

# The Future of Geospatial Information Ecosystem: A Technology Innovating National Development

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The world is rapidly advancing, with technological innovations continuing to drive this change and disrupting traditional data generation, delivery, and dissemination methods on the way. Further, a lot of technological innovations in geographic information systems (GIS) have enabled location intelligence in a big way. As a result, GIS has become essential for businesses, governments, and individuals alike, helping in better decision-making, from where to build a control center to how to mitigate the effects of climate change. Better decision-making leads to growth in individual organizations that aggregates into national development.

## Current Trends in GIS Data Capture & Its Application

GIS provides valuable spatial data analysis and visualization capabilities. From a nation's development perspective, it is getting increasingly utilized in various application areas, including disaster management (including preparedness, response & recovery), impact forecasting of NatCat events, monitoring and managing natural resources, urban planning, infrastructure development, environmental conservation and strengthening the defense mechanism of the country, to name a few. The technology's versatility and ability to integrate various data sources make it a valuable tool for decision-makers in these sectors.

There has also been tremendous advancement in GIS data capture, helping to boost GIS applications. Advanced remote sensing and high-resolution satellite imagery are now available at a daily vintage, providing detailed and up-to-date information about the Earth's surface, including land cover,

vegetation, and changes over time. UAVs, or drones, equipped with cameras and sensors, have revolutionized GIS data capture.

Further, Mobile Mapping Systems mounted on vehicles or carried by individuals are being used for efficient and accurate data capture. These systems typically include GPS, LiDAR (Light Detection and Ranging), and imaging sensors to collect geospatial data while on the move. Mobile mapping is useful for road inventory, asset management, and infrastructure planning applications. Crowdsourcing platforms and citizen science initiatives also enable the public to contribute to GIS data capture and enhance official datasets.

The proliferation of IoT devices, such as sensors and smart devices, also generates a vast amount of geospatial data. These devices collect real-time information about environmental conditions, traffic patterns, infrastructure usage, and more. Integrating IoT data with GIS allows for dynamic and comprehensive data capture, enabling real-time decision-making and analysis at the location level.

GIS data capture increasingly focuses on integrating and analyzing large and diverse datasets. Big Data technologies and advanced analytics are facilitating the processing and analysis of massive amounts of geospatial information, enabling insights and patterns that were previously challenging to uncover.

AR and VR technologies are also being integrated into GIS data capture workflows, allowing users to visualize and interact with spatial data in immersive and realistic ways.

For example, field workers can overlay GIS data onto their real-world view using AR, enhancing data collection and analysis in the field.

These trends reflect the ongoing technological advancements, enabling more efficient, accurate, and versatile GIS data capture methods. The boost in the availability of high-quality location data provides opportunities for enhanced decision-making, planning, and analysis in various industries and sectors.

### New Geospatial Policy - A Harbinger of Change

Every national initiative linked to India's development needs significant use of geospatial data and high-level analysis to enhance decision-making at the country level and transform the economy.

The Indian government has significantly changed its geospatial policy, recognizing the need for change. It is a landmark announcement that liberalized the rules for acquiring and producing geospatial data services. As per the new rules, the globally available geospatial data should no longer be restricted in India. The new guidelines have removed the barriers and allowed easy data sharing between public and private organizations. The new policy indicates that the government also realizes the importance of making the geospatial data sets available and how it is linked to the country's National Growth.

Ready access to geospatial data will offer a level playing field to private entities, offering to take ahead scientific and

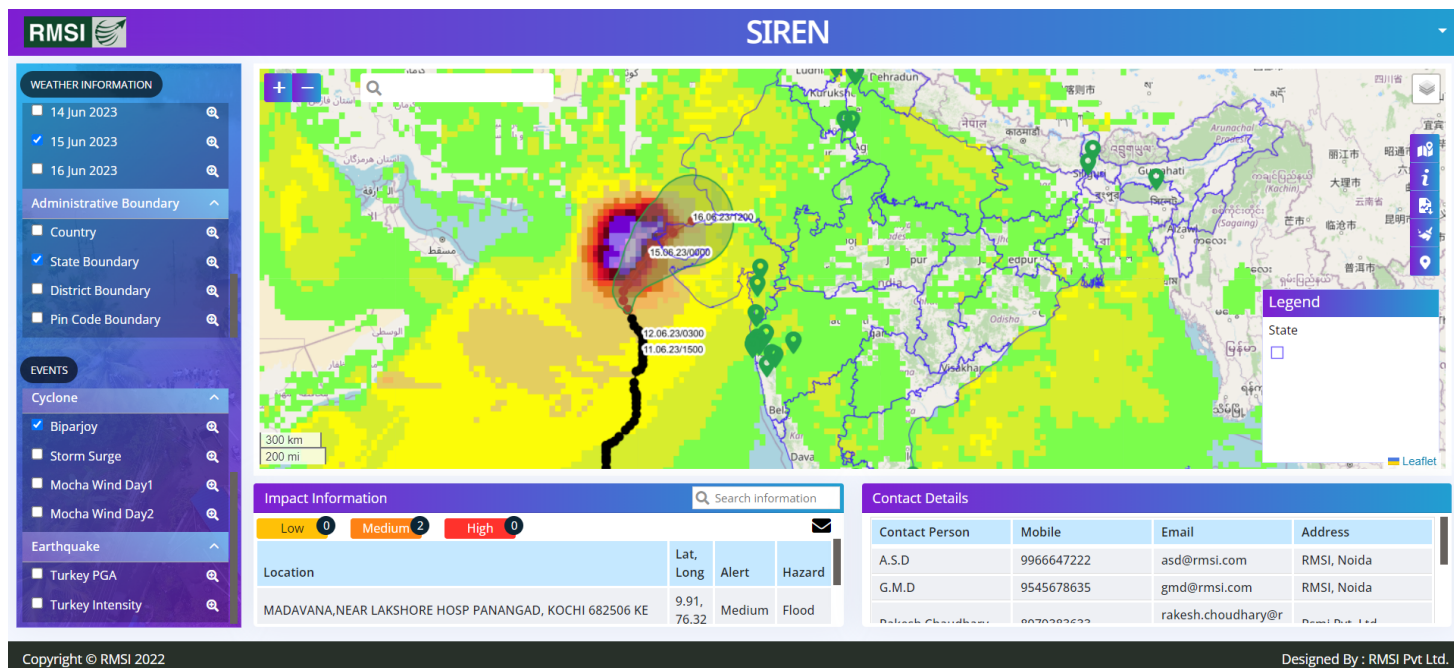


Figure 1: RMSI's Impact Forecasting Platform is a comprehensive solution that helps you visualize and analyze the impact of upcoming NAT CAT events for specific locations of your interest to maximize your decision space and take appropriate measures. The above image shows the live tracking of cyclone Biparjoy with potential windspeeds and flood depth at various locations.

developmental research to build high-quality solutions and maps. And, hence, enabling the private sector to contribute more and more to national development.

### Contribution of GIS to the National Development Agenda (Solving Real-World problems)

A country's national development is evaluated based on addressing some of the most pressing challenges, such as connectivity (land-based and telecom), urban development, climate change, food security, disaster management, and self-reliance in every walk of life.

Geospatial technology today plays a key role in infrastructural development, the safety of cities, the growth of agriculture production, monitoring border security, and more. Moreover, geospatial technology has facilitated India in becoming self-sufficient in food production and exporting it to other countries.

### Sustainable Infrastructure

Geospatial technology can improve sustainable infrastructure planning, design, and construction.

Infrastructure development is a critical element of a nation's development. GIS as a technology offers a unique advantage in planning, designing, and monitoring infrastructure development. It helps identify the most suitable location for infrastructure development by identifying a host of location-specific information from soil type, hazard risk levels, and current development around the area of interest. It can also play a crucial role in establishing and maintaining green belts,

which are essential for the environment. The geospatial analysis also allows for identifying and assessing the environmental impact of infrastructure projects, tracking the condition of assets, monitoring the performance over time, and planning to replace aging infrastructure. This information can help planners and designers make informed decisions about where to build infrastructure and how to design it to be as sustainable as possible.

The Gati Shakti plan launched by PM Modi is slated to be a game changer for infra projects in India and is expected to prevent delays in infrastructure projects. Interestingly, the project's backbone spans technologies from geospatial mapping to analytics. **A core feature of Gati Shakti is a GIS platform that provides spatial planning tools.** The integrated portal will give visibility to various departments under the 16 ministries, showcasing over 200 layers of large-scale databases superimposed by the departmental data sets over a geo-coded map. Such GIS-enabled projects have massive potential for cost savings, bringing down delays and enhancing the effectiveness of key infra projects. Starting as a niche technology, GIS is core to many such initiatives in India. It indicates that the government reflects on this technology's importance in India's overall developmental agenda.

RMSI has built software for several international infrastructure projects. We feel that using GIS can substantially reduce project costs, especially by avoiding reruns and delays in interdepartmental processes. For instance, in the US, we recently built a software platform to monitor well pads, and eventually, the system delivered cost savings of 30-40 percent for our client.

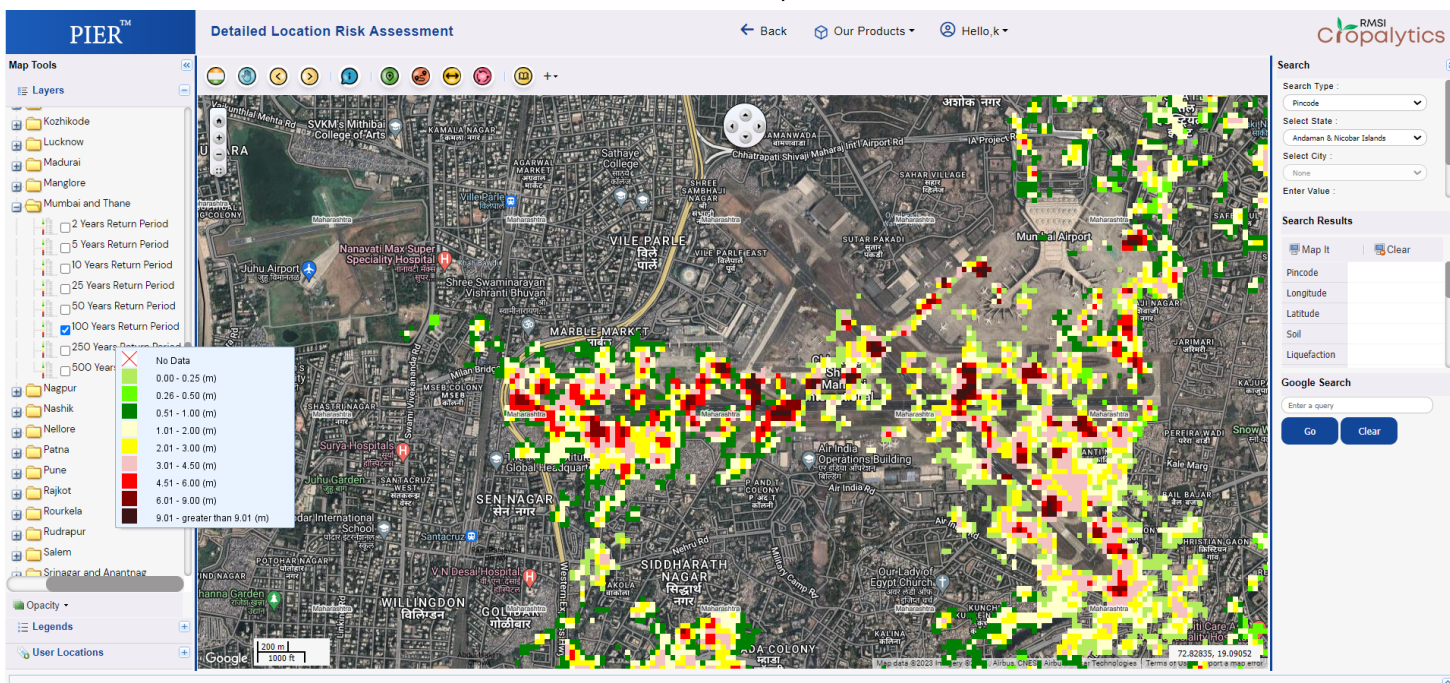


Figure 2: The above image shows a flood map of 100 year return period in Mumbai City on the PIER's (Profiler for Insurance Exposure & Risk) detailed Location Risk Assessment tool.

We have also developed an impact forecasting platform that provides early updates 2-3 days in advance to help organizations and industries identify potential business interruptions, supply chain disruptions, and other indirect losses that could arise due to natural catastrophe events. An early impact forecast helps them to take measures to protect their assets, employees, and customers and minimize the impact of these events. The alert feature can ensure preventive maintenance of critical components at the exposed locations.

### Creating Better National-Level Strategies For Disaster Management

A sound disaster management strategy is also crucial to the overall sustainable development of a nation. Disasters are spatial in nature. They strike at a specific location and influence a particular area. Thus, location intelligence plays a critical role in disaster management.

GIS, coupled with remote sensing, provides a basic framework that helps in all disaster management stages, from preparedness to response and recovery. Through advanced wireless technologies and web-based GIS applications, disaster management by governments and other agencies is being revolutionized. It enhances the coordination of response efforts and planning for disaster risk reduction. GIS decision support systems for disasters have been applied in several parts of the world for effective management.

RMSI has implemented Decision Support Systems (DSS) for the Government of Puducherry and the National Disaster

Management Authority for cyclone impact forecasting to support preparedness and response for all the coastal states of India. Also, from a disaster risk reduction (DRR) perspective, we are working with various state/union territory governments, such as J&K, Andhra Pradesh, Assam, UP, and Meghalaya in India, for detailed Hazard, Vulnerability, and Risk Assessment (HVRA), hydro-meteorological hazard forecasting, and long-term mitigation planning.

### Transforming the Food Security Problem

Geo-assisted agricultural practices enable countries to become more self-reliant on food. Technology has made significant advancements in the agriculture sector by developing innovative solutions around key industry pain points. AI/ML-based technologies enable crop identification and health monitoring to improve crop quality and help mitigate the impact of adverse weather and climate change. Geospatial technology is a valuable tool in transforming the agri-value chain with predictive and data-based insights for the traceability of seeds, monitoring pest and disease outbreaks, and expected yields.

This technology helps the entire agri-value chain by providing information and analytics to solve the challenges of the Indian Agri-sector and assist decision-makers in government, crop insurance, agriculture input sector, banks, commodity buyers, and the social sector.

For India, RMSI Cropalytics, an affiliate of RMSI, has developed an agri-market platform bringing in all the players in the ecosystem on a single platform to improve the overall

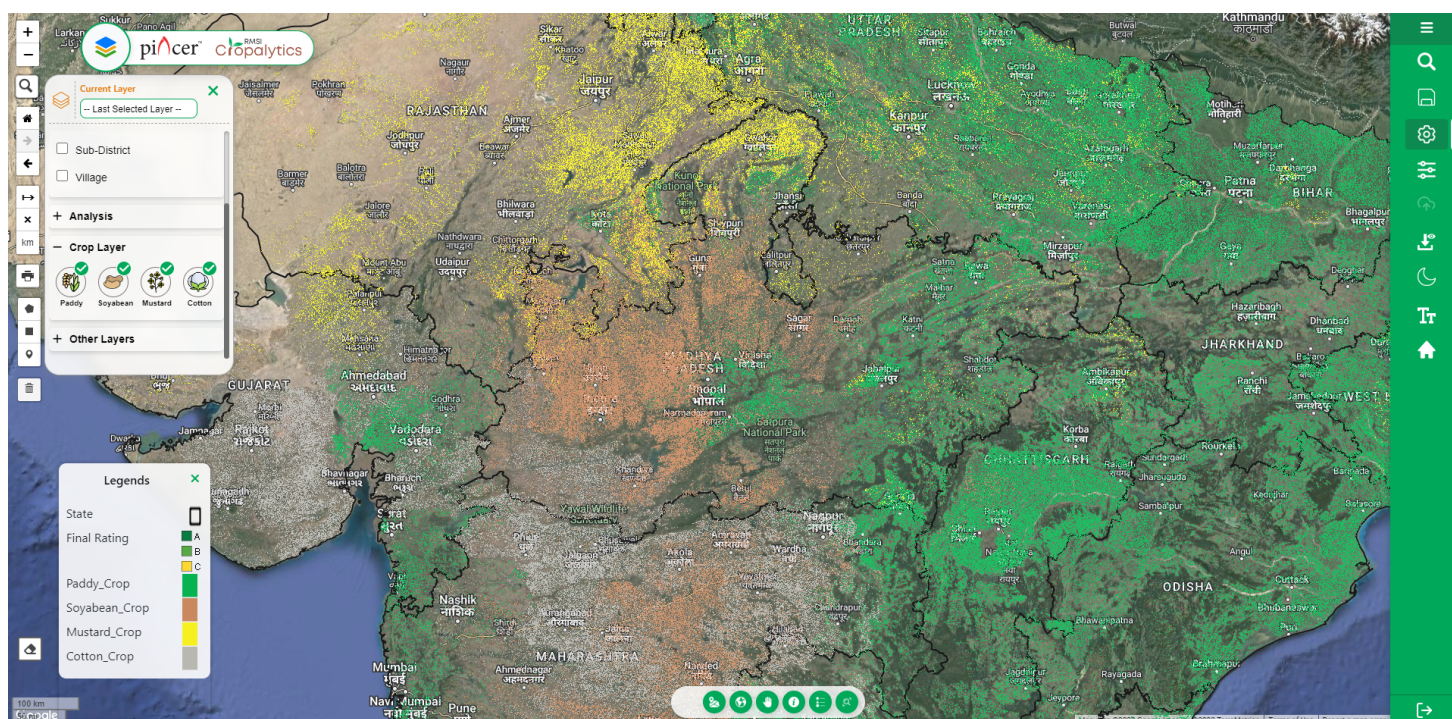


Figure 3: The above image shows the Crop Map of our product PiNcer™. Crop Map helps the industry uncover insights, sync data in real-time, and ensure their business is future-ready. The map covers major crops such as paddy, soybean, maize, sugarcane, and wheat, amongst others & shows the geo-location of sown acreage of the current cropping season in high resolution.

efficiency of the entire value chain. RMSI Cropalytics has developed the capability of generating crop maps across India for all major crops and estimating the crop risk profile for every farm in India.

**Urban Development**

The Indian Government's Smart City Mission aims to provide citizens with a high quality of life while promoting sustainable environments by implementing smart solutions. While the government is developing various online services, location intelligence is the backbone behind these services. It allows for location-based citizen services where individuals tag locations with their requests that trigger the complete service request completion cycle; this also helps citizens to convey risk situations via a mobile application that can alert the rescue teams to combat the risk by tracking the location by the app.

RMSI recently worked on a prestigious project in Saudi Arabia involving the construction of a one of its kind, 170 km vertical city. The project had a large volume of geospatial data that is maintained & managed under the ArcGIS enterprise environment. Regular field surveys were conducted to enhance and update the existing geospatial information. In addition, the recorded data was to be managed, improved, and made accessible to various sectors for decision-making.

Geospatial information also empowers the service industry by creating high-quality last-mile delivery data offering quick and accurate route planning, package tracking, and timely delivery, resulting in more efficient and reliable services for

citizens reliant on online deliveries and shopping. Besides, Last Mile data helps emergency responders reach impacted locations faster. Additionally, high-quality maps make it easier for businesses and residents to find what they are looking for and improve their quality of life.

Recently, RMSI undertook a pilot in the city of Gurgaon (Delhi NCR) to prepare a highly detailed last-mile map. There were significant gaps in existing last mile maps as many road networks are mapped incorrectly, also not covering details like road blockages and gate timings.

**Conclusions**

Geospatial technology has proven to be a critical component in developing nations, revolutionizing how we approach complex challenges and opening up an entirely new realm of possibilities. From providing crucial insights for policymakers to supporting various industries, including agriculture, transportation, and urban planning, geospatial technology has firmly cemented itself as a vital tool in the vertical integration of complex systems.

It empowers informed decisions, enhances citizens' lives, and provides a holistic view of progress and prosperity. Geospatial technology is crucial to our present and future success as a civilization, leaving an indelible mark on modern life.

In short, geospatial technology's role in national development cannot be underestimated, as it remains critical to our current and future success as a civilization.

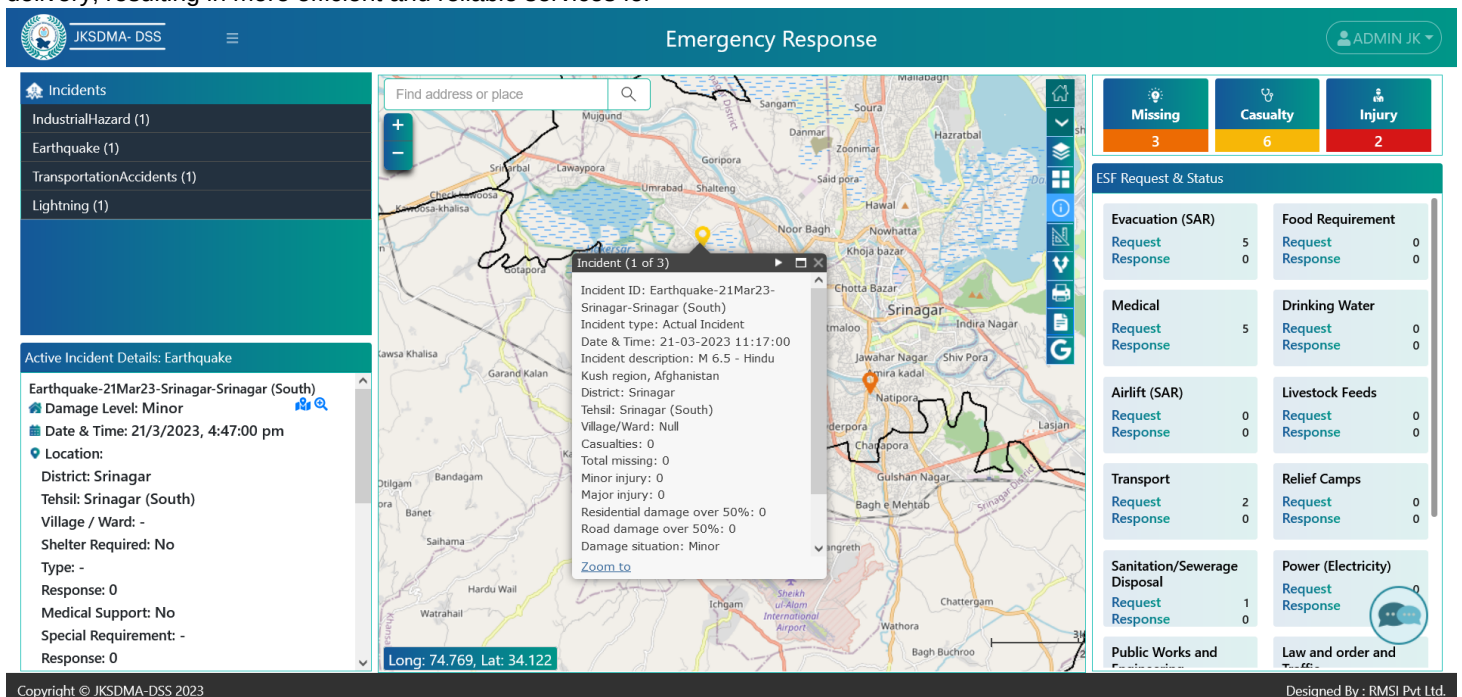


Figure 4: The above image shows a flood map of 100 year return period in Mumbai City on the PIER's (Profiler for Insurance Exposure & Risk) detailed Location Risk Assessment tool.