

IN FOCUS

GIS: Innovate. Integrate. Inspire.

Geographic Information System (GIS) has evolved far beyond its traditional role as a mapping technology. Modern GIS has become the digital intelligence layer connecting data, people, and processes across the enterprise. Enhanced by Geospatial AI, cloud computing, IoT, and real-time analytics, **GIS empowers organizations to innovate with confidence, integrate operations seamlessly, and inspire meaningful change through informed decision-making.**

Innovation Begins with Understanding

Innovation is often associated with breakthrough technologies. However, meaningful innovation begins with deeper understanding. Organizations innovate when they uncover opportunities hidden within data, identify operational inefficiencies, anticipate future challenges, and make faster, more informed decisions.

GIS is at the heart of this transformation. No longer just a system for mapping and spatial analysis, it has evolved into the foundation for next-generation technologies such as Artificial Intelligence (AI), Digital Twins, and the Internet of Things (IoT).

Geospatial AI (GeoAI)

AI needs GIS. While conventional AI excels at identifying patterns and making predictions, GeoAI enriches these insights with the critical dimension of location. It enables AI to understand not just **what** is happening, but **where**

it is happening, **why** it matters, and **what** is likely to happen next. By embedding spatial context into AI workflows, GIS transforms AI from a predictive engine into an intelligent decision-making system capable of delivering more accurate, contextual, and actionable insights.

Esri's ArcGIS platform is evolving rapidly to power this new era of innovation.



AI assistants embedded within ArcGIS are bringing the power of generative AI directly into the user experience. Instead of navigating complex menus or writing scripts, users can interact with ArcGIS using natural language. They can simply ask questions or describe what they want to accomplish, and the AI assistant helps execute the task.



This democratizes GIS by enabling planners, engineers, analysts, executives, and field personnel to derive insights without requiring deep technical expertise. The result is faster adoption, greater collaboration, and more informed decision-making across the enterprise. One of the most significant innovations in ArcGIS is

Esri's Geospatial Vision Language Model (GoVLM), a foundation model purpose-built for geospatial applications.

Unlike traditional deep learning models that are designed to perform a single task, GoVLM combines an understanding of both geospatial imagery and natural language. This enables users to interact with imagery using simple prompts rather than creating and training separate models for each analytical requirement.

Its “one model, multiple tasks” approach offers organizations a far more flexible and scalable way to analyze geospatial imagery. Instead of maintaining multiple task-specific models, organizations can rely on a single intelligent model capable of supporting diverse workflows across sectors such as agriculture, forestry, utilities, urban planning, defence, mining, and disaster management.

As geospatial datasets continue to grow in size and complexity, foundation models such as GoVLM represent a major leap forward in making advanced imagery analysis faster, simpler, and more accessible.

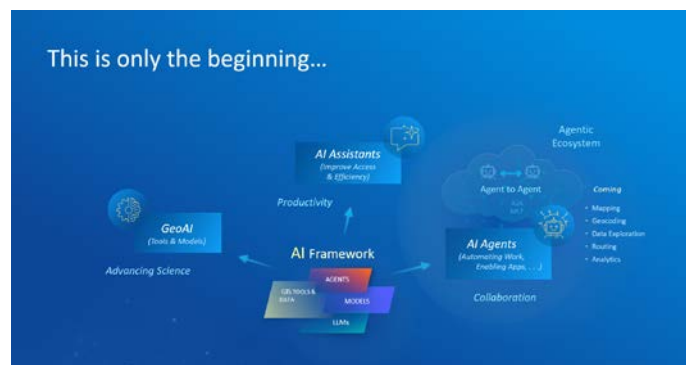
The next frontier of innovation is **AI-powered action**. While agentic AI is advancing rapidly, most general-purpose AI frameworks still lack one critical capability: **spatial intelligence**. Without geographic context, AI agents cannot fully understand the physical world in which organizations operate.

Within ArcGIS, agentic mapping applications are introducing a conversational experience directly on top of maps. Instead of navigating layers or complex interfaces, users can simply ask questions such as:

- Which villages are most vulnerable to flooding?
- Show me infrastructure projects currently under construction.
- Identify areas suitable for new EV charging stations.
- Where are the highest-risk utility assets?

The system interprets natural language, queries spatial data, performs analysis, and returns meaningful answers in context. This dramatically expands access to GIS by enabling non-technical users, including executives, planners, policymakers, and field teams, to interact with

spatial information conversationally.



Esri is extending the power of GIS into the era of Agentic AI through support for the Model Context Protocol (MCP), an open standard that enables AI assistants and agents to securely discover and use external tools and data. By exposing ArcGIS capabilities through MCP, Esri allows AI agents to access authoritative geospatial services such as geocoding, routing, spatial analysis, feature queries, map generation, and location intelligence using natural language. This innovation ensures that AI-powered applications are no longer limited to generic responses but can reason with real-world geographic context, resulting in more accurate, location-aware insights and decisions. As Esri expands MCP support across the ArcGIS ecosystem, it is making geospatial intelligence seamlessly accessible within enterprise AI workflows, helping organizations build smarter, more context-aware AI solutions.

Living Digital Twins

One of the most transformative innovations enabled by GIS is the emergence of Living Digital Twins. While often perceived as another technology platform, a Living Digital Twin is not a new system—it is a smarter way of bringing together the systems organizations already have. It integrates operational, engineering, business, IoT, and geospatial data into a connected environment that supports better, faster, and more informed decisions.

More than a visual representation, a Living Digital Twin creates a continuously evolving digital replica of the real world. It helps organizations understand what has happened, what is happening now, and what could happen next. By bringing together authoritative data and real-world context, it enables operators, planners,

engineers, executives, and emergency responders to work from a shared understanding of reality, fostering coordinated action across the enterprise.

The foundation of every Living Digital Twin is geography. Every asset, sensor, customer, building, utility network, and business process has one thing in common, location. Geography provides the common reference framework that connects diverse systems and datasets, grounding the digital twin in the real world. It ensures that changes occurring in the physical environment are reflected in the digital representation, while insights generated in the digital environment can be translated into timely actions on the ground. In this way, geography becomes the bridge between the physical and digital worlds.

A Living Digital Twin is distinguished by three defining characteristics.

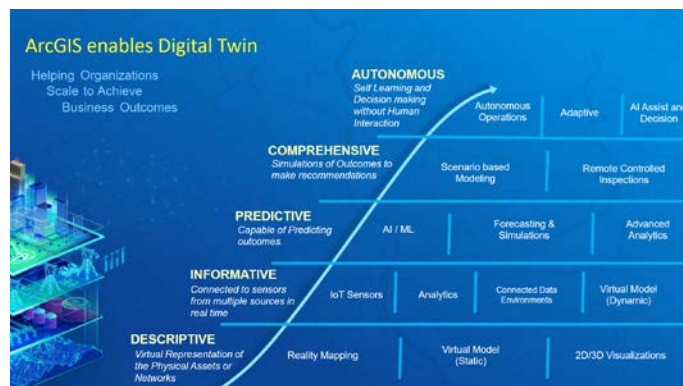
First, it is continuously connected. It integrates data from enterprise GIS, IoT sensors, engineering models, BIM, CAD, satellite imagery, drones, business systems, and operational databases into a living digital environment that remains current as conditions evolve. Rather than presenting isolated datasets, it creates a comprehensive view of interconnected assets, processes, and relationships.

Second, it is time-aware. Unlike static 3D models, a Living Digital Twin captures the past, reflects the present, and helps simulate future scenarios. Organizations can analyse historical trends, monitor real-time operations, and evaluate “what-if” scenarios before making critical decisions. This ability to move seamlessly across time transforms planning from reactive problem-solving to proactive decision-making.

Third, it is outcome-driven. Every Living Digital Twin is designed around a specific operational objective—whether improving urban mobility, strengthening utility resilience, optimizing industrial operations, enhancing disaster preparedness, or supporting sustainable urban development. The technology is valuable not because it creates a sophisticated 3D model, but because it enables better decisions and measurable business outcomes.

ArcGIS provides the geospatial foundation that powers this journey. Beginning with authoritative

spatial data, organizations can progressively integrate route networks, real-time sensor feeds, enterprise systems, advanced spatial analytics, and GeoAI to build increasingly intelligent Living Digital Twins. Rather than replacing existing investments, ArcGIS connects systems of record into a unified decision-support environment, enabling collaboration across departments and throughout the organization.



Ultimately, the power of a Living Digital Twin lies not in its visualization capabilities, but in its ability to combine authoritative data with real-world context. It provides organizations with a living, continuously updated understanding of complex systems, enabling them to understand today's operations while exploring tomorrow's possibilities. As infrastructure, cities, and enterprises become increasingly connected, Living Digital Twins are emerging as a critical capability for building resilient organizations, intelligent infrastructure, and sustainable communities.

Reliance Jio: Connecting Millions Through Smarter Network Planning

India's rapidly expanding digital economy depends upon robust telecommunications infrastructure. As service providers extend high-speed connectivity across diverse geographies, efficient network planning has become increasingly complex.

Reliance Jio has leveraged advanced ArcGIS capabilities to support large-scale planning, asset management, and network deployment across the country. By integrating engineering information with geographic context, planners gain greater visibility into network infrastructure, optimize rollout strategies, and accelerate service delivery.

Location intelligence enables engineers to evaluate terrain,

existing assets, customer demand, and infrastructure constraints simultaneously, supporting informed investment decisions while reducing deployment timelines.

As India advances toward ubiquitous digital connectivity, GIS continues to play an important role in enabling smarter telecommunications infrastructure.

"Innovation accelerates when every network decision begins with geography."

Integration at the core of Innovation

GIS fosters innovation by bringing together disparate datasets, business applications, operational systems, and real-time information within a common geographic framework. By providing spatial context to enterprise data, GIS enables organizations to move beyond isolated insights and build a connected, data-driven enterprise capable of responding faster, planning better, and innovating continuously.

The Power of Integration

Every organization generates enormous amounts of data. Utilities collect information from smart meters and supervisory control and data acquisition (SCADA) systems. Telecom companies monitor network performance through millions of connected devices. Urban planners rely on satellite imagery, cadastral records, and demographic data. Manufacturers use IoT sensors to monitor production assets, while retailers analyse customer behavior across multiple channels. Individually, these datasets provide valuable insights. However, when they exist in silos, their potential remains largely untapped. GIS addresses this challenge by providing the common thread that connects information across departments and systems.

Connecting Enterprise Business Platforms

Today's enterprises rely on a wide range of digital business platforms to manage operations. ERP systems oversee financial and operational processes, CRM platforms capture customer interactions, asset management solutions monitor infrastructure, while business intelligence tools generate performance reports. Traditionally, these systems operate

independently, requiring users to switch between applications to obtain a complete picture of operations.

GIS bridges these systems by integrating enterprise business applications with location intelligence. For example, an electricity distribution company can connect its GIS platform with ERP and asset management systems to visualize infrastructure investments geographically, monitor maintenance schedules, and analyse service performance in real time. A telecommunications provider can integrate customer databases, network assets, field workforce management, and service requests into a single operational dashboard, enabling faster fault resolution and improved customer satisfaction.

Similarly, municipal governments can integrate property tax databases, land records, utility networks, transportation infrastructure, and citizen grievance systems into a unified geospatial platform. This not only streamlines administration but also enables evidence-based planning and more responsive public services.

In infrastructure planning, engineers can integrate BIM models with GIS to visualize proposed assets within their surrounding environment, assess terrain constraints, analyse utility conflicts, and evaluate environmental impacts before construction begins. During operations, IoT sensors, inspection reports, and maintenance records can continuously update the same GIS environment, creating a living digital representation of the infrastructure throughout its lifecycle.

Rather than replacing existing enterprise applications, GIS enhances their value by providing the geographic context necessary for informed decision-making.

ArcGIS offers a wide range of integration capabilities to connect with enterprise IT systems, enabling seamless workflows and enhanced geospatial intelligence. These integrations are supported through strategic partnerships, APIs, and tools that cater to various use cases.

ArcGIS integrates with enterprise software such as Microsoft Azure, AWS, and SAP HANA, allowing organizations to leverage cloud computing, secure data storage, and spatially enabled business applications.

FROM DATA SILOS TO ENTERPRISE INTELLIGENCE

BEFORE GIS

Operating in Silos. Limited Visibility. Slower Results

- 1 Separate Databases**
Data is stored in disconnected systems across departments.
- 2 Duplicate Data**
Redundant data leads to inconsistencies and higher costs.
- 3 Delayed Decisions**
Lack of real-time information leads to delays and missed opportunities.

AFTER GIS

Connected. Collaborative. Intelligent

- 1 Shared Operational Picture**
A single, trusted view of information for all departments.
- 2 Connected Systems**
GIS integrates enterprise systems, data and workflows seamlessly.
- 3 Faster Responses**
Real-time insights enable quick actions and proactive decisions.

Developers can use ArcGIS APIs and SDKs to build custom integrations with in-house or third-party systems. These tools enable the creation of tailored solutions for data management, spatial analysis, and automation. For example, the “Integrate” tool in ArcGIS Pro allows users to analyze and align feature vertices within specified tolerances, ensuring data consistency.

ArcGIS also supports open standards and specifications, ensuring interoperability with other systems and fostering collaboration across platforms.

From Insight to Impact

Innovation introduces new possibilities. Integration connects those possibilities into a cohesive system. But the true measure of technology lies in its ability to inspire meaningful action and create lasting impact. GIS transcends technology to become an enabler of transformation. Every map tells a story. Every dashboard reveals an opportunity. Every spatial analysis supports a decision that can improve lives, protect natural resources, strengthen communities, or build resilient infrastructure.

OneMap Gurugram: A Single Source of Truth

As one of India’s fastest-growing urban centers, Gurugram faces increasing demands on infrastructure, mobility, utilities, and citizen services.

The Gurugram Metropolitan Development Authority (GMDA) developed OneMap Gurugram, an integrated GIS platform that brings together data from multiple departments onto a single digital platform.

Urban planners, engineers, utility agencies, and administrators now access shared geospatial information for planning and decision-making.

Instead of maintaining separate maps and datasets, stakeholders collaborate using a common geographic framework, improving coordination while reducing duplication and delays.

OneMap demonstrates how ArcGIS enables cities to move from departmental operations to integrated urban governance.

Jawaharlal Nehru Port Authority (JNPA): Building a Smart Port

Ports are among the most complex operational environments, involving shipping movements, cargo logistics, road connectivity, security, utilities, environmental monitoring, and infrastructure management.

The Jawaharlal Nehru Port Authority (JNPA) has adopted ArcGIS to create an integrated view of port operations.

By combining infrastructure data, utility networks, logistics information, and operational assets within a single geospatial platform, port authorities gain improved situational awareness and more effective coordination across departments.

GIS also supports future expansion planning by helping planners visualize land availability, infrastructure capacity, and operational constraints before investments are made.

Tata Steel UISL: Integrating Urban Infrastructure

Managing urban utilities requires continuous coordination between water supply, wastewater systems, roads, public facilities, and citizen services.

Tata Steel UISL has leveraged ArcGIS to integrate utility operations, enabling engineers and administrators to monitor assets, streamline maintenance activities, and improve service delivery.

By connecting infrastructure information through a common geographic framework, the organization has enhanced operational efficiency while supporting smarter urban management.

Organizations that integrate spatial intelligence into enterprise workflows can reduce duplication, improve coordination, and accelerate decision-making by ensuring every stakeholder works from the same geographic context.

Across India, organizations are using GIS not merely to manage assets or analyse data, but to solve complex societal challenges, from ensuring clean drinking water and protecting forests to modernising governance, responding to disasters, and creating more sustainable cities. The most compelling GIS stories are no longer about technology. They are about people.

Governance

Good governance begins with understanding people, places, and the complex relationships between them. GIS provides governments with a comprehensive, location-based view of assets, infrastructure, resources, and communities, enabling more informed, transparent, and timely decision-making. By integrating data across departments, GIS helps improve urban planning, land administration, public safety, infrastructure management, disaster response, and citizen services. When combined with AI, IoT, and real-time data, GIS empowers governments to predict challenges, optimize resource allocation, and deliver more responsive, citizen-centric services. In an increasingly digital world, GIS has become the foundation of smart governance—transforming data into actionable intelligence and enabling governments to plan smarter, respond faster, and build more resilient and sustainable communities.

Agriculture

Agriculture has always been deeply connected to geography, with factors such as soil, water availability, terrain, and climate influencing productivity. Today, precision agriculture is redefining this relationship by combining GIS with satellite imagery, drones, remote sensing, IoT sensors, and artificial intelligence. These technologies provide farmers and policymakers with timely, location-specific insights that enable better planning and decision-making throughout the agricultural cycle.

Rather than applying the same practices uniformly across an entire farm, GIS enables interventions tailored to local conditions. Farmers can monitor crop health, analyse soil variability, optimize irrigation, identify pest and disease outbreaks, forecast yields, and apply fertilizers and pesticides only where they are needed. This data-driven approach not only improves productivity and profitability but also reduces water consumption, minimizes input costs, and lowers the environmental impact of agricultural operations, making farming more sustainable and resilient.

Forests, Biodiversity, and Conservation

India's forests are vital for preserving biodiversity, supporting millions of livelihoods, regulating climate,

and maintaining ecological balance. Managing these vast and diverse ecosystems requires continuous monitoring and informed decision-making across large geographic areas, something that traditional field-based methods alone cannot achieve.

GIS has become an indispensable tool for forest departments and conservation agencies by providing a comprehensive spatial view of forest resources. It enables authorities to monitor changes in forest cover, detect encroachments, identify illegal logging and mining activities, assess wildlife habitats and migration corridors, plan conservation initiatives, and monitor biodiversity over time. By integrating satellite imagery with AI-powered change detection and geospatial analytics, environmental monitoring becomes faster, more accurate, and more proactive, allowing authorities to respond quickly to emerging threats while supporting long-term conservation goals.

Defence

GIS has transformed the way defence organizations plan, operate, and make decisions. The technology, coupled with AI, has brought in highly credible outcomes in a wide range of applications, including intelligence gathering, battlefield management, terrain analysis, surveillance, infrastructure management, and monitoring activities. By providing accurate geospatial information and real-time situational awareness, GIS enhances operational efficiency, improves strategic planning, and strengthens national security.

Additionally, the integration of GIS with AI enables defence systems to evolve from reactive decision-making to proactive and predictive capabilities. This convergence supports intelligent threat detection, improves resource allocation, and enables faster, data-driven strategic and tactical decisions.

Land Administration

GIS is transforming land management by creating a single, authoritative view of land records, cadastral maps, ownership details, zoning regulations, and development plans. By integrating spatial and administrative data, GIS enables government agencies to efficiently manage land assets, verify land-use information, monitor development activities, and streamline approvals. It

enhances transparency, reduces disputes, supports evidence-based planning, and improves coordination across departments. With real-time visualization, mobile data collection, and analytics, GIS empowers authorities to make faster, more informed decisions while ensuring sustainable land use, efficient resource management, and better citizen services.

GIS Enabling Evidence-based Decision-making: LDA

Lucknow Development Authority (LDA) transformed urban planning and governance through Urban Vista Lucknow, a comprehensive GIS portal built on ArcGIS. The platform integrates land records, cadastral maps, master plans, property allotments, Nazool land, utilities, road networks, satellite imagery, and engineering projects into a single geospatial system, enabling planners, government officials, and citizens to access accurate, authoritative spatial information for evidence-based decision-making.

Before implementing the GIS platform, LDA struggled with fragmented data spread across multiple departments, limited transparency, manual workflows, lengthy approval processes, and the absence of a centralized system for verifying land-use information. These challenges resulted in administrative inefficiencies, delayed approvals, and reduced public trust.

Esri India addressed these challenges by developing a single-window GIS portal with integrated web applications, mobile apps, interactive dashboards, ERP integration, and tools for land management, cadastral mapping, property management, project monitoring, park and monument information, and change detection using satellite imagery. The solution also included data standardization, user training, and real-time geotagging of projects to improve operational efficiency and data accuracy.

The implementation has significantly improved governance by providing a unified view of planning and infrastructure data, enhancing transparency, simplifying information management, streamlining workflows, strengthening collaboration, and enabling faster, data-driven decisions. The platform has also expanded public access to verified planning information, reduced manual processes, improved resource management, and supported sustainable urban development through better planning and monitoring.

Disaster Management

Climate change is redefining how societies plan, build, and protect infrastructure, manage natural resources,

and prepare for disasters. Increasingly frequent and severe events—extreme rainfall, heat waves, cyclones, droughts, forest fires, and sea-level rise—are creating complex challenges that require a deeper understanding of location and geography. Since every climate risk has a spatial dimension, decision-makers need technologies that can reveal where vulnerabilities exist, how risks are evolving, and which communities and assets are most exposed.

GIS provides the spatial intelligence needed to move from reactive disaster response to proactive climate resilience. By integrating satellite imagery, elevation models, weather forecasts, historical records, and real-time sensor data, GIS creates a comprehensive view of both current conditions and future risks. This enables governments, utilities, and emergency agencies to identify high-risk zones, simulate the impact of different climate scenarios, optimize evacuation routes, prioritize resilient infrastructure investments, and strengthen emergency preparedness and response strategies.

By making future risks visible today, GIS empowers organizations to make informed, evidence-based decisions that reduce vulnerability and enhance resilience. Whether protecting critical infrastructure, safeguarding natural ecosystems, or improving community preparedness, spatial intelligence is helping societies adapt to a changing climate and build a safer, more sustainable future.

AGiSAC: Driving Smarter Governance with GIS

Aryabhatta Geo-informatics and Space Application Centre (AGiSAC) is leveraging ArcGIS to strengthen governance in Himachal Pradesh through a centralized Decision Support System (DSS). AGiSAC has developed web, desktop, and mobile GIS applications for multiple government departments, including rural development, public works, irrigation, forests, town planning, and environment, enabling efficient, transparent, and data-driven governance.

The GIS-based applications integrate cadastral maps, satellite imagery, demographic and departmental data to support infrastructure planning, human resource management, gap analysis, route optimization, monitoring of government schemes, and identification of suitable locations for new facilities such as schools, healthcare centres, and fair-price shops. GPS-enabled mobile

devices ensure real-time data updates, while a common geospatial platform enables seamless collaboration across departments.

By using ArcGIS, AGiSAC has enabled government officials to visualize complex datasets, perform spatial analysis, and make faster, evidence-based decisions. The platform has improved planning, resource allocation, infrastructure monitoring, and developmental gap analysis while supporting initiatives such as the Green Corridor, Panchayat Development Plans, PMGSY progress monitoring, water conservation under the Jal Shakti Abhiyan, and industrial planning. Overall, the project demonstrates how GIS serves as a powerful foundation for integrated, transparent, and citizen-centric governance.

Inspiration Creates a Ripple Effect

The true power of GIS extends beyond technology—it lies in its ability to inspire transformation. Every successful implementation becomes a model that others can learn from and adapt. When one city demonstrates how GIS can improve governance and citizen services, other municipalities are encouraged to follow. When a utility uses spatial intelligence to reduce outages and improve operational efficiency, similar organizations recognize the value of adopting geospatial solutions. Likewise, when a state builds a comprehensive geospatial platform to support planning and decision-making, neighboring states are often motivated to accelerate their own digital transformation initiatives.

Innovation spreads through demonstrated success. As more organizations witness measurable improvements in efficiency, sustainability, resilience, and public service delivery, confidence in geospatial technologies continues to grow. This ripple effect is one of the defining characteristics of India's rapidly expanding geospatial ecosystem, where shared learning, collaboration, and innovation are collectively driving smarter governance, stronger industries, and more sustainable development.

Conclusion

Innovation reveals new opportunities. Integration connects systems, data, and stakeholders to enable seamless collaboration. Inspiration encourages organisations to learn from successful implementations and embrace new possibilities. Together, these three pillars define the next chapter of digital transformation.