloud — entities all over the world are leveraging geospatial information to derive critical insights for robust performance and develop meaningful growth strategies for the overall socio-economic development of their countries. Further, the integration and interoperability of geospatial information with the broader Information Technology (IT) and engineering workflows (Building Information Modelling, and others) is radically disrupting the geospatial ecosystem, opening it for use by varied economic sectors and for next-generation activities.

Evaluation of international geospatial policies and legislative processes during the last decade shows a gradual transition by governments — away from the thrust provided to building spatial data infrastructure and towards adopting globally recognized frameworks such as the **Integrated Geospatial Information Framework (IGIF)** and the **Geospatial Knowledge Infrastructure (GKI)** framework. Governments worldwide are recognizing the role of these global frameworks and are increasing investments in infrastructure (data and positioning infrastructure) and national capabilities for advancements in technology, institutions, industry, and human resources. Therefore, geospatial technology and information demand a dynamic response today in policy-making from governments worldwide, including India.



Fig 2.1: Evolving Geospatial and allied policies, strategies and rules and regulations

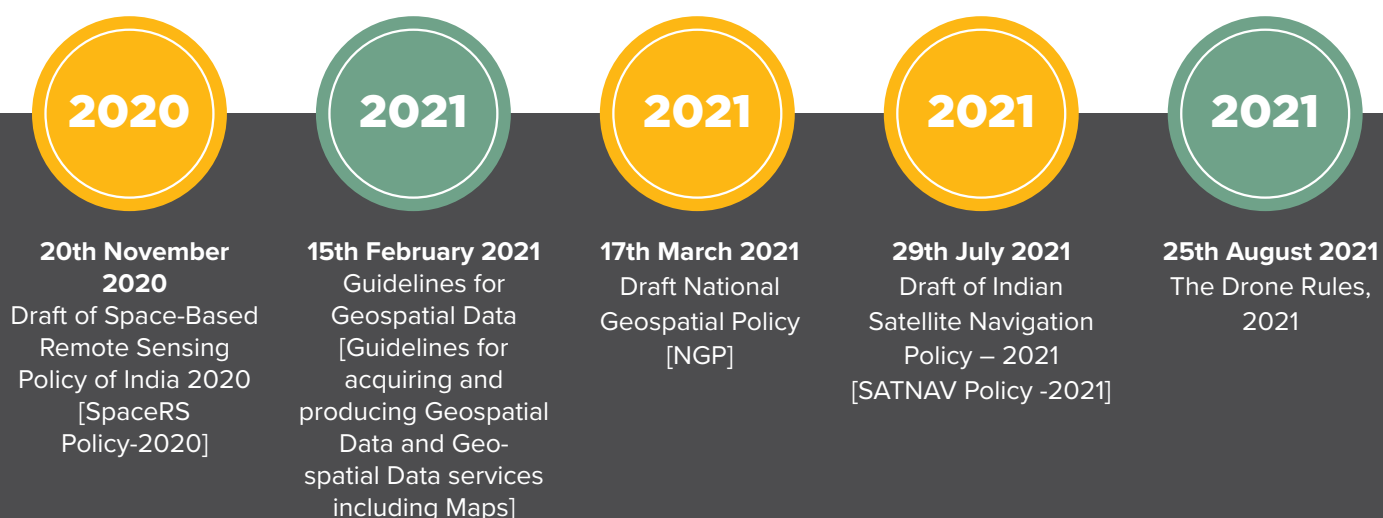
Geospatial Policies/Strategies in the Indian Context

Historically in India, huge volumes of geospatial datasets have been available since the 1800 in the form of maps and have been governed by restrictive provisions, rules, and regulations. Consequently, these datasets have never been of adequate accuracy and precision and shareable with the end users in digital form. However, in today's digital age, there have been significant advances in Geoinformation and Communication Technologies (GEO-ICT) which is driven by increased accessibility of end users to these technologies for different applications. These new applications have opened new vistas for business opportunities for individuals, business entities, and user organizations.

The Indian geospatial ecosystem has consistently been challenged by multiple regulations, often overlapping and conflicting in provisions. The governing rules and regulations, and policies for geospatial and other related departments, have often been conservative by restricting access and implementing tedious procedures for the dissemination of geospatial information. These processes have further impaired commercial companies from innovating, scaling, and moving up the value chain.

The pandemic years – **2020 and 2021** - will go down in history as a transformative years for the geospatial industry as the Government of India has strategically and determinedly pushed boundaries in geospatial and allied policies and the implementation of the technology across varied economic sectors. The Guidelines for Geospatial Data, the Drone Rules 2021, and the Draft Policies (Geospatial, Remote Sensing, and Satellite Navigation) will liberalize, democratize, and commercialize the use of geospatial data and information for planning and monitoring requirements within the country while also boosting geospatial entrepreneurship across varied technology segments. These policies, guidelines, and rules will eventually lay the foundation for knowledge and data-driven Digital India and help achieve self-reliance and a five trillion-dollar economy by 2025.

The **Guidelines for Geospatial Data**, and the **Drone Rules 2021** - both released in 2021 - are significantly relevant today as they are already in implementation and have become the base for innovation with direct innovation in mission mode projects like National Infrastructure Pipeline (NIP), National Hydrology Project (NHP), Gati Shakti National Master Plan for Infrastructure, SVAMITVA scheme (Survey of Villages and Mapping with Improved Technology) and the Smart Cities Mission, among many others. Alternatively, while many of the current policies are in the consultation phase with the broader geospatial industry, user, and civil society ecosystem, the implications of these documents will be significant in the future. The key features of the geospatial policy ecosystem assessed across various parameters are mentioned in the Annexure.



GUIDELINES FOR GEOSPATIAL DATA – Pivotal Advancement Towards Technological Liberalization

On February 15th, 2021, the Department of Science and Technology (DST), Government of India introduced the new Guidelines for Acquiring and Producing Geospatial Data and Geospatial Data Services including Maps (Guidelines for Geospatial Data). The guidelines liberalize the pre-existing regulations around geospatial data in India, paves way for unrestricted environment for its usage across diverse sectors of the economy, will boost geospatial entrepreneurship in the country and greatly enhance the scalability of adoption of geospatial data, knowledge, and services across economic sectors, thus enhancing the Ease of Doing Business in the country.



Acknowledgment of the Value of Geospatial Information

The Guidelines recognize and acknowledge the usefulness of geospatial data (including location information) to unlock socio-economic and environmental opportunities for sustainable development.

Integrated Policy Framework for Geospatial Data Acquisition and Production

The Guidelines (and the draft NGP) supersede the multiple geospatial and related policies, guidelines and executive documents published earlier, making them redundant or obsolete. They serve as a single point reference, thus simplifying most of the ambiguities and grey areas in the previously available 15+ policies making the geospatial environment less complicated and bureaucratic.

Thresholds of Geospatial Data Capture

The following thresholds have been defined for geospatial data under the guidelines which will be regularly reviewed and amended as necessary by the DST.

On-site spatial accuracy:
one meter for horizontal or
planimetry and three meters for
vertical or elevation.

Gravity anomaly:
1 milli-gal.

Vertical accuracy of bathymetric
data in territorial waters: 10
meters for up to 500 meters
from the shoreline and 100
meters beyond that.

Open and Easy Access to Geospatial Information

The guidelines provide for an open and accessible geospatial data (not necessarily free data) which is a fundamental requirement for all stakeholders to engage, collaborate, and innovate to transition into a knowledge economy, bring transparency, and increase efficiency in public services and development in related markets.

Industry Development

The guidelines aims to liberalize the map making industry to spur domestic innovation, facilitate 4IR technology prowess and empower the Indian geospatial entities (public, private, start-up) to scale and move up the value chain to deliver wholesome solutions.

Trust Building and Self-Reliance

Governments' forward-looking and inclusive approach to allow geospatial industry, geospatial practitioners, and citizens to self-certify geospatial data as per the defined thresholds aims to build self-reliance and trust within the larger geospatial ecosystem.

DRONES RULES 2021– Ushering in the growth of Drone ecosystem in India

In July 2021, the Ministry of Civil Aviation repealed the UAS rules released in March 2021 and announced the Drone Rules 2021 which came into effect on August 25 2021. The new liberalized Drone Rules have been announced with the aim to fulfill the Government of India's vision of making India a Drone Hub by 2030. The Drone Rules are expected to usher in growth in the nascent drone ecosystem as it reduces the red tapes initially serving as a bottleneck between drone companies and the government. These Rules are expected to transform the core sectors of the Indian economy including infrastructure, agriculture, land administration, transportation, mapping, and surveying, defence, mining, and emergency response, among other sectors.



Acknowledgment of the Economic Value of Drones

The Rules acknowledge the importance of Drones in creating significant opportunities for economic growth across varied sectors and in employment generation.

Industry Development

The Rules aim to improve the ease of doing business in the drone sector by reducing the number of clearances from twenty-five to six. Single-window clearance on the Digital Sky Platform will make registering, owning, and operating drones easy, save time and bring efficiency. Simultaneously, no restriction is placed on drone operations by foreign-owned companies registered in India.

Promotion of Make in India

The Rules promote the use of Make-in-India technologies, designs, and components for manufacturing drones in India.

Impetus to Research and Development

State and Central Government recognized research and development (R&D) institutes and educational institutions, among others, will not require a remote pilot license, type certificate, or Unique Identification Number (UIN) if they operate in the green zone of airspace and entirely within the organization's control. This will enable start-ups and R&D organizations to survey and map the green zone area for research purposes as per the thresholds defined for guidelines for geospatial data.

Threshold of Drone Operations

The following thresholds have been defined for drone operations basis an airspace map published on the Digital Sky platform on 25th September 2021. The map segregates the airspace into red, yellow, and green zones. Drone operators will not require any permission or flight path registration when flying in green zones but will need to declare purpose and take relevant permission for flying in red or yellow zones.

Development of a Drone Promotion Council

The adoption and promotion of Drones will be done by a dedicated industry body established by the Central Government, namely, the Drone Promotion Council (DPC). The Council shall facilitate a business-friendly regulatory regime with automated permissions and establish incubators and accelerators to develop drone technologies in India.

INDIAN SPA

REMOTE SENSING DATA POLICY (RSDP) – 2011 CURRENTLY IN IMPLEMENTATION

The Remote Sensing Data Policy 2011 replaced the 2001 policy to open the remote sensing (earth observation) sector in India while removing data-based restrictions to enable more users to access and use high-resolution data for developmental activities. The policy established the guidelines for operating remote sensing satellites in India, and the acquisition, and distribution of remote sensing data from India and Foreign satellites. The RSDP-2011 established the Department of Space is the nodal agency for implementing the policy.

ACKNOWLEDGMENT OF THE VALUE OF REMOTE SENSING DATA

- RSDP-2011 recognizes that Remote Sensing data provides much essential and critical information, a necessary input in developmental activities at different levels, and benefits for socio-economic development.

REMOTE SENSING SATELLITE OPERATIONS

- For operating a remote sensing satellite from India, license and permission from the Government of India shall be necessary through the nodal agency.
- The Government and the Department of Space, as the nodal agency, shall be the sole and exclusive owner of all data collected/ received from IRS. All users will be provided with only a license to use the said data and add value to the satellite data.

THRESHOLDS OF REMOTE SENSING DATA SHARING

- All data of resolutions of up to 1 meter to be distributed on a non-discriminatory basis and on 'as requested basis'.
- All data better than 1-meter resolution shall be screened and cleared by the appropriate agency before distribution considering national security.

ROLE OF NATIONAL REMOTE SENSING CENTRE (NRSC)

- NRSC has the authority to acquire and disseminate all satellite remote sensing data in India from both – Indian and foreign satellites for development purposes.
- The policy establishes the Government's right to impose control over imaging tasks and distribution of data from Indian remote sensing satellites in issues of national security and international obligations and/or if foreign policies of the Government require so.

DATA SHARING

- The policy allows government users, namely ministries, departments, public sector, autonomous bodies, government research and development institutions, government educational, and academic institutions, to obtain remote sensing data without further clearance.
- Private sector agencies that support developmental activities will only be allowed access to data when recommended by at least one agency.
- Private users – including Indian and foreign entities, including web-based service providers- can obtain the data after further clearance from an inter-agency High-Resolution Image Clearance Committee (HRC).



CE SECTOR

DRAFT SPACE-BASED REMOTE SENSING POLICY OF INDIA – 2020 (DRAFT SPACE-RS POLICY – 2020)

CURRENTLY IN CONSULTATION (DRAFT)

In Nov 2020, the Department of Space unveiled its Draft SpaceRS Policy-2020, which aims to encourage the country's citizens to actively participate in space-based remote sensing activities to enhance the commercialization of space technology. The draft policy pushes for easy access to space-based remote sensing data and information to unravel India's best knowledge-based solutions for socio-economic development

ACKNOWLEDGMENT OF THE DEMAND AND VALUE OF REMOTE SENSING DATA FOR SUSTAINABLE DEVELOPMENT

- The Draft SpaceRS Policy acknowledges the growing role of remote sensing technology in sustainable development and various economic applications and operational activities. The policy recognizes the increasing demand for satellite data to meet the country's requirements for developmental and commercial activities.

SPACE INDUSTRY DEVELOPMENT

- The Draft SpaceRS Policy acknowledges the need to bridge the demand and supply gap in the remote sensing data ecosystem. Towards this, the Government has developed processes that allow entities to provide end-to-end space-based remote sensing services within and outside India on a commercial basis.
- The Draft SpaceRS policy also allows Indian entities to freely market and realize space assets through a process of authorization.
- The satellite systems for the strategic sector shall be realized using indigenous designs, systems, and infrastructure providing the capabilities of a secured environment by DOS. While realizing such missions, DOS may avail capabilities of Indian industry when deemed appropriate.

EASY ACCESS TO SPACE-BASED REMOTE SENSING DATA

- The Draft SpaceRS policy provides Indian entities to provide remote sensing data and services to any user in the country to unlock the potential of remote sensing data in the Indian market. The policy allows Indian entities to share commercial data with resolutions better than 5m and up to 50 m.

IMPETUS TO RESEARCH AND DEVELOPMENT

- Department of Space (DOS) shall continue to emphasize research and development in space to implement social programs aimed at national development and the development of satellites for strategic applications.
- DOS shall make Indian Remote Sensing satellite data having GSD of 5m easily accessible on a 'free and open' basis which shall promote increased usage across all economic sectors; while simultaneously developing satellite-based solutions capability within the country.

TIMELY AND RESPONSIVE REGULATORY ENVIRONMENT

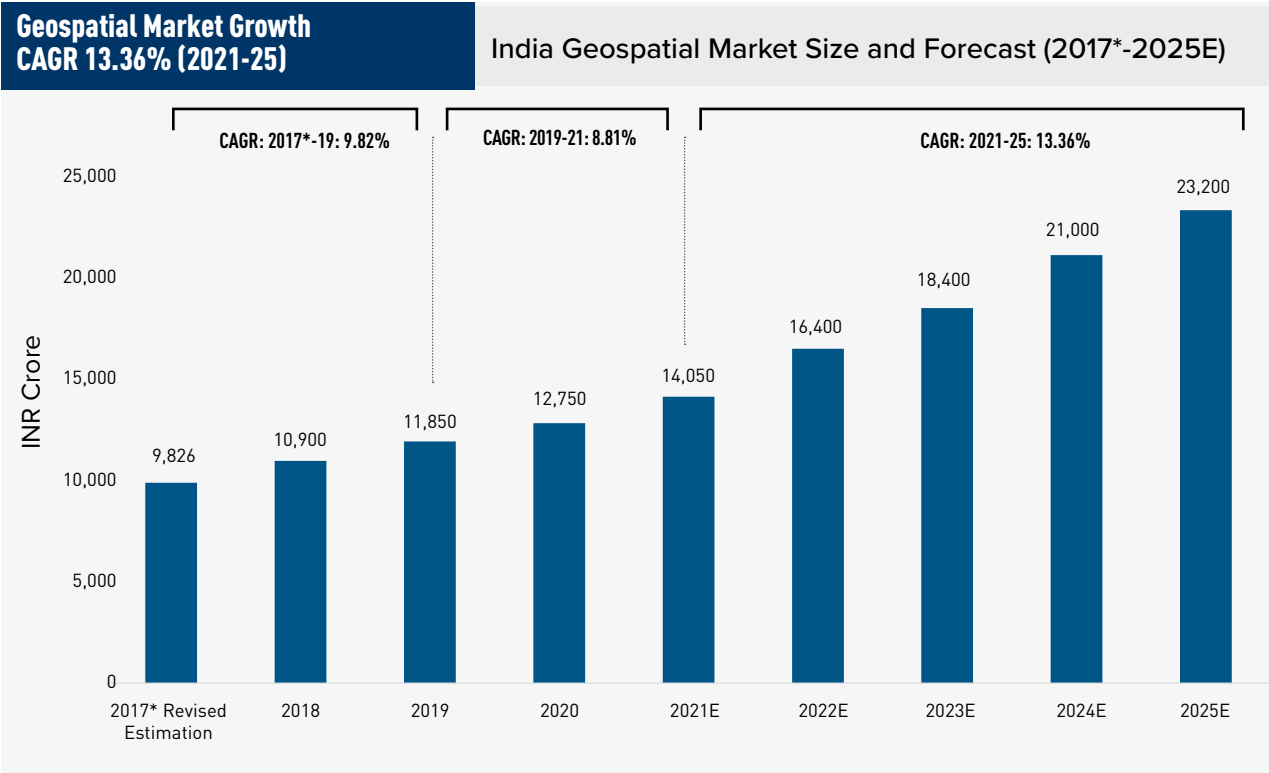
- Indian National Space Promotion & Authorization Centre (IN-SPACe), an independent body constituted by the Government of India, under the Department of Space (DOS), will be a single-window responsible agency to provide authorizations and permissions for all space-based remote sensing activities in India.

Indian Geospatial Market

Overview

The Indian geospatial market is on the verge of a significant transformation owing to the profound changes in the geospatial policy environment in the country. The past year or two have been difficult for all economic sectors, which has also indirectly led to a contraction in the geospatial market of India in the time period 2019-21. While the Indian geospatial market grew at a conservative annualized CAGR of 9.82% during 2017-19; the market further contracted in the period 2019-21, growing at a CAGR of 8.81%. The COVID-19 pandemic and the pandemic-induced lockdowns, along with restrictive and complex policy environment decelerated the growth of the market in the past five years. However, in present scenario, beyond 2021, the geospatial market is estimated to grow at a significantly moderate rate, 13.39% CAGR, growing from INR 14,050 crore in 2021 to INR 23,200 crore in 2025. This growth is attributed to the positive sentiments infused in the market by –

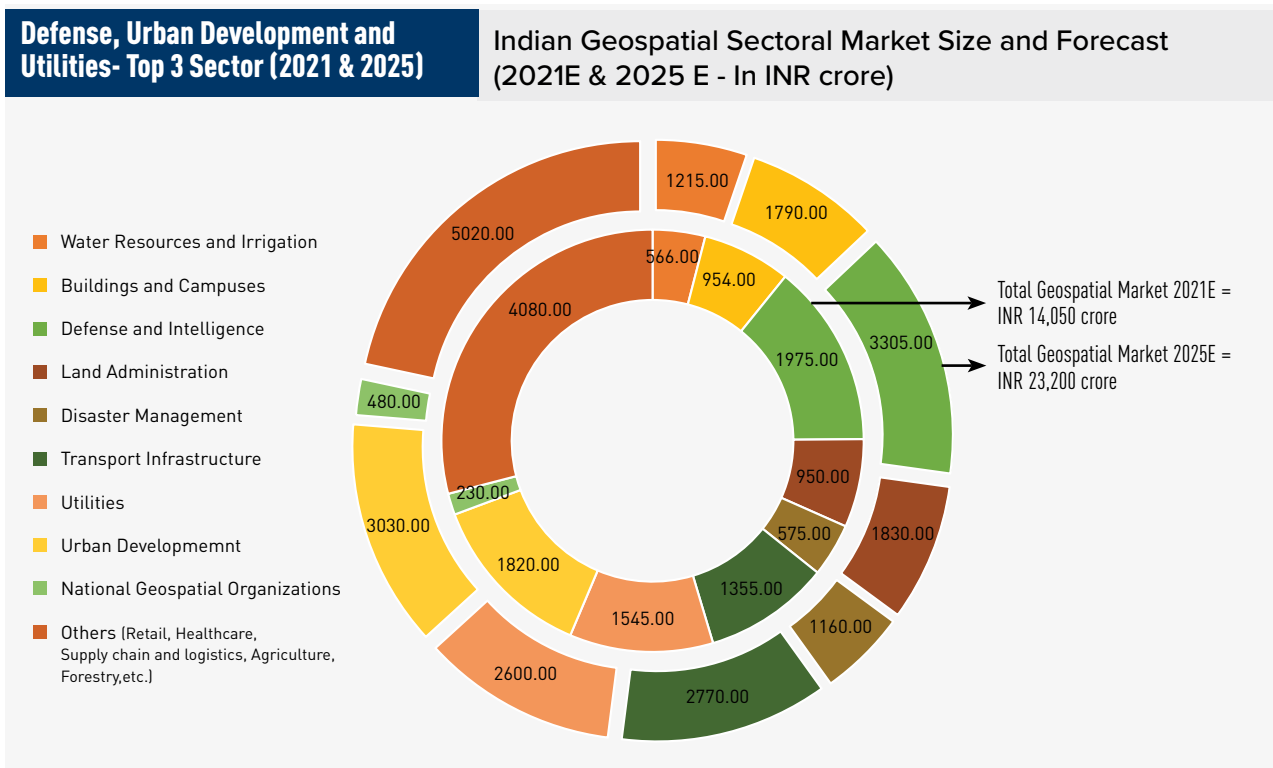
1. India's swift economic recovery to 90% of the pre-pandemic level with growth impulses is visibly transmitted to all sectors of the economy. This growth is enthused by the ebbing of second-wave of Covid, fast-paced vaccinations, festive season, enhanced mobility, and consequent improvement in consumer and industry sentiments.
2. Critical announcements by the Government of India on the Draft National Geospatial Policy 2021 [Draft-NGP 2021], the Guidelines for Geospatial Data 2021, the Drone Rules 2021, and the Draft Space Remote Sensing Policy [Draft-Space RS Policy 2021] for liberalization and democratization of geospatial data will lead the growth in Indian geospatial market.



- The increasing interest of leading global geospatial industry players to expand their businesses in the Indian market by importing hardware equipments (Total Stations, LiDAR, GNSS sensors etc.); developing software, APIs and applications, low-cost data processing and image processing services; establishing research and development (R&D) centers to develop solutions in the areas of deep learning, GeoAI solutions, cloud, big data analytics; among other things, will enhance domestic capacity and capability.
- Strategic push by the Government of India to adopt the latest technologies (including geospatial information and technology) across national mission-mode projects to achieve the vision of 5 trillion dollar economy by 2025; with an aim to simultaneously improve productivity, efficiency, and efficacy across all economic sectors contributes to geospatial market growth.
- Almost every national integrated program linked to India's development, like National Hydrology Project (NHP), Bharatmala, AMRUT Smart Cities, SVAMITVA Scheme, National Infrastructure Pipeline, require enormous volumes of spatial data and analysis to enhance program efficiency. Major technological investments in these projects significantly add to the domestic geospatial market of India.

Indian Geospatial Sectoral Market

Geospatial information and technology as an empowering technology redefines the paradigms of sectoral output (GVA). It holds critical importance in all sectors of the economy, as all of them today, more than ever, require predictive analytics, modeling, and simulations to enhance productivity, efficiency, transparency, and monitoring in their workflows. It is a crucial enabler in policy planning, implementation, and engagement with citizens. Governments and businesses are increasingly relying on geospatial technology to improve services to citizens/customers – be it tracking illegal construction, ensuring compliance, minimizing environmental energy, planning energy resources, improving emergency response, or planning sustainable development. The use of geospatial technologies through sectoral applications, value-added knowledge, and enterprise



Source: Geospatial World Analysis

solutions only adds to sustainability's efficiency and effectiveness, leading to incremental benefits to the economy (particularly the gross value added) at a quick pace.

With respect to sectoral application areas, the geospatial market of India in 2021 is dominated by Defense and Intelligence, Urban Development, and Utilities. Together in 2021, these sectors accounted for 37.98% of the total geospatial market – with each sector accounting for 14.05%, 12.93%, and 11%, respectively. The other two sectors contributing significantly to the Indian geospatial market in 2021 are transport infrastructure (roads, railways, airports, and ports) and the buildings and campuses segment having an estimated market share of 9.64%, and 6.80%, respectively. Altogether, the five sectors mentioned above account for 50%+ of India's total geospatial market in 2021.

Alternatively, in 2025, the geospatial market is going to be dominated by the Defense and Intelligence and Urban Development sectors, with each sector accounting for 14.26%, and 13.06% respectively. Meanwhile by 2025, the geospatial market in transport infrastructure is going to surpass the Utilities market, and Land Administration is going to replace Buildings and Campuses to be the fifth most priority market for the geospatial industry. The market share of these sectors is estimated to be 11.93%, 11.22% and 7.90% respectively.

Factors driving Geospatial Market Growth in top five sectors in 2025:

DEFENSE AND INTELLIGENCE



The Defense and Intelligence sector (GEOINT community) has been the largest consumer of geospatial information and technologies globally and so it is the case in India. United States, India, Japan, and Australia initiated a strategic dialogue, known as the Quadrilateral Security Dialogues (QUAD) in 2007; revisiting the same in 2017. The development of the QUAD took place in the context of Chinese military modernization and will play a strategic role in defining the Defense organizations use of geospatial technologies for military purposes. Further, in 2020, India and the U.S. signed the Basic Exchange and Cooperation Agreement for Geospatial Cooperation (BECA) which includes sharing classified information and giving India access to accurate geospatial data for military applications. Thus, to address the geopolitical uncertainties lurking at India's border, the growing protectionism and the volatile global economy, all Defense organizations of the country have been expanding their geospatial technology capabilities for surveillance, monitoring, and situational awareness. The market is expected to grow at a moderate CAGR of 13.81%, i.e., from approximately INR 1,975 crore in 2021 to approximately INR 3,305 crore in 2025.

Urban Development is the second priority sector with a significant geospatial market in 2021, i.e., INR 1,820 crore and a total potential of approximately INR 3,030 crore in 2025. Urban Development in India is driven by key national mission mode programs – such as Smart Cities Mission, AMRUT, and the Housing for All by 2022 mission. Additionally, the COVID-19 pandemic, floods, and cyclones necessitated state government and municipalities to plan their urban areas using advanced technologies. Municipalities and development authorities of Karnataka, Assam, Kerala, etc., have announced plans to formulate master plans for managing urbanization and spatial sustainability. Urban development master plans are being discussed in various states with a 'whole of society' approach to cultivate an ecosystem of civic innovation. Governments are increasingly recognizing the value of spatial data in planning urban (and rural) areas and are pushing for a comprehensive spatial development strategy under statutory master plans. The government impetus on urban development programs with a spatial understanding will drive the geospatial market in this sector incrementally.

URBAN DEVELOPMENT



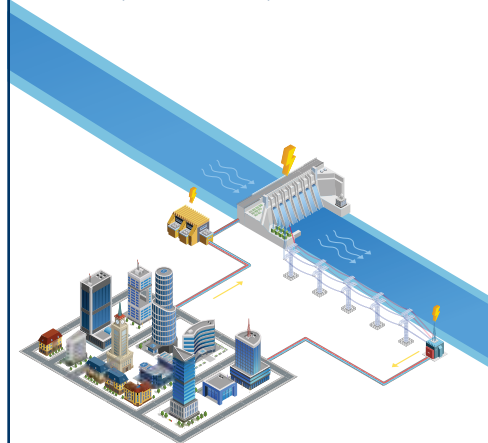
TRANSPORT INFRASTRUCTURE



The Indian transport infrastructure sector is estimated to grow at a CAGR of 19.73% thereby becoming the fastest growing segment of India's infrastructure sector. Of the four transport sub-sectors, roads and highways are of national priority for the Indian Government, followed by railways, airports, and ports. Additionally, MoRTH's mandate of using LiDAR (and other such advanced technologies) in highway projects, increasing the use of drones for surveying, mapping, and monitoring in railways and airport projects adds to the significant growth of the geospatial market of transport infrastructure projects. Alternatively, the recently launched Gati Shakti – National Master Plan for Multi-modal connectivity based on a GIS-based platform with as many as 600 data layers, brings together railways, road and highways, ports, among other 16 ministries together for developing integrated planning and coordinated implementation of infrastructure connectivity projects by 2024-25. This goal will only be achievable with the use of the latest geospatial technology and real-time spatial data. Therefore, the geospatial market in transport infrastructure is estimated to grow from approximately INR 1,355 crore in 2021 to INR 2,770 crore in 2025.

The Utilities (Energy, Electricity, Water) sector is estimated to be the fourth crucial geospatial market in 2025. India is among the fifth largest electricity producer globally, with an installed capacity of 388.134 GW electric grid as of 31 August 2021. The government is also working towards significantly improving the proportion of renewable energy in its installed capacity and reaching net-zero by 2070. For this purpose, the government recently launched the Geospatial Energy Map of India developed on a GIS platform. The map enables the real-time update of India's diverse energy sector while simultaneously enabling visualization, assessment, planning, and monitoring across all related sectors – transport, manufacturing, environment, etc. Additionally, government programs like Integrated Power Development Scheme (2015) and Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA) -2017, are already driving the adoption of geospatial technologies in the Electricity and Energy sector. In the Water sector – the use of geospatial technologies in the Jal Jeevan Mission (Rural and Urban) is mandated for hydrological mapping, land use mapping, web-GIS platform development, among other things. Therefore, the total geospatial market in the Utility segment is estimated to rise from INR 1,545 crore in 2021 to approximately INR 2,600 crore in FY 2025.

UTILITIES (ENERGY, ELECTRICITY, WATER)



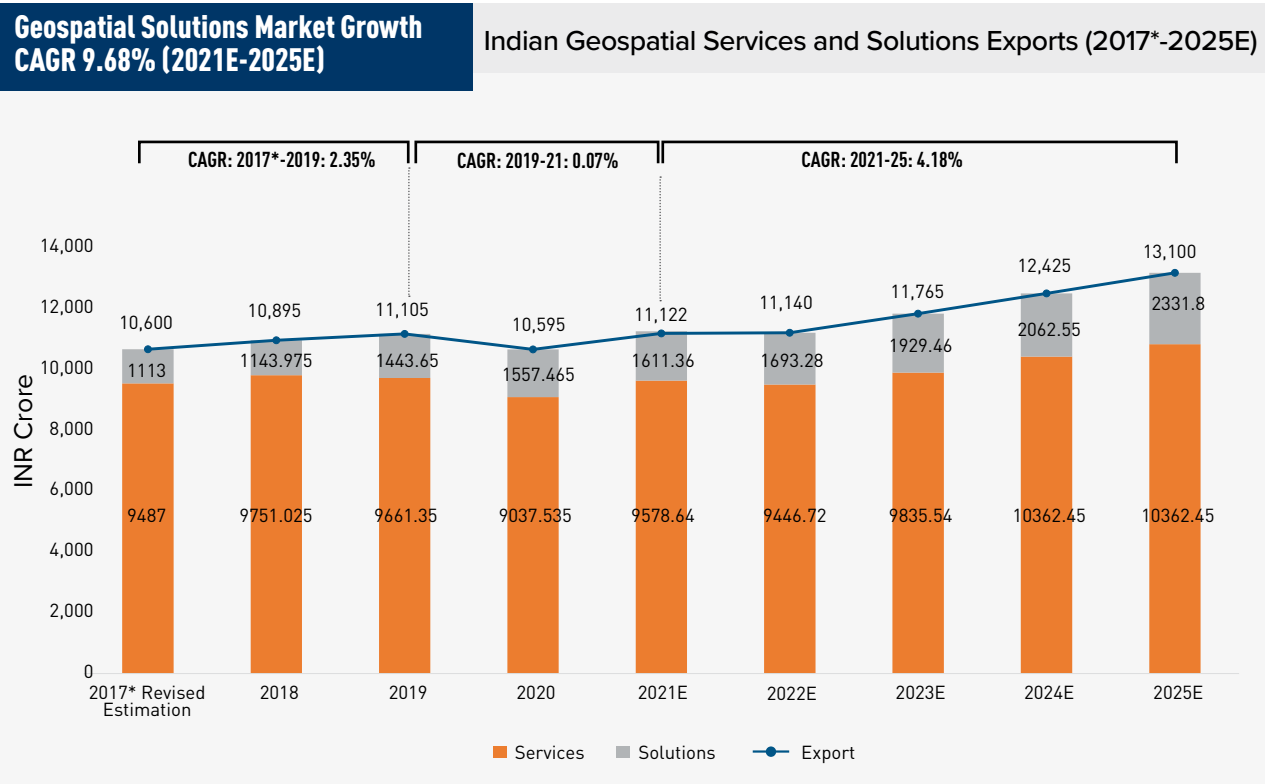
LAND ADMINISTRATION



Land Administration is estimated to be the fifth most crucial geospatial market in 2025, growing from INR 950 crore in 2021 to approximately INR 1,830 crore. One of the critical programs in the sector launched in Aug 2020, the SVAMITVA scheme (Survey of villages and mapping with improvised technology in village areas), of the Ministry of Panchayati Raj aims to provide rural citizens the right to property documentation. The scheme allows for surveying the land parcels in rural inhabited areas across the country in a phased manner using drone technology from 2020-2025. Additionally, using data collected via survey, preparing a better-quality Gram Panchayat Development Plan (GPDP) using GIS software is in proposal for comprehensive planning of the village. Many state governments are already working with India's national mapping agency, Survey of India, to conduct the pilot phase of the project successfully. Further, both the SVAMITVA scheme and the ongoing Digital India Land Records Modernization Program mandates LiDAR and satellite imagery for surveying and mapping; showcasing a significant geospatial market potential by 2025.

Indian Geospatial Export: Services and Solutions

The Indian geospatial services and solutions export market in India is set for a transformational change. Traditionally, the Indian geospatial export market continues to be a services market as export of solutions is still at a nascent stage since there are hardly any solution companies in India. During 2017 to 2019 – the geospatial exports market in India grew at a conservative rate of 2.35%; contracting to 0.07% during the period of the COVID-19 pandemic (2019-2020). The sharp contraction in the geospatial exports is attributed to the macroeconomic factors of export restrictions, travel lockdowns, and supply chain disruptions. However, as the global economy recovers, the export market is estimated to match its pre-pandemic levels. It is estimated that the geospatial export market in 2021 was INR 11,122 crore and is estimated to rise at a CAGR of 4.18% to INR 13,100 crore in 2025.



Source: Geospatial World Analysis

Interestingly enough, **the growth is estimated to rise much more sharply in the geospatial solutions export sub-segment instead of the geospatial services export sub-segment.** The geospatial services export is estimated to grow at a CAGR of 2.97% from INR 9,578 crore in 2021 to INR 10,768 crore in 2025; whereas the geospatial solutions market is estimated to grow at an enormous CAGR of 9.68% from INR 1,611.34 crore 2021 to INR 2,331.8 crore in 2025.

The potential growth in the Indian geospatial solutions export market can be significantly attributed to the impetus provided by the Government of India for the liberalization and democratization of geospatial data. The Draft Policy and the Guidelines make all geospatial data produced easily accessible (open, not necessarily

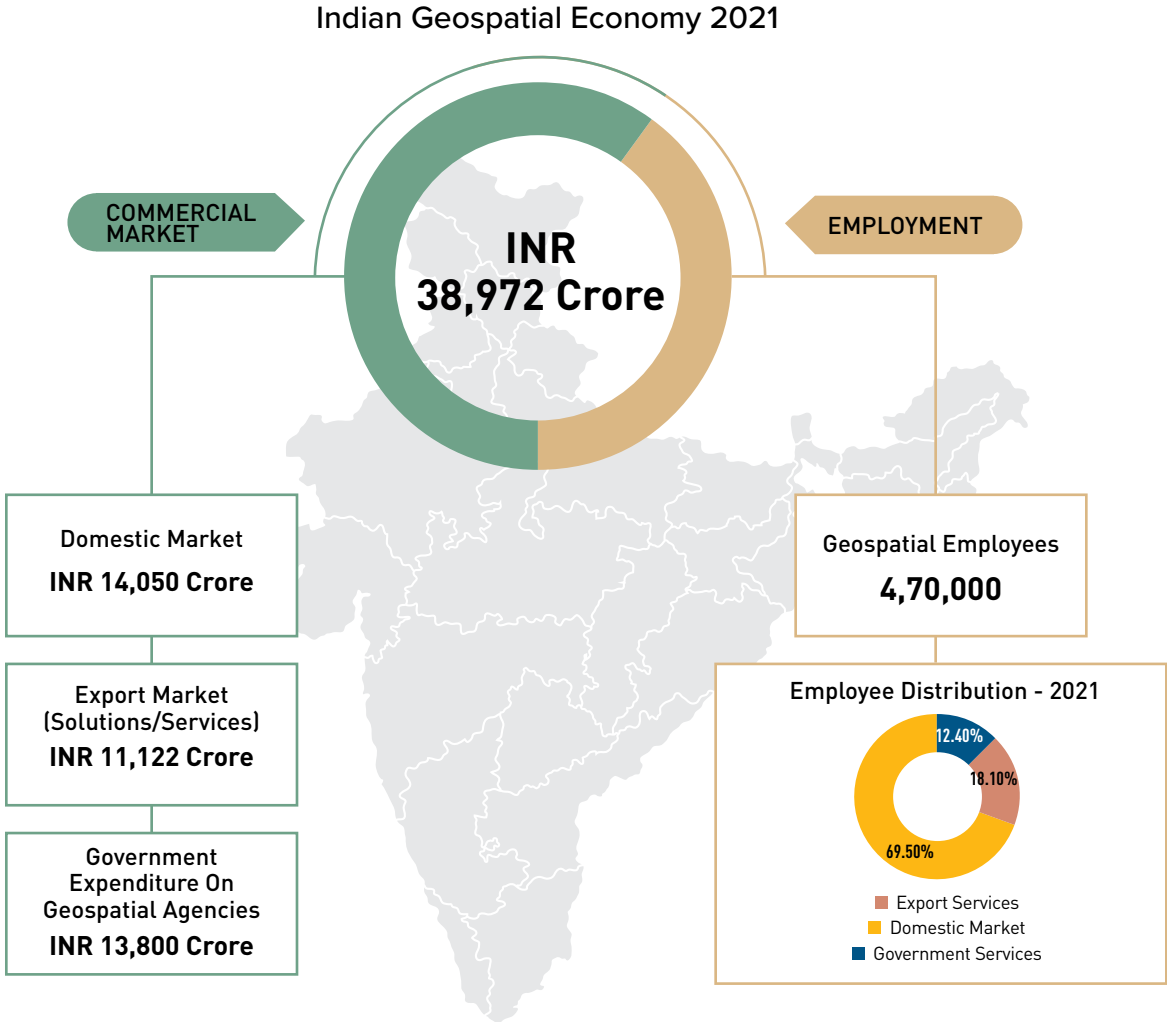
free) to all Indian entities and government organizations without the need for prior approval, security clearance, license or any other restrictions. Open and easy access to geospatial information will maximize the use and reuse of data (without any duplications), facilitate the development of innovative solutions, lead to creation of newer business models, and enable the better use of existing resources. The commercialization and democratization of geospatial information is already exciting for geospatial industry players, both old and new, to experiment, innovate and scale their business operations and product portfolios. This will lead to strategic geospatial 'industrial development' within the Indian economy wherein the geospatial industry ecosystem shall transform itself to increasingly provide geospatial applications and solutions to the international markets instead of only services.

Indian Geospatial Economy 2021

The Indian Geospatial Economy comprises of the following key components -

- domestic market size through commercial procurement of hardware, software, data, and services (inclusive of import value of geospatial hardware, software, data and services)
- export value of geospatial hardware, software, data, and services.
- investment on creation and maintenance of geospatial data, infrastructure and institutions, that is, government expenditure on national geospatial organizations and associated government departments, such as, municipalities, provinces, etc.

India's geospatial economy is estimated to be INR 38,972 crore in 2021 employing approximately 4,70,000 people across the country spread across the domestic market (including user industries, government services, and export services). In 2025, the geospatial economy is estimated to be valued at INR 52,770 crore with employment in the sector rising to over 9,50,000 people.*



Source: Geospatial World Analysis

Key Highlights

Domestic Market

- India's domestic geospatial market is valued at approximately INR 14,050 crore in 2021 and estimated to grow at a CAGR of 13.39% by 2025 to INR 23,200 crore.
- Sectorally, the traditional sectors (inclusive of defense and intelligence, transport infrastructure, urban development, utilities, etc.) account for the maximum share of the geospatial market in India in 2021 and 2025 respectively – i.e., up to 55% of the total market share. defense and intelligence, followed by urban development and transport infrastructure are future growth sectors for the geospatial market.
- Non-traditional sectors such as banking and finance, insurance, supply chain and logistics, etc., are new sectors where the adoption of geospatial technologies (primarily digital maps) is at a nascent stage. These sectors are approximately 8% of the total domestic market.

International Trade

- The Indian geospatial industry relies heavily on geospatial hardware and software imports for its geospatial technology requirements. For 2021, the amount spent is estimated to be approximately INR 2,560 crore. The country imports most of its geospatial hardware equipment's, such as Total Stations, LiDAR, Mobile Mapping devices, etc., from the leading geospatial technology providers of United States, Europe and China.
- As the geospatial market increases in the country driven by impetus provided by government projects, technology mandates, FDI approvals, and technology innovations there is a significant increase in the consumption of geospatial data and technology which is exported as a service/ or a solution to the global world. The export market for geospatial services and solutions is estimated to be INR 111,22 crore in 2021 and is estimated to rise to approximately INR 13,100 crore by 2025.
- Leading geospatial companies of India such as Cyient, Genesys, Ceinsys, etc., export geospatial-related services and solutions to foreign markets. Simultaneously, globally recognized system integrator and consulting firms such as AECOM, Atkins, Arup, etc.,; and information technology firms like Tech Mahindra, Infosys, etc., are exporting most of their geospatial services outside India.

Government Investment

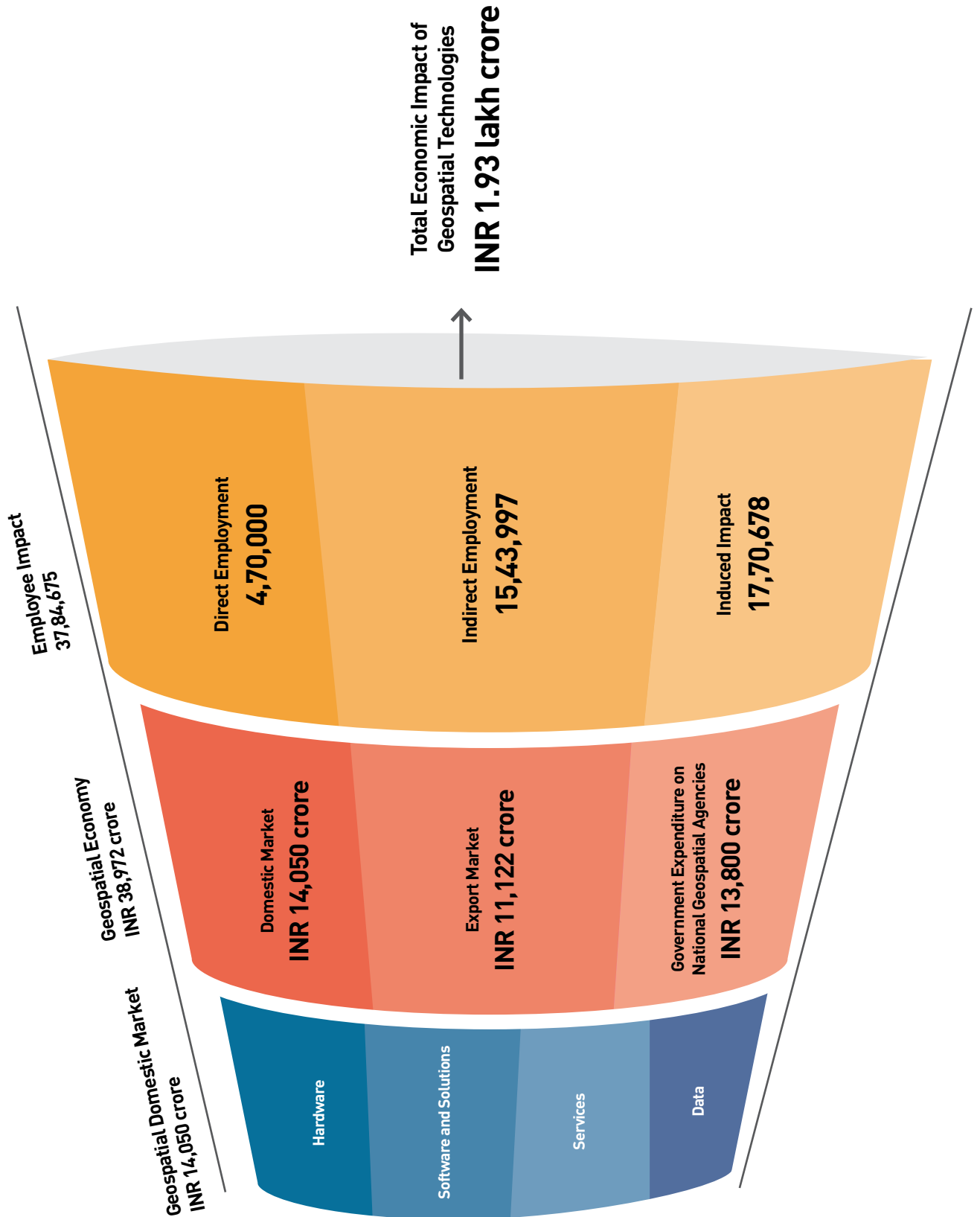
- During 2020, the government invested nearly INR 10,305 crore in total on all the National Geospatial Organizations of the country through revenue and capital expenditure. An almost INR 2,000 crore deduction was seen from its investments in 2019 (INR 12,720 crore) owing to the COVID-19 pandemic. However, this investment again rose in 2021 at a year-on-year growth rate of 34.1% in 2021 to INR 13,800 crore.
- Assuming a conservative CAGR of 4.49%, the government investment on national geospatial organizations is estimated to grow to INR 16,470 crore in 2025.
- At present, the government is spending heavily on developing in-house GIS software and data-integration platforms and sourcing hardware equipment's for centrally and state-allocated projects such as SVAMITVA, National Hydrology Project (NHP), National Infrastructure Pipeline (NIP), etc.

Employment

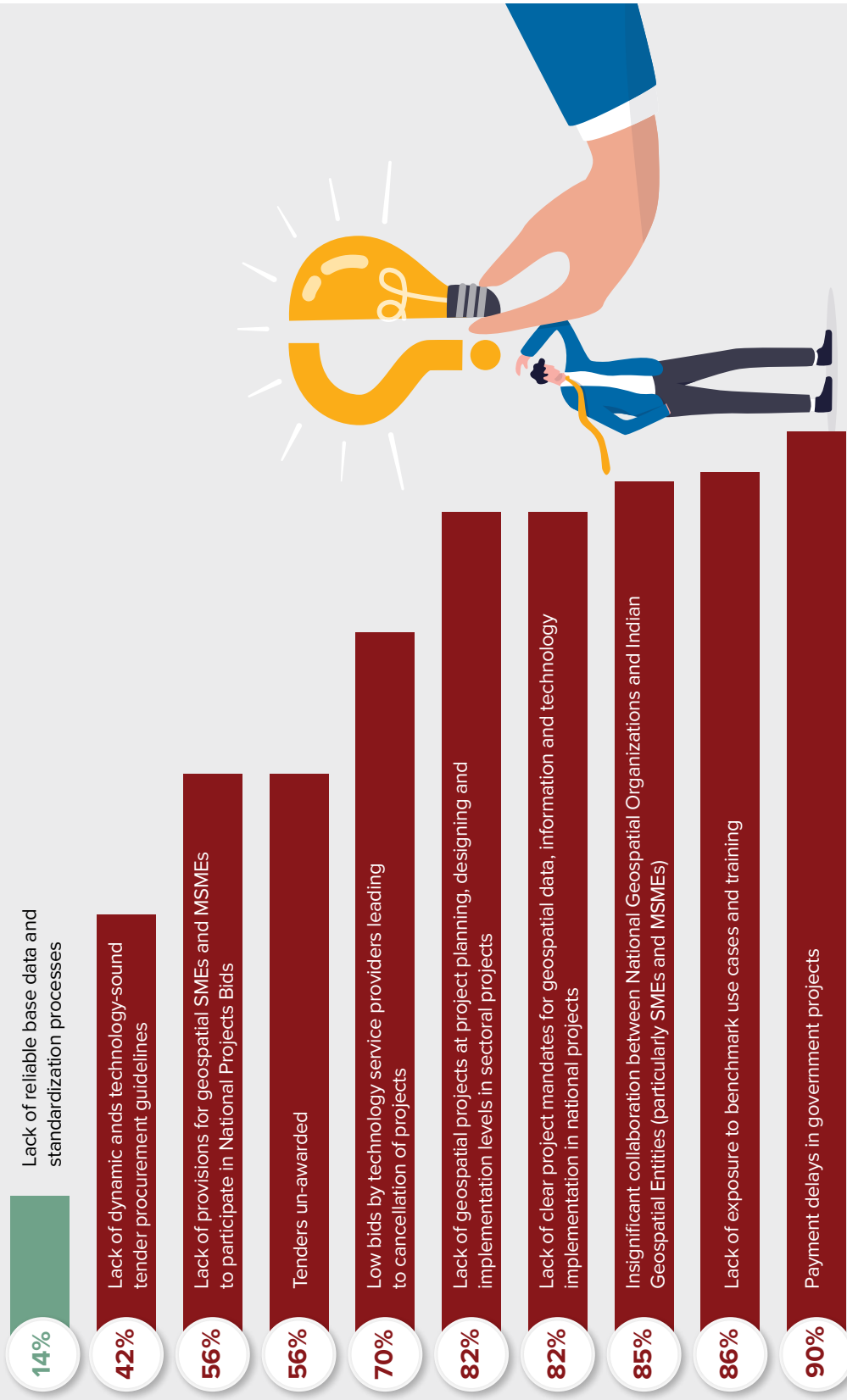
- In 2021, the Indian geospatial industry employed 4,70,000 people including domestic employment, export services and employees in the government services.
- Of these 4,70,000, about 69.50% of employees were employed in the domestic geospatial market (including user segments), that is, approximately, 3,26,000 people were employed by the companies providing and using geospatial solutions in India.
- Further, the total number of employees engaged in export-related services in 2021 was nearly 85,000, i.e., 18.1% of the total number of employees in the geospatial ecosystem.
- Additionally, up to 12.40% of the total number of people employed in the Indian geospatial ecosystem, i.e., 58,200 are found to be employed in government services (inclusive of National Geospatial Organizations, state governments and municipalities) in 2021.

INDIAN GEOSPATIAL ECONOMY 2021

MARKET | ECONOMY | IMPACT



INDIAN GEOSPATIAL MARKET AND ECONOMY CHALLENGES



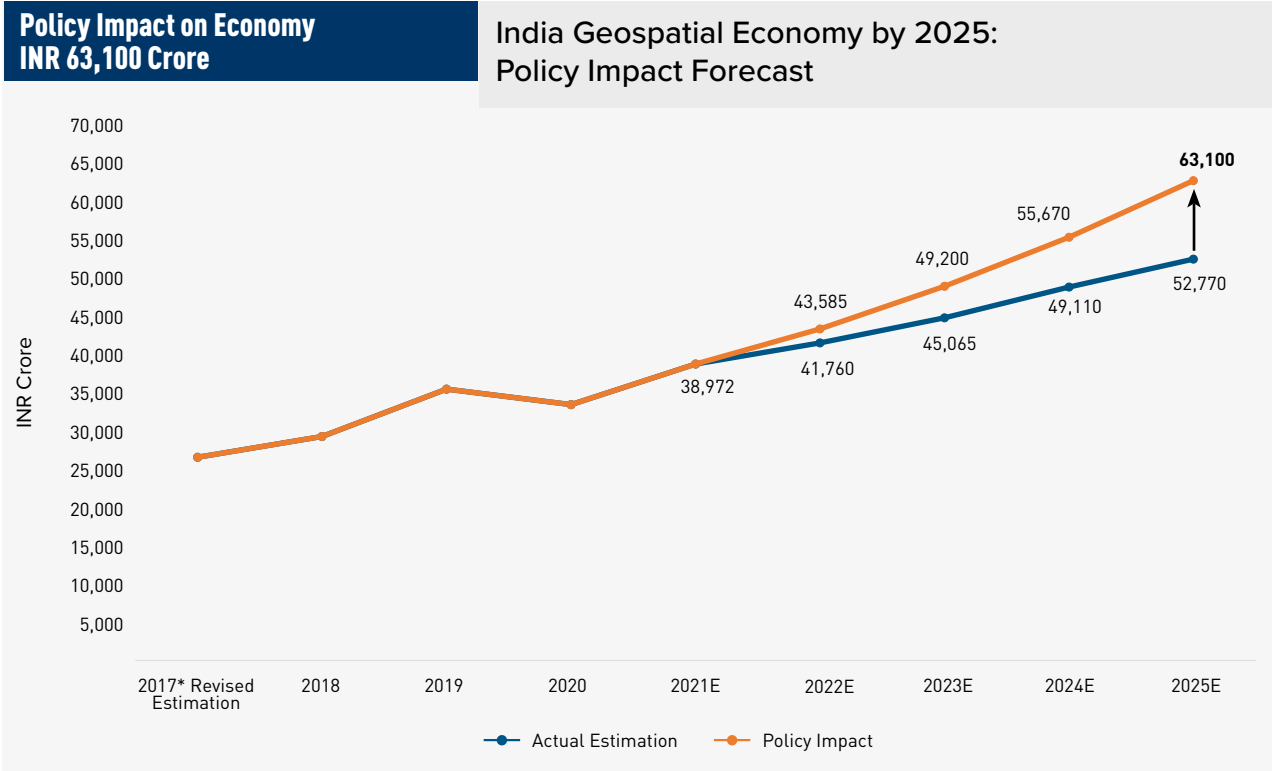
■ Positively impacted by Guidelines for Geospatial Data - 2021
■ No impact of the Guidelines/Rules/Strategies

%s represent the number of respondents who cited the said challenge; total respondents - 150+ industry leaders; and 500 survey responses; Geospatial World Analysis

India Geospatial Economy by 2025: Policy Impact Forecast

The current market scenario highlights that the Indian geospatial economy is expected to grow from approximately INR 38,972 crore in 2021 to INR 52,770 crore in 2025, growing at a CAGR of 7.87%. However, if the Government of India implements the three geospatial policies in 2022 which are currently in the draft stage; in that case, the Indian geospatial economy is forecasted to rise to INR 63,100 crore in 2025 – a growth rate of 12.8%!

The Indian geospatial market and economy have long been driven by archaic limitations – holding back the growth and progress of the Indian geospatial ecosystem and its move in the industry value chain. 2020-2021 proved to be revolutionary in this regard, with the Government releasing/announcing five major policy/strategy/rules initiatives for the geospatial technology ecosystem of India. While some of these are in implementation – like the Guidelines for Geospatial Data 2021 and the Drone Rules 2021 - the other three policies, namely, Draft of Space-Based Remote Sensing Policy of India 2020, Draft National Geospatial Policy-2021, and the Draft of Satellite Navigation Policy-2021 are in consultation are soon expected to be formalized as policy documents.



Source: Geospatial World Analysis

*Corrected for Inflation

An assessment of the guidelines/and the policies shows that if implemented in a timely and phased manner, these documentations have a significant impact on the Indian Geospatial Market and Economy – much beyond the linear market estimation of geospatial industry growth. The liberalization of geospatial data and the transition towards openness is going to lead to:

1

Scalability of Solutions

With easy access to accurate, precise geospatial data, the geospatial industry ecosystem in the country will grow by leaps and bounds with new tech start-ups in the domain. The removal of restrictions and deregulation of geospatial data and services will enable the geospatial industry of India to scale and move up the value chain to deliver wholesome solutions.

2

Geospatial Industry Competitiveness

The policy will enhance the competitiveness of Indian geospatial companies around the globe – enabling a transition from a geospatial services exporter to a geospatial solutions exporter. The Indian geospatial industry will strategically move up the industry value chain beyond the ‘services’ (data processing, image processing, surveying and mapping, and outsourcing activities) category. A successful transition is already seen wherein Indian IT tech giants are looking at opportunities to enter the geospatial ecosystem and provide solutions for domestic and international markets.

3

Open and Easy Access to Geospatial Information

Open and easy access to geospatial information will maximize the use (and reuse) of geospatial data, which will further the growth of the knowledge economy, bring transparency and increase efficiency in public services and growth in related markets. For civil society, open data will empower citizens to make better-informed decisions, participate in the decision-making process, and develop a more engaging relationship with government bodies.

4

Partnership and Collaboration

The decentralized approach of the policies creates a dynamic environment for Indian geospatial firms to partner/collaborate with not only Indian government entities but also with foreign entities to deliver highly precise and accurately detailed maps boosting map-reliant commercial operations in the country.

5

Enhanced Adoption across Non-Traditional Sectors

The liberalization of the mapping industry is going to significantly impact every company – large or small for which the foundation of their operations is a map. Companies in the e-commerce, food technology, mobility, real estate, and insurance domains, who use digital maps as the basis of their operations, will have access (not necessarily free) to all geospatial data produced using public funds, enabling data-driven innovation and service to the broader economy.

6

Impetus to Geospatial Education

The government’s commitment to developing the geospatial knowledge base for three categories of professionals – skilled workflows, technical professionals, and experts will enhance the uptake of geospatial knowledge in students and professionals at an early age, this will further enhance the uptake of geospatial technologies across different economic sectors, and create a dynamic environment for innovative solution-based tech-start-ups in the country.

The reforms will thus unlock tremendous opportunities for our country – foster innovation and invention, encourage new technology adoption, enable the transition from data to knowledge, thus, enhancing Ease of Doing Business in India. Geospatial World’s analysis finds that if the suggested draft policies are implemented by 2022, along with the already implemented Guidelines and the Drone Rules 2021, the impact on the geospatial market and economy would be multifold. The policies would lead to significant value creation for the Indian economy and society wherein sector’s that form 70% of India’s GDP – such as healthcare, agriculture, finance, land, logistics, transportation, technology, and many more – will be positively impacted.

BENEFITS DERIVED BY USER ORGANIZATIONS



Surveying and Mapping

Surveying and mapping are critical to the basic operations of the geospatial industry and many economic sectors (land administration, transport infrastructure, urban development, etc.). Private companies will now be able to conduct surveying and mapping activities without prior government approvals and share the data for various everyday applications with the broader geospatial and IT industry ecosystem – leading to enhanced software and solution development



Insurance

Insurance companies will now be able to create ‘virtualized collaterals in real-time using highly accurate and precise data sets and remotely evaluate risks for crop insurance, decide on the premiums and even settle claims. This will bring in significant time and cost efficiency to the otherwise lengthy and tiring insurance processes.



Agriculture

Democratization of geospatial data will increase the use of geospatial and remote sensing data and geospatial technologies in the agricultural sector bringing in significant efficiencies in terms of increase in food production, better management of land resources, and improved farm practices.



Supply Chain and Logistics

Logistic companies will be able to save significant time and money as there will be precise navigation systems that will reduce the time to reach the destinations.



Research and Development (R&D)

Government data collected using public funds will be easily accessible for all scientific R&D activities. Researchers will no longer have to pass through a red tape to collect, generate, publish and use geospatial data for technology innovation.



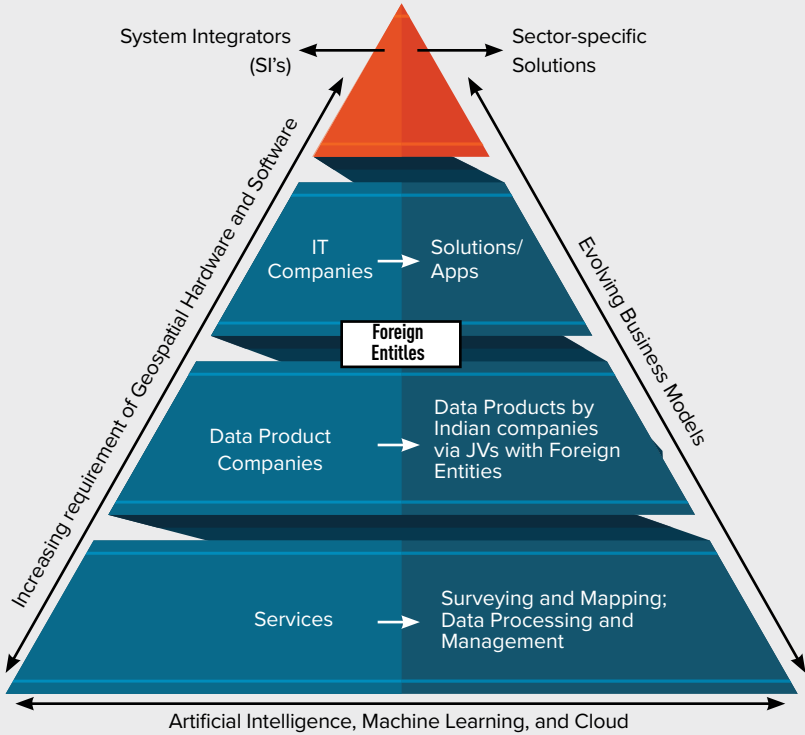
POLICY IMPACT: EVOLVING GEOSPATIAL INDUSTRY ECOSYSTEM

The policy impact, by numbers, is encouraging. The guidelines will have a far-reaching impact on how the Indian geospatial industry ecosystem grows in the next few years, aligning technology, policy, and people accordingly.

The policies announced and the ones in in-consultation are all forward-looking initiatives of the Government of India to boost the domestic geospatial industry, innovation and create a self-reliant economy. The vision is to build a collaborative geospatial ecosystem that focuses on deregulation and liberalization of the surveying and mapping in the country; and leads to the transformation of the National Geospatial Organizations. The guidelines are, in fact, friendly for the Indian geospatial industry ecosystem to collect, process, store, and disseminate data with a focus on ‘Atmanirbhar Bharat’. In this context, the geospatial industry will evolve significantly in the next few years – and some of those trends are already visible in the industry.

POLICY IMPACT

- The domestic surveying and mapping industry is set to consolidate in the long run as large service companies or even IT companies will either merge or acquire smaller geospatial businesses to meet the increasing demand of the government, the sectoral businesses, and foreign entities.
- Large domestic geospatial entities who are providing geospatial and engineering and GIS-based services to the foreign markets are now looking to expand their mapping services portfolio in India. These companies foresee potential in both location and business intelligence services market and to the business from the government in the infrastructure, smart cities, and utility sector.
- Domestic entities are investing significantly to enhance their technology capability (geospatial data acquisition technology), IT infrastructure capabilities (cloud, AI/ML, etc.) to start providing data processing and management, data products and solutions, and apps with or without the collaboration of foreign entities.
- Encouraged by the policy guidelines, many of the domestic geospatial entities want to transition now to develop more products and solutions to cater to both Indian and foreign markets and henceforth move up the value chain. Drone companies that have not been able to focus on the mapping business are now showing significant interest in surveying and mapping and developing the required capabilities on airborne LiDAR to cater to the mapping services needed for the national mission-mode programs.

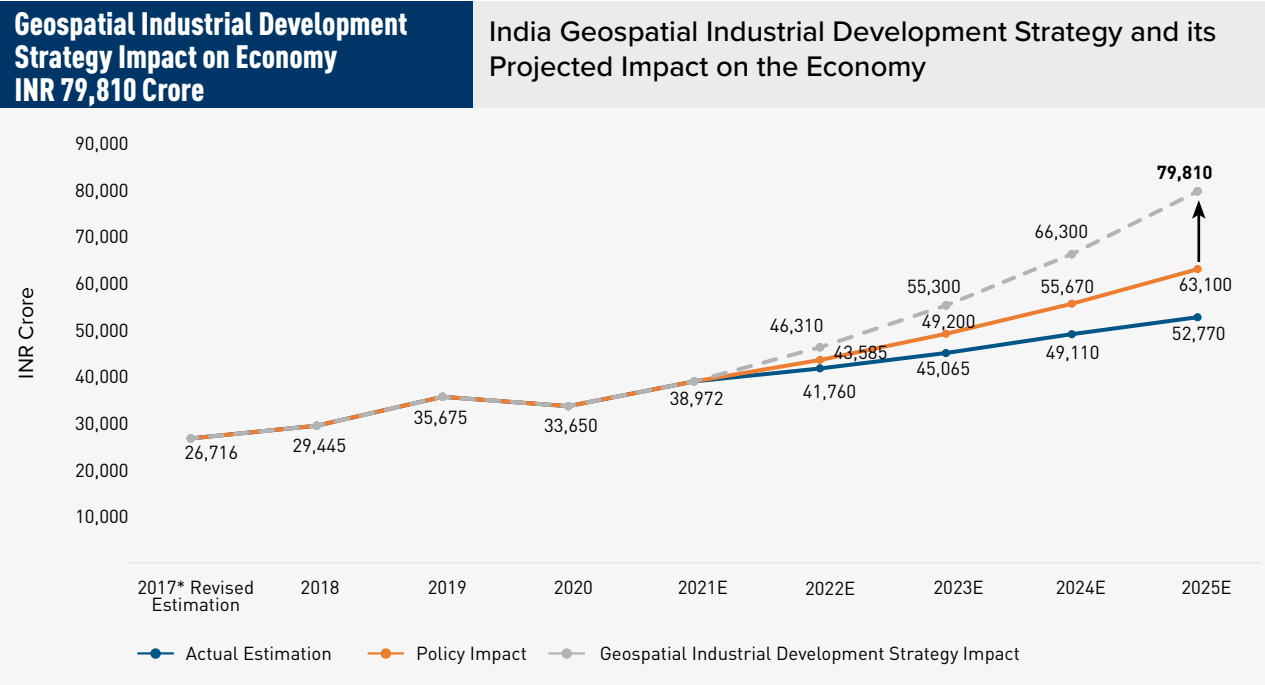


Source: Geospatial World Analysis

India Geospatial Industrial Development Strategy and its Projected Impact on Economy

Undoubtedly, the geospatial reforms and policy imperatives taken by the Government of India will have a significant impact on the Indian geospatial market and economy. In addition, Geospatial World proposes the development of a dedicated **India Geospatial Industrial Development Strategy**, which would augment the Indian geospatial market and economy exponentially. If implemented, a strategy and a supporting body may lead to **the Indian geospatial economy growing to approximately INR 80,000 crore by 2025** (a CAGR of 19.6% from 2021 market and economy values), with approximately 18,00,000 people employed in the sector!

The geospatial and allied policies announced by the Government of India are aligned with the self-reliant India mission, aimed at boosting the geospatial industry ecosystem, including export and import of geospatial data, products, solutions and services. For the industry to mature to a solutions industry instead of a service-based industry, there is an immediate need in the country to develop an **India Geospatial Industrial Development Strategy**; supported by an industry board, namely **Geospatial Industry Development Board**.



Source: Geospatial World Analysis *Corrected for Inflation

Note: Incase there was no COVID-19 pandemic, the geospatial economy, in an ideal situation would show a positive economic growth. However, in a systematic analysis, India’s geospatial economy growth would have still tapered off, if there was no announcement by the Government on geospatial policy/guidelines and sectoral mandates. The anticipated economy growth to INR 80,000 crore is based on the perceived outcomes from Geospatial World’s research. There are other factors which could impact the growth in the geospatial economy as well.

Geospatial World proposes that an **India Geospatial Industrial Development Strategy** should be formulated to develop a robust, competitive and technology driven geospatial market and economy. A geospatial economy of INR 79,810 crore in 2025 is potentially achievable if the following key tenets of the strategy are followed -

1

Creation of a Geospatial Industrial Development Board

An empowered high-level Geospatial Industrial Development Board should be formed to encourage, support, strengthen and monitor the implementation of the key facets of the Geospatial Industrial Development Strategy; and the activities of the Indian geospatial entities. The Board should be responsible for –

- The development of guidelines and protocol for the empanelment of Indian companies to undertake projects of importance for national development and security, and
- Monitor and audit Indian companies annually, in terms of their deliveries, adherence and compliance to guidelines and protocols, and capacity development.

2

Partnership and Collaboration with National Geospatial Organizations

The Geospatial Industrial Development Board should be responsible for initiating and collaborating with the Indian National Geospatial Organizations to -

- Develop the foundation data infrastructure
- Define the alignment with global frameworks – Integrated Geospatial Information Framework (IGIF) and Geospatial Knowledge Infrastructure (GKI), to enable the transition from geospatial ‘data’ to ‘knowledge’, and
- Provide wholesome workflow solutions enabled by fourth industrial revolution (4IR) technologies.

3

Creation of a Geospatial Industrial Development Fund (GIDF)

Under the aegis of the strategy, the government should create a Geospatial Industrial Development Fund (GIDF) as extra-budgetary funding for advancing the geospatial industry in the country. It is recommended that the GIDF should fund innovations in the domain of geospatial and 4IR, for development of services, solutions and applications, which could be of importance to national projects, sustainability, citizen services, and national development.

4

Improve Process of Project Bids

The Geospatial Industry Development Board should develop mechanisms for National Project Bids that would empower small and mediums enterprises (SMEs); and micro, small, medium-sized enterprises (MSMEs). It is suggested that the Board develops a mechanism for Indian Entities to Bid as Consortium This will enable SMEs and MSMEs to participate in big-ticket projects of the Government of India and empower their capabilities to deliver projects of high-scale and of dynamic geospatial technology architecture.

5

Enhance Local Manufacturing Capabilities

India’s reliance on imports to support its domestic market is significantly high. The India Geospatial Industrial Development Strategy should formalize processes and workflows keeping with the Government of India’s vision of ‘Make in India’, and develop mechanisms to reduce the dependency of the Indian geospatial market on international hardware and software. The government should bring geospatial equipment’s in the ambit of provisions like Production Linked Incentive (PLI) to encourage domestic/localization of manufacturing hardware and software.

6

International Competitiveness

The Geospatial Industrial Development Board should not only work with Indian geospatial entities but also have provisions to work with foreign companies who are willing to expand their business in India. There should be mechanism to strengthen international competitiveness in the country.

7

Public Private Partnerships (PPP)

The Indian Geospatial Industrial Development Strategy should incentivize public-private partnership mechanisms, which should be driven by the Geospatial Industry Development Board. An overarching framework for PPP models should be created to harness the benefits and opportunities of adding a spatial dimension to the economy and the society. The Geospatial Industry Development Board should lead the following initiatives -

- Collaborative efforts should be made between the public and private sector to reduce duplication of data collection.
- Government and private organizations should together decide on data acquisition projects and data collection efforts and subsequently also share data acquisition costs, and
- Provisions should be developed to include data collected by private industry and civil society (crowdsourcing) in the National Data Repository (NDR) and Geoportal by defining an appropriate public-private partnership business model.

7

Geospatial Incubation Centres and Contract R&D

The Indian Geospatial Industrial Development Strategy should highlight specific provisions to establish Geospatial Incubation Centres or Geospatial Industry Accelerators to grow the domestic geospatial industry ecosystem. The Geospatial Industry Development Board should facilitate these provisions in collaboration with National Geospatial Organizations, the private geospatial industry players, user sectors, and civil society to promote open innovation in the country. As part of the strategy, the Board should facilitate long-term Contract R&D to enable the geospatial industry to build next-generation geospatial technologies and also strengthen the geospatial economy of the country.

Apart from the India Geospatial Industrial Development Strategy, the other factors which can have a significant impact on the Indian Geospatial Economy are:

1

Strategic Investment Push to National Geospatial Organizations

A strategic investment push from the Government of India to National Geospatial Organizations, including Survey of India, Indian Space Research Organization, and others is required to –

- Develop an interconnected platform within the data.gov.in platform, wherein geospatial data (inclusive of earth observation data) from different disciplines, formats, and organizations can be integrated in an organized and usable manner.
- Strengthen the government data generating organizations to fulfil their mandate by effectively contributing foundational and thematic data on a regular basis to the national geospatial data platforms.
- Develop a **Resilient PNT infrastructure** based on Indian Regional Navigation Satellite System, duly augmented by Terrestrial PNT systems, to provide stronger and accurate positional information (both 1 meter horizontal and 3 meter vertical as defined in the thresholds) and also provide higher level of resilience at a lower cost.
- Develop a **National Digital Twin strategy** which is geospatially aware and built on a dynamic geospatial infrastructure.

2

Independent and Inter-dependent Sectoral Strategies

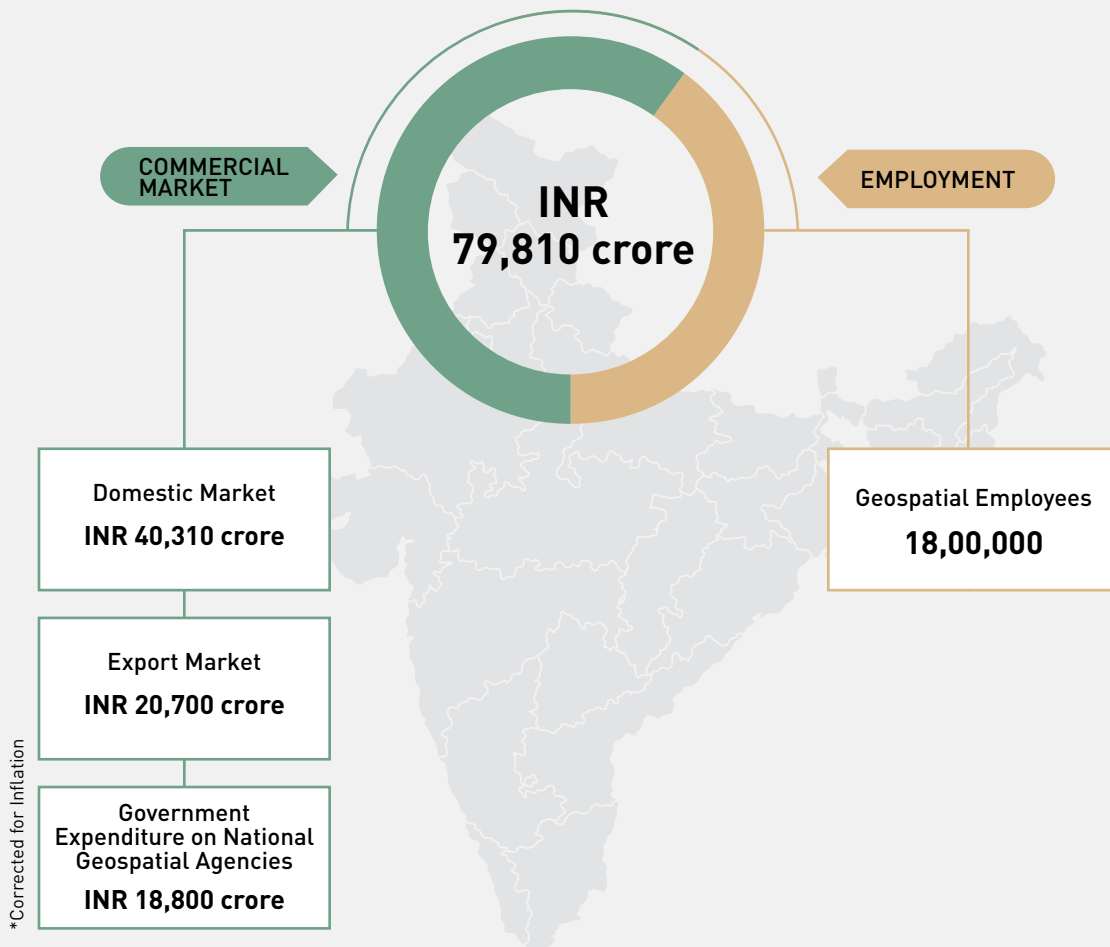
An independent sectoral geospatial strategy needs to be developed by sectoral ministries and departments for better utilization of geospatial information for planning and delivery of projects to ensure social and inclusive growth. The sectoral strategies should also be in sync with each other, particularly because the national integrated programs transcend multiple sectors. If one sectoral strategy is restrictive it can have a broader impact on the entire national program.

3

Benchmarks for Technology Implementation

The strategies should outline broader sectoral benchmarks in discussion with the ministries and departments, and the Geospatial Industrial Development Board defining technology and data benchmarks/ thresholds to ensure optimal utilization of the right technology for the right purpose. These benchmarks and thresholds should be in sync with the Draft National Geospatial Policy and the Guidelines for Geospatial Data. These benchmarks can also be used to validate the level of geospatial implementation in a sector. The Government of India should ensure there are technical capabilities to evaluate and certify the completion of the projects.

Geospatial World’s projection of the augmented impact of developing an India Geospatial Industrial Development Strategy, and other significant measures (as mentioned above) - on the Indian Geospatial Market and Economy 2025 is -

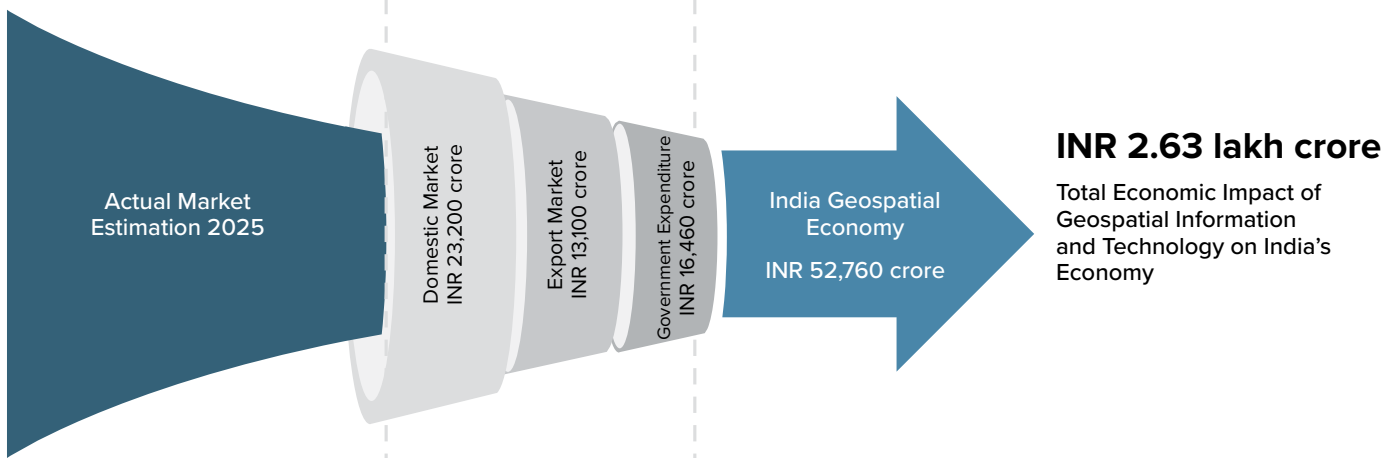


Source: Geospatial World Analysis

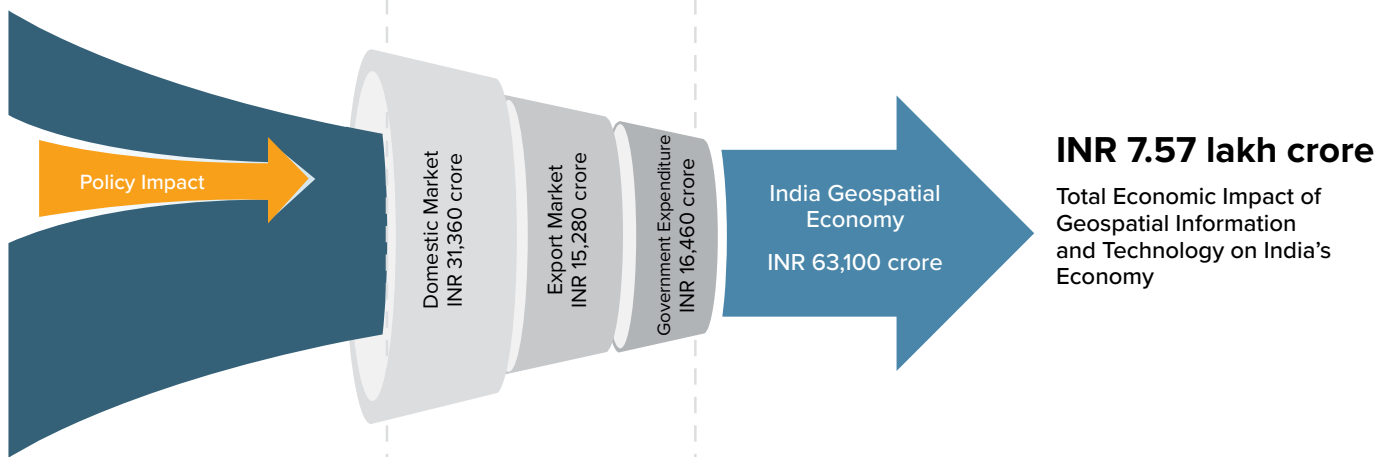
INDIAN GEOSPATIAL MARKET AND ECONOMY: ECONOMIC IMPACT FORECAST IN 2025

Scenario 1: Geospatial Market Impact on India's Economy

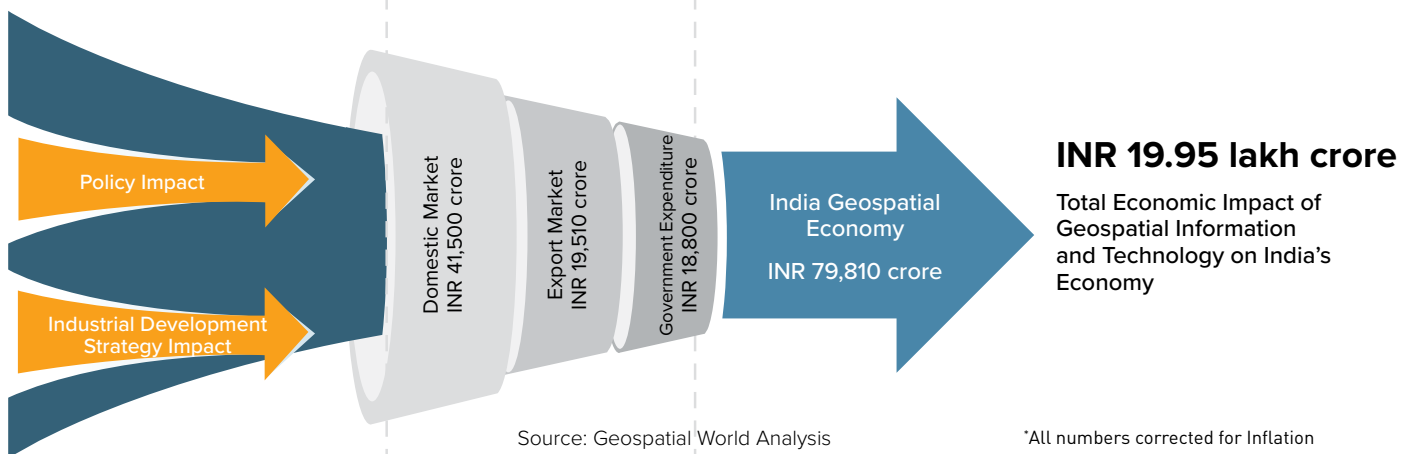
(basis no policy/industrial development strategy)



Scenario 2: Policy Impact on India's Economy



Scenario 3: Geospatial Industrial Development Strategy Impact on India's Economy



Source: Geospatial World Analysis

*All numbers corrected for Inflation

ANNEXURE

Implemented Policies

Policies	Parameters				
	Collection, Acquisition and Generation of Data	Threshold Value	Management, Dissemination, Sharing and Publication	Foreign Entity Operations	Indigenous Industry Participation
Guidelines for acquiring and producing Geospatial Data and Geospatial Data Services including Maps [Guidelines for Geospatial Data -2021]	<ul style="list-style-type: none"> Indian entities are free to acquire, collect, generate, prepare, digitize and create geospatial data of any spatial accuracy within India, using any "Geospatial Technology", subject only to the regulations on attributes on the 'negative list'. 	<ul style="list-style-type: none"> Threshold values – All geospatial data with an on-site spatial accuracy of 1m (horizontal) and 3m (vertical); Gravity anomaly 1 milli-gal.; Vertical accuracy of Bathymetric data in Territorial Waters 10 meters for up to 500 meters from the shoreline and 100 meters beyond that can be shared by Indian and Foreign Entities. 	<ul style="list-style-type: none"> All geospatial data collected using public funds, except classified data, shall be made available to all Indian Entities (whether private or Government) without restriction, at a fair and transparent price. No need for approvals, security clearances and licenses on the generation, publication dissemination and digitisation of maps and geospatial data. Rather than licenses and approvals, Guidelines propose a self-certification system to ensure compliance. It also does away with a restriction of maps on prohibited areas. Instead, a 'negative list' will be notified by the DST, which will include attributes that will not be permitted to be marked on any map. Geospatial Data of accuracy up to the threshold value can be uploaded to the cloud and data with accuracy finer than threshold value to be stored and processed on a domestic cloud or on servers physically located within the Indian territory. 	<ul style="list-style-type: none"> Foreign companies and foreign owned/ controlled Indian companies can license geospatial data of accuracy finer than the threshold value from Indian entities with the contingency to serve customers in India. Access to such data will be made available through APIs that don't allow data to pass through licensee company or its servers; re-use or resale of such data by licensees prohibited. 	<ul style="list-style-type: none"> Only Indian Entities can collect and acquire data finer than the above thresholds.

Parameters					
Parameters Policies	Collection, Acquisition and Generation of Data	Threshold Value	Management, Dissemination, Sharing and Publication	Foreign Entity Operations	Indigenous Industry Participation
The Drone Rules, 2021	<ul style="list-style-type: none"> Only the holder of the remote pilot license listed on the digital sky platform would be able to operate UAS for collection of data, except for operating nano UAS and micro UAS for non-commercial purposes. An individual desirous of obtaining a remote pilot licence for any category, sub-category, or class of the UAS, or a combination thereof, would be required to complete the training specified by the Directorate General of Civil Aviation (DGCA) for such category, sub-category or class, and pass the tests conducted by the authorized remote pilot training organization. 	<ul style="list-style-type: none"> The UAS has to be flown at the height prescribed in the Rules or as specified in the permit issued by the DGCA. A micro UAS can only fly at a maximum height of 60m. 	<ul style="list-style-type: none"> The digital sky platform has been established as a single window platform hosted by the DGCA for various activities related to the management of UAS, including registration/ deregistration of UAS, transfer of UAS, etc. 	<ul style="list-style-type: none"> There are no restrictions now on drone operations by foreign-owned companies registered in India. Import of UAS will be regulated by the Directorate General of Foreign Trade or any other entity authorised by the Central Government in addition to the applicable provision of the Drone Rules. 	

Policies	Parameters				
	Collection, Acquisition and Generation of Data	Threshold Value	Management, Dissemination, Sharing and Publication	Foreign Entity Operations	Indigenous Industry Participation
Remote Sensing Data Policy 2011 [RSDP-2011]	<ul style="list-style-type: none"> For operating a remote sensing satellite from India, license/ permission from the nodal agency is necessary. NRSC shall enter appropriate arrangements with DOS for acquiring/ distributing data from IRS within the visibility circle of NRSC receiving station(s). NRSC shall maintain a systematic National Remote Sensing Data Archive and a log of all acquisitions/ sales of data for all satellites 	<ul style="list-style-type: none"> All users are made available images up to 1m without any exceptions. 	<ul style="list-style-type: none"> All satellite remote sensing data in India of resolutions up to 1 m shall be distributed on a non-discriminatory basis and on "as requested basis" With a view to protect national security interests, all data of better than 1 m resolution shall be screened and cleared by the appropriate agency prior to distribution; and the following procedure shall be followed. Government users namely, Ministries/ Departments/ Public Sector/ Autonomous Bodies/ Government R&D institutions/ Government Educational/ Academic Institutions, can obtain the data without any further clearance. Private sector agencies, recommended at least by one Government agency, for supporting development activities, can obtain the data without any further clearance. Specific requests for data of sensitive areas, by any user, can be distributed only after obtaining clearance from an inter-agency High Resolution Image Clearance Committee (HRC). Specific sale/ non-disclosure agreements to be concluded between NRSC and other users for data of better than 1 m resolution. 	<ul style="list-style-type: none"> For acquisition and distribution of IRS data for use in countries other than India, the Government of India, through the nodal agency, shall grant license to such bodies/ agencies of those countries as are interested in the acquisition/ distribution of IRS data, as per specific procedures. Foreign agencies can obtain the data after further clearance from HRC, already in place. For operating a remote sensing satellite from India, license/ permission from the nodal agency is necessary. NRSC and/ or Antrix Corporation Ltd., shall be competent to enter into agreements with foreign satellite operator(s) for acquisition/ distribution of foreign satellite data in India. 	<ul style="list-style-type: none"> The new remote sensing policy is expected to be user and industry friendly, and Government of India is trying to remove most of the clearance hurdles, encouraging both upstream and downstream business.

Policies	Parameters				
	Collection, Acquisition and Generation of Data	Threshold Value	Management, Dissemination, Sharing and Publication	Foreign Entity Operations	Indigenous Industry Participation
National Data Sharing and Accessibility Policy 2012 [NDSAP-2012]			<ul style="list-style-type: none"> • Applicable to all sharable non-sensitive data available in digital/ analog forms and generated using public funds by Government of India; designed to promote data sharing and enable access to Government of India owned data for national planning and development • Types of access – open, registered, restricted. • Data will remain property of entity which collected them and reside in their IT-enabled facility for sharing and providing access; pricing to be decided by data owners as per government policies • Budgetary incentive system for data owners for increasing open access to shareable data. 		

Draft Policies

Policies	Parameters				
	Collection, Acquisition and Generation of Data	Threshold Value	Management, Dissemination, Sharing and Publication	Foreign Entity Operations	Indigenous Industry Participation
Draft National Geospatial Policy [Draft-NGP 2021]			<ul style="list-style-type: none"> The geospatial data, metadata, and data from the State/central level agencies will be available through a Geo-Platform. A National Data Repository(NDR) will be operated by the Geospatial Data Promotion and Development Committee (GDPDC), to enable access to and harnessing of geospatial data. 		<ul style="list-style-type: none"> These Lead Agencies will provide sector specific knowledge and assist in the compilation of data themes under the National Foundation Geospatial Data Asset and the National Thematic Geospatial Data Asset The Lead Agencies will also lead and facilitate the implementation of the draft NGP. This will include examining the Foundation and Thematic Data Asset data sets and identifying challenges, or suggesting standards for their metadata or data use, storage, creation, and processing. State and central level partnering agencies can provide data through Data Nodes

Policies	Parameters				
	Collection, Acquisition and Generation of Data	Threshold Value	Management, Dissemination, Sharing and Publication	Foreign Entity Operations	Indigenous Industry Participation
Draft Indian Satellite Navigation Policy-2021 (SATNAV Policy-2021)		<ul style="list-style-type: none"> • NaVIC is an independent regional navigation satellite system being developed by Indian Regional Navigation Satellite System (IRNSS), is expected to provide a position accuracy of better than 20 m in primary service area. This policy supports the continuity of NaVIC services. 	<ul style="list-style-type: none"> • The policy ensures guaranteed and continuous availability of free-to-air navigation signals for civilian uses and secured navigation signals for strategic uses in the defined coverage area. • For aviation safety in the defined coverage area, the draft ensures guaranteed and continuous availability of the Satellite-Based Augmentation System (SBAS) 	<ul style="list-style-type: none"> • While many of the space and ground based systems are indigenously developed, ISRO/DOS shall put best efforts towards reduction of dependence on imports like US GPS systems or Europe's Galileo systems or Russian Glonass systems. 	<ul style="list-style-type: none"> • It aims to provide Indian industry to carry out research and development activities in the field of Satellite Navigation based applications with emphasis on societal benefits.

Policies	Parameters				
	Collection, Acquisition and Generation of Data	Threshold Value	Management, Dissemination, Sharing and Publication	Foreign Entity Operations	Indigenous Industry Participation
<p>Draft Space Remote Sensing Policy - 2020*</p> <p>(Draft SpaceRS Policy - 2020)</p>	<ul style="list-style-type: none"> Indian entities can seek authorization to establish space asset for remote sensing data collection by providing information on the spacecraft, such as, payload details, spectral bands, orbital parameters, coverage area, etc. Government shall reserve the right to impose/ control on the imaging/ observation and its data distribution, when national security and/or international obligations and/or foreign policies of the Government, so requires. In such cases, Government may restrict operations of the commercial systems and limit collection and/or dissemination of certain data and products. 	<ul style="list-style-type: none"> Threshold value: The very high-resolution data having Ground Sampling Distance (GSD) < 50 cm is considered 'sensitive' data. 	<ul style="list-style-type: none"> Any satellite service provider is free to provide remote sensing data and services to any user in the country as per the defined thresholds. The dissemination of 'sensitive' data will be regulated / controlled by the Government of India, as per the consideration of national security and prevailing foreign policy. Remote sensing data over Indian territory shall be made easily accessible to users by Indian entity as long as the source of remote sensing data is originating from a registered/ authorized space asset and the remote sensing data is not 'sensitive'. Government may impose control on the imaging / observations and data distribution, in case of the national security and / or international obligation and/ or foreign policy considerations. 	<ul style="list-style-type: none"> Indian National Space Promotion & Authorization Center (IN-SPACe), an independent body constituted by Government of India, under Department of Space (DOS), shall accord necessary authorizations and permissions for all space based remote sensing activities, to or from Indian territory. 	<ul style="list-style-type: none"> Indian industry to build technological base to provide remote sensing technology solutions both within and outside India The remote sensing activities within the Indian territory can be carried out, only with an authorized space asset Indian industry can avail state-of-the-art facilities of the Government for manufacturing satellite and associated ground segment; can be availed from designated PSU/ CPSE under DOS on commercial terms, subject to availability. Satellite systems for strategic sector to be realized using indigenous designs, systems and infrastructure providing the capabilities of secured environment by DOS; DOS may avail capabilities of Indian industry, when deemed appropriate. Indian entities can seek authorisation to establish space asset for remote sensing and also for setting up ground station within India for monitoring and control of remote sensing satellite and/or reception of remote sensing data.

LIST OF ABBREVIATIONS

4IR- Fourth Industrial Revolution	IT- Information Technology
AI- Artificial Intelligence	LiDAR- Light Detection and Ranging
BECA- Basic Exchange and Cooperation Agreement	MoRTH- Ministry of Road Transport and Highways
BPCL- Bharat Petroleum Corporation Limited	MSF- Marginal Standing Facility
CAGR- Compound Annual Growth Rate	MSME- Micro, Small & Medium Enterprises
DPC – Drone Promotion Council	NDR- National Data Repository
DST- Department of Science and Technology	NIP- National Infrastructure Pipeline
FDI- Foreign Direct Investment	NGP- National Geospatial Policy
FTP- Foreign Trade Policy	NHP- National Hydrology Project
GDP- Gross Domestic Product	PLI- Production Linked Incentive Scheme
GeoAI- Geospatial Artificial Intelligence	PPP- Public-Private Partnership
GEO-ICT- Geographic Information and Communication Technologies	PNT- Positioning, Navigation, and Timing
GEOINT-Geospatial Intelligence	SAUBHAGYA – Pradhan Mantri Sahaj Bijli Har Ghar Yojana
GIS – Geographic Information System	QUAD-Quadrilateral Security Dialogue
GIDF- Geospatial Industrial Development Fund	R&D- Research and Development
GKI-Geospatial Knowledge Infrastructure	RS- Remote Sensing
GPDP- Gram Panchayat Development Plan	SATNAV – Satellite Navigation
GPS/GNSS-Global Positioning System/Global Navigation Satellite System	SME- Small and Mid-Size Enterprises
GVA-Gross Value Added	SPA- Share Purchase Agreement
IGIF- Integrated Geospatial Information Framework	SVAMITVA- Survey of Villages and Mapping with Improved Technology in Village Areas
IMF- International Monetary Fund	TPF- Trade Policy Forum
IoT- Internet of Things	UAS- Unmanned Aircraft System
IPR- Intellectual Property Rights	UIN: Unique Identification Number

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Best regards,

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 President & Managing Director
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Kaushik Chakraborty
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Sreeramam GV
 CEO, NeoGeoInfo Technologies
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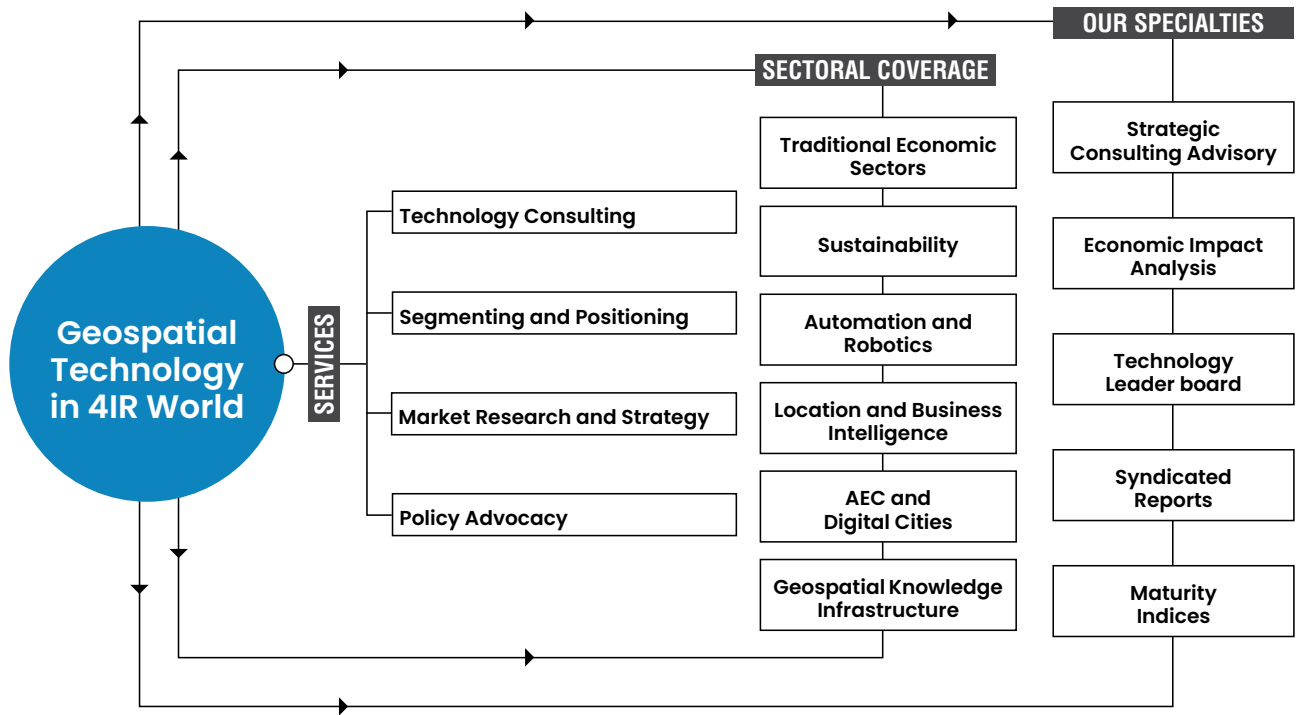
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