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ArcIndia News

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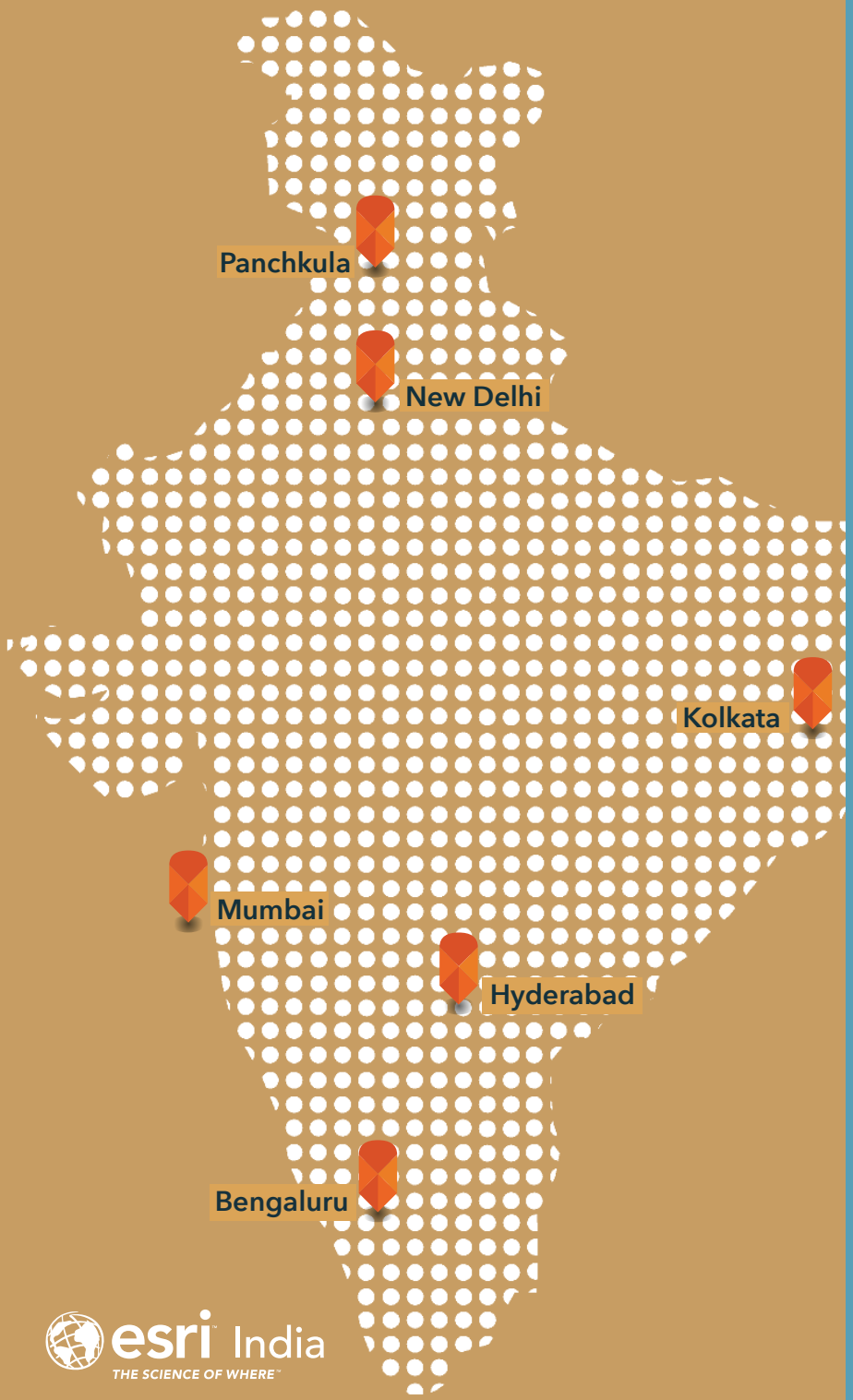

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MD'S DESK

Agendra Kumar

Managing Director, Esri India

We achieve the best outcomes through seamless integration of systems, teams, and processes. When these work together, more efficient and agile organizations are created. When operations are integrated, silos are eliminated, duplication is reduced, and workflows are streamlined, leading to faster decision-making and improved productivity. Integration also allows better data sharing and analysis, paving the way for smarter, more informed strategies that drive expansion.

GIS is integrating everything, everywhere, as a common thread. As an integrative platform, it is bringing together people, data, systems, and processes to solve complex problems. By enabling integration of organizations and the systems within, it is fostering collaboration and powering decisions that are not only data-driven, but also context-aware and impact-oriented.

GIS is turning complexity into clarity and chaos into coordinated action. This capability is expanding rapidly with the integration of AI. This fusion, referred to as GeoAI, is enabling users across various sectors to derive actionable insights from satellite imagery, drone videos, unstructured text, and other data sources at unprecedented speed and scale. Additionally, natural language-powered AI assistants are making GIS more accessible, allowing users to interact with complex spatial datasets simply by describing the tasks in plain English or even in their native language.

As these advancements become a reality, to help our partners and users keep pace and harness the capabilities of GeoAI optimally, we have recently invested in a GIS and AI Competency Centre. We have also expanded our team of AI specialists, data scientists, GIS experts, and industry domain professionals to focus on developing advanced AI-powered geospatial solutions that can effectively address the complex challenges faced by our users.

As we continue to invest in AI, data science, and domain expertise, our goal remains clear—to help our users unlock deeper insights, improve operational efficiency, and make smarter decisions. We look forward to partnering with you on this journey of transformation, where integrated systems and intelligent solutions create lasting impact. Let's continue to integrate. Let's continue to transform.

A Power-Packed Edition of the Esri India Developer Summit Concludes

Esri India Developer Summit 2025 brought together the vibrant GIS developer community across two key cities—Delhi and Hyderabad. The summit served as a powerful platform for innovation and collaboration, enabling participants to explore the latest Esri developer tools and cutting-edge advancements in geospatial technology.

The Summit featured a thoughtfully curated agenda packed with technical sessions, live demonstrations, and networking opportunities, equipping developers with the knowledge and tools to build smarter, more impactful geospatial applications. Esri India proudly hosted **over 450+ delegates from 171+ organizations.** This is a strong testament to the company's commitment to empowering the developer ecosystem, a driving force shaping the future of GIS in India.

The event attracted participation from across India, including prominent organizations such as the Indian Army, SOI, GSI, FSI, NATMO, NTRO,DRDO, NIC , MRSAC, NRSC, Uttarakhand State Disaster Management Authority, NDMA, SLUSI, and NHAI. Delegates also represented various Central Government Ministries (Home Affairs, Jal Shakti, Environment, Forest and Climate Change, Water Resources), top consulting organisations (PWC, Deloitte), and other leading organisations including DHBVN, Jacobs, HMWSSB,WSP, Quantela Inc, Adani, BSES, Tata Power, Jio, APCRDA, Telangana Forest Department, ECIL, BEL, and the Directorate of Town & Country Planning, among others.

Esri India and IPE Global Released a Joint Climate Study

By 2030, climate change is expected to drive 43% rise in the intensity of extreme rainfall events across India, making the country hotter and wetter, according to the IPE Global and Esri India study. Eight out of ten districts in India are going to experience multiple instances of such rainfall extremes by 2030, according to the study. The study also found a 2.5-fold increase in the number of heat wave days by 2030.

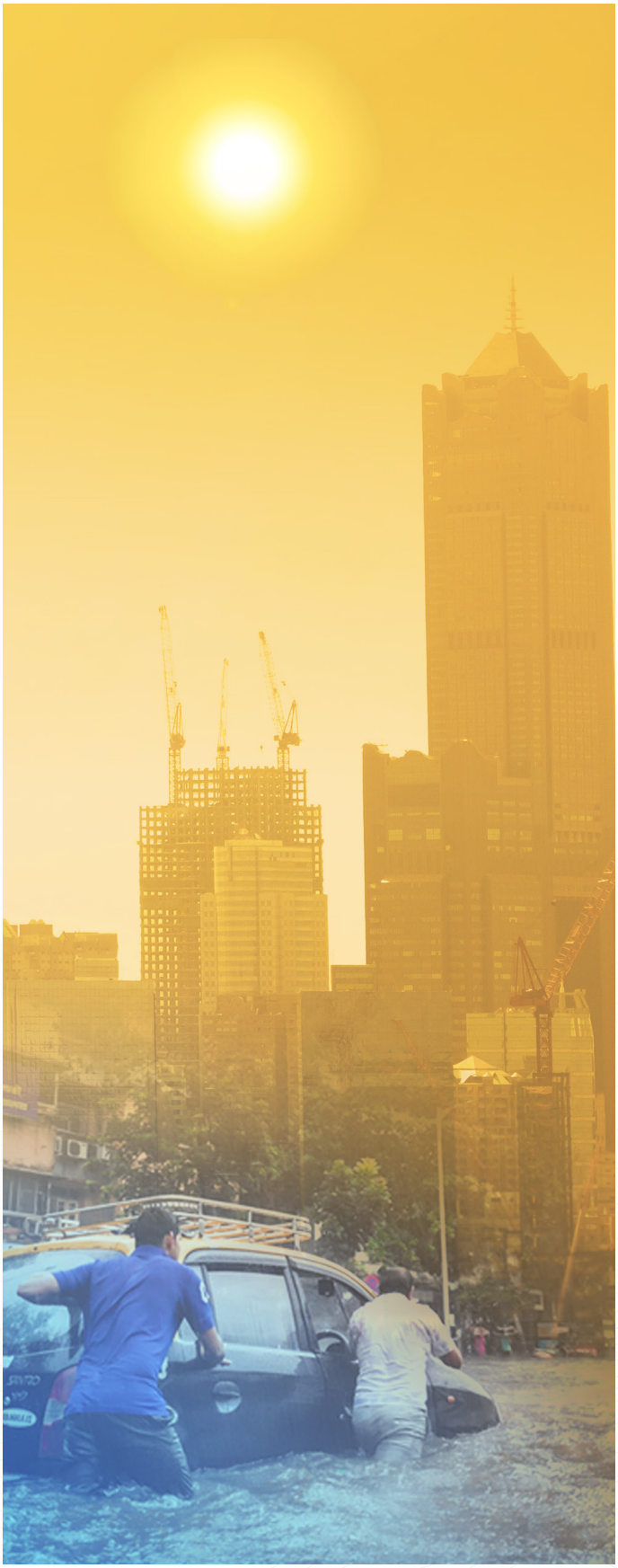
The study was launched at the International Global-South Climate Risk Symposium titled "Paving a Climate Resilient Future", organised by IPE Global and Esri India.

Agendra Kumar, Managing Director, Esri India, said, "The growing intensity and frequency of extreme heat and rainfall events across India are no longer rare occurrences—they are signals of a shifting climate reality impacting lives, livelihoods, and infrastructure. Addressing this challenge requires a holistic, data-driven approach rooted in science and spatial intelligence. Geographic Information System (GIS) technology, with its ability to integrate, visualize, and analyze diverse datasets, offers a powerful lens to understand climate impacts across economic, social, and environmental dimensions. GIS supports proactive planning—whether for climate-resilient infrastructure, disaster response, or public engagement. GIS is already foundational to national missions like PARIVESH, Jal Jeevan Mission, and Clean Ganga, helping turn climate data into actionable insight. At Esri India, we are committed to empowering our users and partners with cutting-edge geospatial tools and data, enabling them to not just monitor the changing climate but to build a more adaptive, resilient, and sustainable future."

Abinash Mohanty, Head of the Climate Change and Sustainability Practice at IPE Global and the lead author of the study, noted, "The study and its stark findings suggest how climate change has exposed India to extreme heat and rainfall and the situation is going to be grimmer and harsher by 2030 with majority of the urban centres are going to be impacted the most. Further, the meteorological phenomenon like El Niño & La Niña are going to gain stronger momentum, resulting in abrupt surge in climate extremes like flood, cyclones, storm surges and extreme heat. Our analysis suggests that around 72 per cent of the tier-I & tier-II cities are going to witness an increased occurrences of heat stress and extreme rainfall events, accompanied with storm surges, lightening and hailstorms. Embracing hyper-granular risk assessments and establish climate-risk observatories should become a national imperative to safeguard Indian agriculture, industry, and large-scale infrastructural projects from the vagaries of climate change".

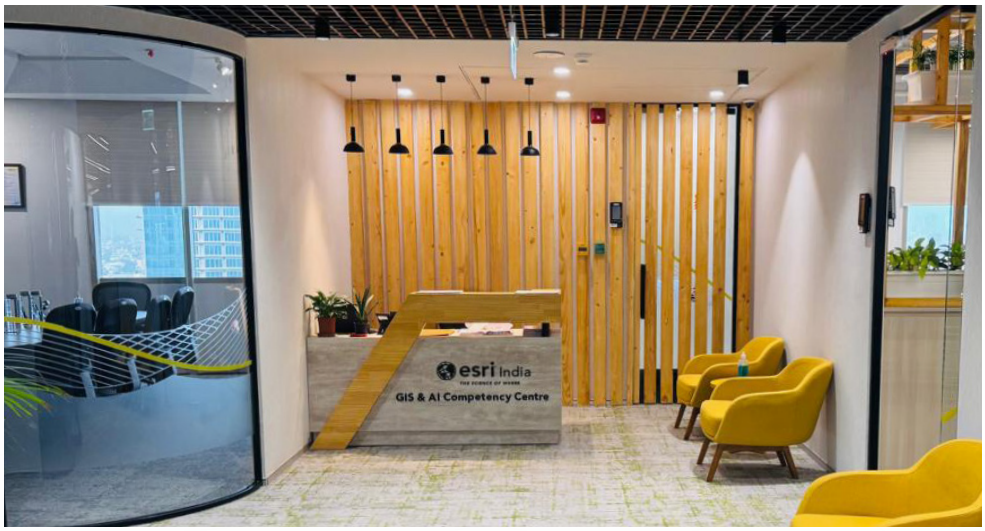
Ashwajit Singh, Founder and Managing Director of IPE Global, said, "Recently, United Nations Secretary-General António Guterres issued a "Call to Action on Extreme Heat in response to the deadly impacts of rising temperatures all over the world" -- and India is no exception. Climate and development pathways are intricately linked. Nearly all countries of the Global South face the dual challenge of improving living conditions for large segments of their population while simultaneously adapting to the consequences of climate change. We, at IPE Global, have been consistently striving to develop and implement strategies that turn environment risks into competitive advantages. This study is a testament to how we can bring innovations from the margins to mainstream --making India and Global South climate-ready. Only then, can India truly emerge as the climate solutions capital to the world".

The study recommends that risk assessment principles should form the cornerstone of India's strategy to build resilience against heatwaves and extreme rainfall. As an initial step, it proposes establishing **a Climate Risk Observatory (CRO)** that can help identify, assess, and project chronic and acute heat risks at a hyper-granular level.



Esri India Announces INR 150+ Crores Investment in New Competency Center for GIS and AI

Esri India has opened a **GIS & AI Competency Center** at a new facility in Noida for which it will invest more than INR 150 crores over the next 5 years. This strategic investment aims to foster the broader adoption of AI in GIS applications. Building on Esri India's leadership in the GIS domain, the new center will serve as a dynamic catalyst for the company's focus on GeoAI offerings and empowering customers to enhance their GIS and GeoAI capabilities.



As part of this investment, Esri India will expand its team of AI specialists, data scientists, GIS experts, and industry domain professionals. This growing pool of specialized talent will focus on developing advanced AI-powered geospatial solutions that address increasingly complex challenges faced by GIS users.

Agendra Kumar, Managing Director, Esri India, said, "The convergence of AI and geospatial intelligence is defining novel innovations in GIS applications. On one hand, Esri's GIS technology is evolving faster than ever before, with numerous new functionalities and configurable applications. On the other hand, innovations in AI are emerging at a very fast pace. The speed of change is so high that without strategic investments, it will not be possible to lead the transformative use of AI in GIS applications. The engineers at this new GIS and AI Competency Centre will focus on the integration of AI into spatial analysis, enabling customers to extract richer insights from complex geospatial data, automate routine processes, and make faster, more informed decisions."

As data volumes explode and new challenges emerge, the ability to quickly extract actionable insights has become critical. AI is playing a transformative role in this new landscape, enabling organizations to process vast amounts of data, identify patterns, predict trends, and automate decision-making at a scale that was previously impossible.

Esri India has successfully supported GIS applications with AI in land management, asset management, object identification from imagery, video analytics, etc., for its users in India.

Esri India is also strengthening its partnerships with academic institutions and research organizations to build local AI talent and foster innovation in GeoAI. The company intends to release AI-ready datasets, train models with Indian data, and build competency to support the growing demand for AI-powered GIS applications.

GIS - Integrating Everything, Everywhere

In an age defined by complexity—climate disruptions, geopolitical tension, urban sprawl, digital fragmentation—what the world needs more than ever is **a common language of understanding.** One that transcends borders and disciplines. One that does not just ask what or why, but also where. That language is GIS—Geographic Information Systems.

Once considered a niche technical domain, GIS has evolved into **the connective tissue of the 21st century,** linking data with geography, people with policy, and the digital with the physical. From climate models to traffic patterns, from deforestation in the Amazon to flood risks in Chennai, GIS enables us to see the world not just as isolated problems but as an intricate, interrelated system. In doing so, it offers clarity, coordination, and ultimately, solutions.

The Spatial Revolution

At its core, GIS answers the most fundamental of questions: Where?

Where is the need greatest? Where are we vulnerable? Where are we growing? Where are the patterns forming? These spatial questions form the bedrock of modern decision-making. But GIS does more than just locate. **It connects. It explains. It predicts.**

Urban Planning

In urban planning, GIS enables planners to manage urbanization more effectively across multiple sectors, including land use, transportation, housing, development, and the environment. Each stage of urban planning, ranging from setting objectives to implementation and monitoring, benefits from GIS tools that support data analysis, modeling, and scenario evaluation. Technologies like ArcGIS Urban allow planners and administrators to visualize demographic needs, assess housing plans, and collaborate through web-based 3D applications.

GIS helps store and analyze physical, social, and economic data, aiding in site feasibility studies and tracking land changes over time. It also facilitates citizen engagement, encouraging community input to create smarter, more livable cities. Esri's smart city solutions are empowering professionals to design impactful plans that enhance the overall quality of life.

Infrastructure Development

Infrastructure forms the backbone of a city. In infrastructure development, GIS is playing a pivotal role. Smart infrastructure projects today rely heavily on advanced technologies, such as GIS, BIM, and Digital Twins, to enhance planning, execution, and efficiency. Large infrastructure projects often face cost overruns of 20–60% but integrating GIS and BIM can yield up to 13% in cost savings. GIS supports site selection, environmental assessment, and infrastructure alignment by offering spatial context, helping teams plan projects such as roads, railways, and airports with minimal ecological impact. ArcGIS supports the full AEC lifecycle. Its tools offer intelligent mapping, GeoDesign capabilities, real-time visualization, and data sharing to boost operational transparency, collaboration, and cost-effectiveness.

Utility Management

In utilities, GIS helps in gaining better situational awareness along with actionable intelligence for informed decisions.

More than 90% of utility enterprises have a context of location associated, which can be easily harnessed for higher efficiency. Making it easier, faster, and cheaper than ever, ArcGIS is providing an opportunity for utilities to proactively interact with every asset and consumer. ArcGIS Utility Solutions are making access to contextualized information easier than ever before, helping utility CXOs address their priorities more effectively, strengthen their ability to stay agile in changing times, and grow sustainably.

Disaster Management

Effective Disaster management is a necessary component of resilient urban and rural spaces. GIS empowers administrators to enhance disaster preparedness and build more resilient living environments. It aids in enhancing preparedness, response, and recovery through spatial intelligence. Integrated into regional development planning, GIS enables better risk modeling, early warning systems, and informed decision-making. It helps identify vulnerable areas, directs relief efforts, and improves situational awareness, ultimately leading to faster, more targeted responses and efficient recovery. ArcGIS supports the full disaster management lifecycle with powerful tools for mapping, remote sensing, and data visualization. **Indo ArcGIS** offers tailored disaster management solutions that help with real-time resource planning and disaster mitigation efforts, making disaster response more effective and community-centric.

Agriculture

India is primarily an **agricultural** economy, with agriculture serving as the livelihood source for nearly half of the country's population. It is the backbone of rural India, contributing significantly to food security, employment, and national GDP. In agriculture, GIS enables precision farming by linking soil, weather, and crop data into actionable insights. It is playing a transformative role in modern agriculture by bringing precision, efficiency, and sustainability to farming practices. By integrating spatial data on soil health, crop performance, weather conditions, water availability, and topography, GIS allows farmers and agribusinesses to make informed, site-specific decisions. Precision agriculture, powered by GIS, enables optimized planting, targeted irrigation, and efficient use of fertilizers and pesticides, resulting in higher yields and reduced environmental impact.

GIS also supports real-time crop monitoring using satellite imagery, drones, and remote sensors to detect stress factors like disease, pests, or nutrient deficiencies early, allowing for timely interventions. On a broader scale, GIS helps policymakers and researchers assess food security risks, plan for climate change impacts, and improve agricultural supply chains. By visualizing complex relationships between natural resources, human activity, and market dynamics, GIS empowers the agricultural sector to adapt, innovate, and ensure sustainable food production for a growing global population.

Business Growth

GIS forms a core component of Business Growth as well. It empowers businesses to make more informed decisions by providing actionable insights derived from spatial data analysis. By leveraging GIS technology, businesses can gain a competitive edge, optimize their operations, and achieve their strategic objectives more effectively.

For instance, in **retail,** GIS reveals purchasing behavior patterns, optimizes supply chains, and forecasts demand. GIS is revolutionizing the retail sector by enabling businesses to harness the power of location intelligence for more precise decision-making across site selection, customer targeting, supply chain optimization, and competitive analysis. By integrating demographic data, consumer behavior patterns, traffic flows, and competitor locations, GIS allows retailers to identify optimal store locations, predict market demand, and fine-tune marketing strategies based on localized insights. GIS-based spatial analysis helps companies segment customers geographically, personalize promotions, and even adapt product offerings to the preferences of specific neighborhoods or regions.

On the operational side, GIS enhances **supply chain efficiency** by optimizing delivery routes, managing inventory distribution, and anticipating potential disruptions. As e-commerce grows, GIS also supports last-mile delivery planning, enabling faster and more cost-effective service. By connecting consumer data to geography, GIS empowers retailers to understand not just who their customers are, but where and how they engage, driving smarter, location-informed business strategies that strengthen competitiveness in a rapidly evolving retail landscape.

GIS is also becoming a core technology of **quick commerce.**

Since the core promise of quick commerce is ultra-fast delivery, it is essential to have highly accurate, real-time insights on traffic conditions, road closures, route optimization, and weather disruptions to ensure timely fulfilment. GIS brings automation to enable this level of dynamic, data-driven decision-making. With tools like ArcGIS, quick-commerce companies can dynamically optimize logistics, minimize delivery times, and swiftly adapt to changing conditions such as traffic congestion, weather disruptions, or unexpected delays. This real-time spatial intelligence not only enhances operational efficiency but also ensures a consistent, high-quality customer experience.

In **manufacturing,** GIS is increasingly becoming a strategic enabler, offering the agility and intelligence manufacturers need to enhance customer experience and streamline operations. With the growing demand for data-driven decision-making and automation, GIS facilitates coordinated planning across the entire value chain, resulting in improved efficiency, reduced costs, and better risk mitigation.

Esri's location intelligence solutions empower manufacturers to visualize and analyze data with spatial context, leading to smarter decisions in areas such as market analysis, sales territory optimization, field service management, and supply chain operations. Advanced tools, such as ArcGIS Business Analyst and ArcGIS Knowledge, enable manufacturers to innovate across customer service, asset management, and logistics, ultimately driving greater operational resilience and a competitive advantage.

In the **Banking and Financial Services** sector, the adoption of GIS is rapidly expanding, driven by the need for enhanced market intelligence, operational continuity, and regulatory compliance. GIS enables banks to go beyond traditional data analysis by leveraging geospatial visualization to interpret complex market dynamics, customer behavior, and service accessibility.

From identifying optimal branch locations to mapping market potential, GIS supports strategic decisions in sales, marketing, and service delivery. As the sector adapts to decentralized business models and explores new growth in emerging markets, the demand for advanced spatial analytics is growing. Esri's GIS solutions transform geographic data into actionable insights, helping financial institutions enhance their analytical capabilities, refine business strategies, and stay competitive in a fast-evolving global market.

Behind all of these use cases is a unifying force: **a spatial framework that turns chaos into context.**

GIS-The Common Thread

GIS today serves as a powerful common thread that integrates everything, everywhere—across geographies, domains, and data types. It is not just a mapping tool, but a dynamic system that brings together disparate datasets—spatial and non-spatial—to reveal patterns, relationships, and insights that were previously inaccessible. Whether it's linking satellite imagery with cadastral data, integrating IoT feeds with utility networks, or merging socio-economic datasets with administrative boundaries, GIS acts as the connective tissue that enables holistic decision-making. Its ability to break down silos, harmonize information, and present a unified, location-intelligent view makes GIS indispensable for smart governance, resilient infrastructure, environmental sustainability, and inclusive development.

Integrating Science & Knowledge

As a unifying platform, GIS integrates scientific knowledge from various disciplines. It serves as a bridge that connects diverse scientific domains, enabling a holistic understanding of our world. At its core, GIS is grounded in geography, but it intersects with countless disciplines—from climatology and ecology to sociology and economics. Scientific disciplines often function in silos, but GIS provides a universal spatial language that harmonizes them. GIS allows biologists, sociologists, epidemiologists, and geologists to analyze their research in spatial context.

Sociologists use GIS to map and analyze demographic, economic, political, or cultural data from various sources and scales. They also use GIS to examine how human activities affect the environment and vice versa, such as urbanization, migration, climate change, or natural hazards.

An environmentalist uses GIS to investigate the physical processes and characteristics of the Earth and its systems. For example, they can use GIS to measure and model topography, hydrology, geology, ecology, or meteorology. They can also use GIS to monitor and assess the impacts of natural or human-induced changes on the environment, such as land

cover, biodiversity, water quality, or carbon emissions. Biology, ecology, geology – we can explore the natural world using GIS. Tracking migratory patterns, monitoring biodiversity, and analyzing geological formations, GIS helps scientists uncover nature's secrets. GIS is a great tool to visualize the environmental process, hydrologic process, impacts, and results.

GIS can also be used to map and visualize historical events, movements, or places, such as wars, migrations, or landmarks. It can also be used to analyze and interpret the spatial aspects of literary works, artistic expressions, or philosophical ideas, such as themes, symbols, or perspectives. By using GIS, we can enrich our cultural awareness, appreciation, and communication about human experience and its diversity. GIS adds a data perspective to social issues. It should be heralded as a tool used to achieve social objectives, such as equality, distribution of resources, such as healthcare and education facilities. Earth Observation techniques, such as time series analysis, give historians the power to visually and interactively understand events such as migration and changes in settlement patterns. The ability of GIS tools to work in any context is unparalleled.

By integrating GIS with computer science, students can learn programming languages and tools for spatial analysis. For example, GIS can be used to develop web-based mapping applications and spatial algorithms. It enables the integration of spatial data with other data sources, such as remote sensing and social media data. GIS empowers computer scientists to solve spatial problems using computational techniques, contributing to advancements in spatial data management, machine learning, and artificial intelligence. The integration of ML and AI enhances spatial decision making.

Integrating Data and Content

GIS integrates data and content from multiple sources, creating a comprehensive view of information. By harmonizing disparate datasets, GIS enables a more complete understanding of complex issues and facilitates data-driven decision-making. GIS integrates these varied datasets by georeferencing them, allowing users to visualize and analyze disparate information layers within a unified spatial framework.

We live in a world of data excess. But data is valuable only when contextualized. GIS platforms like ArcGIS act as fusion engines, integrating fragmented data from satellites, sensors, surveys, and social media into a coherent spatial narrative. ArcGIS can harmonize structured (databases), semi-structured (Excel), and unstructured data (text, imagery). It supports both raster and vector formats and incorporates real-time data streams from IoT devices.

Integrating Systems

GIS can seamlessly combine high-resolution imagery, real-time traffic feeds, weather data, demographic statistics, environmental measurements, and infrastructure maps – transforming complex, multi-dimensional data into coherent, actionable insights. ArcGIS enables integration of data with external enterprise systems such as ERP, CRM, SCADA, and BIM, ensuring that both operational and analytical data are accessible through location-aware dashboards and applications.

With support for open standards, APIs, and interoperability with cloud, AI, and big data platforms, GIS has evolved into an enterprise-grade system of systems. It creates a unified data environment. It allows organizations to break down data silos, foster cross-disciplinary collaboration, and generate a comprehensive spatial understanding that supports better planning, faster decision-making, and more effective problem-solving.

Integrating Diverse Data for Effective Decision-Making in Mining

Mining entails careful planning and periodic assessment of the area during the entire lifecycle of the project. A geospatial application enables Adani Natural Resources

to get diverse information on a single platform, thereby gaining deep insights.

The GIS application aptly manages the challenges of receiving **different datasets from different stakeholders,** the complexity of having **information in different formats and datasets in different coordinate systems.** This integration has led to better decision making at all levels.

Advanced technology involving drones, 2D & and 3D models, and integrating non-SAP sources has brought visibility to land use. The technological prowess is being enhanced as a part of Adani Mining's vision of being the leading mining company with the ethos of a responsible miner.

Integrating Workflows and Business Processes

In today's data-driven enterprises, GIS plays a pivotal role in integrating and streamlining diverse business workflows and processes across sectors. Traditionally, many organizations managed spatial and non-spatial data separately, resulting in data silos, inefficiencies, and delays. GIS eliminates these silos by acting as a common platform that brings together data, systems, and processes, enabling seamless collaboration and more informed decision-making.**GIS enables:**

Cross-Departmental Collaboration: For large organizations, various departments—operations, maintenance, planning, customer service, compliance—often operate in silos. GIS serves as an enterprise-wide platform where workflows intersect. For example, a utility company's field operations team can update asset conditions in real-time via GIS-enabled mobile apps, which instantly informs maintenance scheduling, regulatory reporting, and customer communication processes.

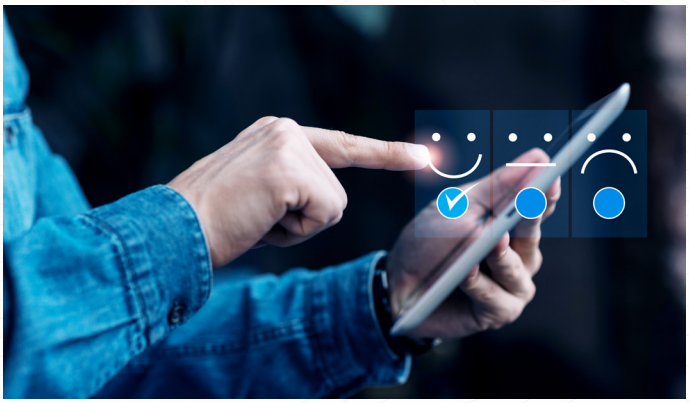
Real-Time Monitoring and Decision Support: By integrating GIS with real-time data streams (e.g., IoT sensors, weather data, traffic feeds), organizations can monitor operations live. This real-time situational awareness supports quick decision-making, early warning systems, and adaptive management. For example, in supply chain logistics, GIS-integrated dashboards allow managers to proactively adjust delivery routes based on current conditions.

Automation of Business Processes: GIS enables automation of routine tasks such as route optimization, resource allocation, incident response, asset inspections, and reporting. Workflows can be designed to trigger specific actions based on spatial data—for instance, automatically dispatching repair crews when a sensor detects pipeline leakage, or rerouting deliveries based on real-time traffic data.

Regulatory Compliance and Reporting: Many industries face complex regulatory requirements that involve spatial data (e.g., environmental constraints, zoning laws, safety zones). GIS simplifies compliance by integrating regulatory frameworks into operational workflows, automatically flagging violations, generating compliance reports, and maintaining audit trails.

Improved Customer Engagement: GIS-powered portals and applications can offer customers self-service options—viewing service outages, tracking service requests, or providing feedback via interactive maps. This integration enhances transparency and improves customer satisfaction.

GIS streamlines workflows and business processes by integrating spatial data into decision-making processes. It optimizes operations by providing a spatial context that enhances efficiency and effectiveness.

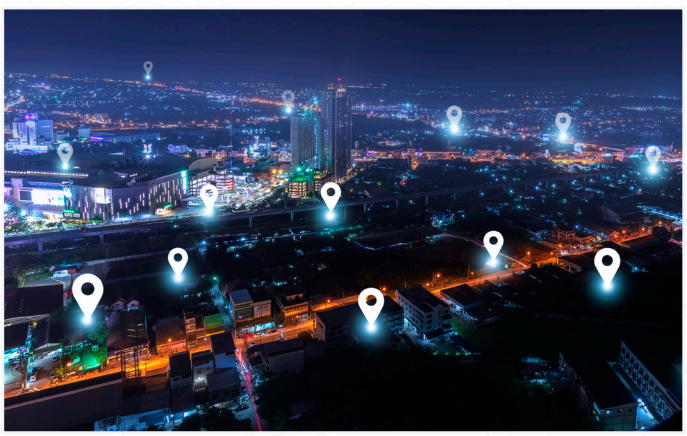


Integrating Experiences and Actions

GIS delivers geographic experiences to data-driven decision-making, immersing the audience and enabling collaboration and communication. It is profoundly reshaping human actions and experiences by bringing the power of location intelligence into daily decision-making at both individual and collective levels. By integrating diverse data sources—environmental, demographic, behavioral, and infrastructural—into dynamic spatial models, GIS enables people to better understand the world around them and make more informed choices.

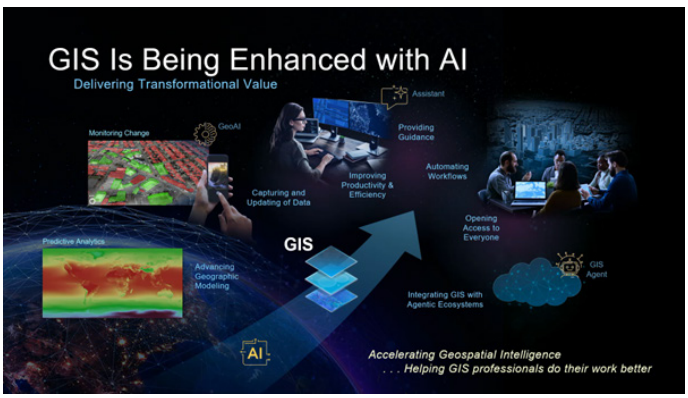
For individuals, GIS applications like navigation systems, fitness trackers, and location-based services enhance daily experiences by optimizing routes, suggesting destinations, or monitoring personal activities in real time. On a larger scale, city planners use GIS to design smarter, more livable urban environments by analyzing traffic patterns, public services, green spaces, and social demographics, thereby directly influencing how people live, move, and interact within their communities.

In fields like disaster response, public health, and climate adaptation, GIS allows decision-makers to proactively manage risks, allocate resources more efficiently, and protect vulnerable populations, ultimately saving lives and minimizing disruption. Furthermore, by visualizing how actions in one place impact distant or marginalized communities—such as the downstream effects of deforestation, urban sprawl, or pollution—GIS fosters greater social responsibility and collective awareness. In essence, GIS is not just a technology for analyzing spatial data; it is a powerful tool that connects people to place, aligns actions with consequences, and helps shape more resilient, equitable, and sustainable experiences for societies at large.



Integrating Analytics

GIS integrates analytics by combining spatial data with advanced analytical tools to derive actionable insights from complex datasets. At its core, GIS allows users to visualize relationships, patterns, and trends that are inherently geographical, but its true power lies in integrating multiple analytical methods—spatial, statistical, temporal, and predictive—within a unified platform. Through spatial analysis, GIS can calculate distances, identify optimal locations, assess suitability, and model spatial interactions between features such as population density, land use, and infrastructure networks.



Integrating GIS and AI

The integration of Geographic Information Systems (GIS) and Artificial Intelligence (AI) is revolutionizing the way we understand, analyze, and act upon spatial data. By combining the spatial processing power of GIS with the predictive and learning capabilities of AI, we can unlock deeper insights from geospatial datasets—ranging from satellite imagery and sensor data to demographic patterns and infrastructure networks. AI-driven algorithms can automate feature extraction, detect anomalies, predict future trends, and optimize decision-making processes across domains such as urban planning, agriculture, disaster response, and environmental management. This synergy not only enhances the accuracy and efficiency of spatial analysis but also enables real-time, intelligent geospatial solutions that were previously unattainable. As this integration advances, it paves the way for smarter cities, more resilient ecosystems, and data-driven governance.

When fused with real-time data streams, GIS supports dynamic monitoring and predictive analytics, enabling organizationsand forecast future trends with high accuracy.

The platform's interoperability with statistical tools like R and Python further extends its analytical depth, allowing complex models to be directly integrated into spatial workflows. By converging location intelligence with advanced analytics, ArcGIS empowers organizations to make data-driven, location-based decisions that drive operational efficiency, strategic planning, and sustainable development.

ArcGIS integrates analytics by embedding powerful spatial, statistical, and predictive tools within a single comprehensive platform. It allows users to analyze complex geospatial data, uncover patterns, and visualize relationships that are not apparent in traditional tabular datasets. Through its extensive suite of spatial analysis tools—such as proximity analysis, network analysis, suitability modeling, and hotspot detection—ArcGIS enables users to perform in-depth assessments across diverse sectors.

Optimizing the Revenue Potential of West Bengal's Excise Department using ArcGIS Business Analyst

ArcGIS Business Analyst is a unique solution that has the potential to greatly enhance the efficacy of government departments by offering precise insights into spatial and demographic factors. Using the solution, government agencies can make data-driven decisions, optimize resource distribution, and customize efforts to achieve more effective outcomes in public safety, economic development, community assessments, city development, and more. They can make a greater impact on the lives of the citizens using the available data as the developmental efforts become more targeted and reach the maximum number of beneficiaries.

Using Business Analyst, the need for users to collect, clean, and verify data is eliminated as Esri, in collaboration with MBR (Michael Bauer Research), provides the latest datasets built into the software. Important parameters such as age-sex distribution, consumer segmentation, spending habits, purchasing power, etc., are available for the user to browse and add to their workflow as required. In the solution, the analysis extent can be set to 8 different geography levels: States, Districts, Parliamentary Constituencies, Subdistricts, Assembly Constituencies, Pincode, Villages & Wards. Business Analyst also provides location data for a wide range of POIs – hospitals, police stations, ATMs, petrol stations, as well as a variety of businesses such as restaurants, malls, etc. The simple task-based structure within the BA toolbox gives users a step-by-step methodology for creating a suitability map while also allowing the flexibility to add, remove, change, and reset weightages of parameters dynamically.

The GIS-based solution, powered by ArcGIS Business Analyst, offers a robust approach to optimizing the revenue potential of West Bengal's Excise Department. By integrating demographic, economic, and various spatial data, the proposed workflows address key challenges and opportunities in Spirits revenue management. Spirit revenue management for the excise department involves overseeing the collection of taxes and duties on alcoholic beverages, specifically spirits, in a way that ensures compliance, minimizes fraud, and maximizes revenue generation. It requires accurate tracking of production, distribution, and sales through systems that monitor and enforce legal standards.

The GIS-based solution enables the Excise Department to overcome the following challenges:

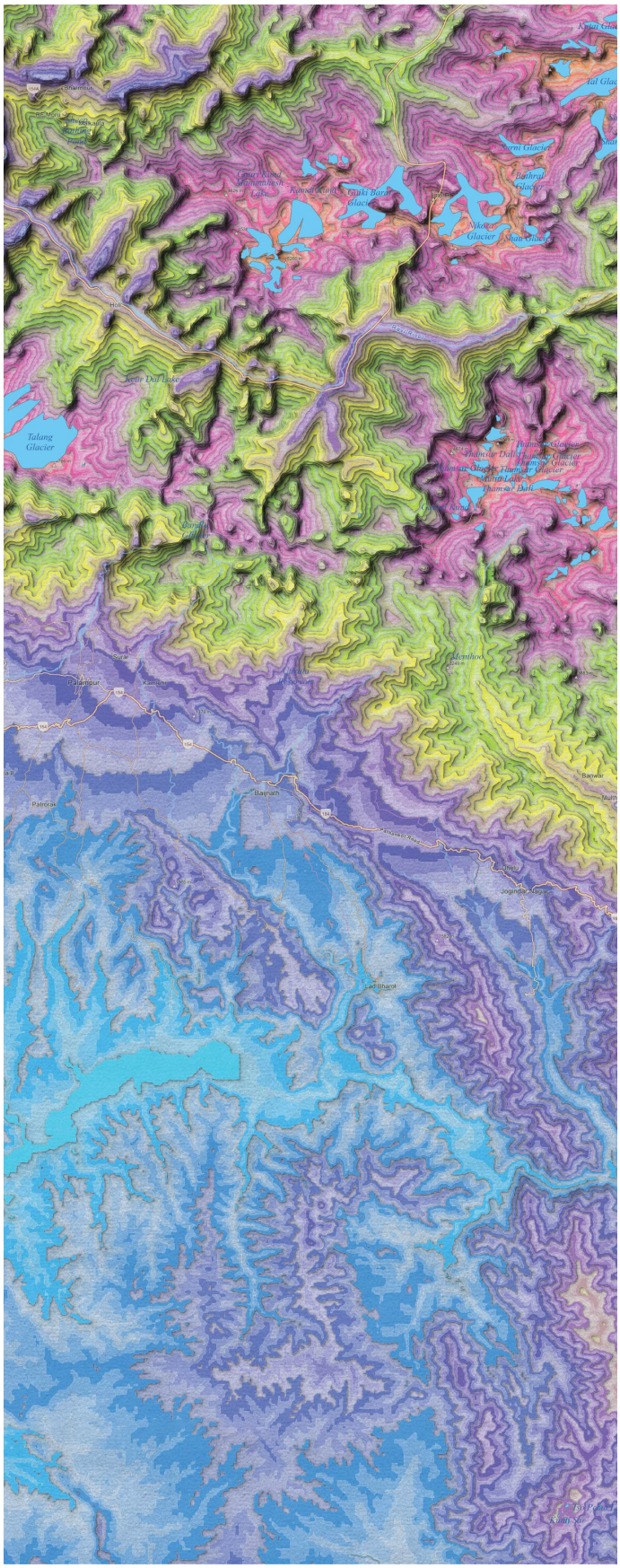
- Data acquisition for the latest demographics, spending patterns, and location of POIs.
- Verification of data for accuracy.
- Identification of suitable locations for new businesses.

Conclusion: From Integration to Transformation

In a world where cities are becoming smarter, industries are becoming more digital, and ecosystems are more threatened, the need for integrated, location-aware decision-making has reached a critical juncture. GIS is emerging as the keystone technology in this transformation. It is enabling organizations to visualize complexity, align cross-sectoral goals, and make informed, spatially contextualized decisions.

GIS connects data, disciplines, devices, and people. It allows city planners to simulate urban development, climate scientists to monitor environmental change, epidemiologists to track disease spread, and businesses to optimize customer engagement—all within the same spatial framework. GIS does not just integrate systems; it integrates understanding. GIS is used to connect various aspects of our world, from personal devices to large-scale infrastructure, creating a seamless and interconnected experience. By getting seamlessly integrated with other technologies like IoT, AI, and machine learning, GIS unlocks new possibilities for problem-solving and decision-making. Real-time sensor data, predictive analytics, and automated insights are turning static maps into dynamic decision platforms. This convergence is enabling smarter energy grids, precision agriculture, early-warning systems, and responsive public services—directly improving quality of life and ensuring sustainability.

At its core, GIS connects people, processes, and places. It democratizes access to information, fosters collaboration across disciplines, and promotes transparency and accountability in governance. In doing so, GIS is not just solving problems—it is empowering communities. By integrating everything, everywhere, GIS is seamlessly bridging gaps across data, disciplines, and decisions to build a smarter, more sustainable world for everyone.



Jio Achieves Excellence in AirFiber Deployment across India with ArcGIS

Client
Reliance Jio

Industry
Telecommunications

Organization Profile
Jio was launched in 2016 to empower every Indian with affordable access to a digital life—a gateway to the world—enabled with the world's best digital technologies. Today, Jio has not only ushered in a digital revolution across India, in how Indians connect to the world, but also in how India will go on to shape the digital future. With Over 470 + Million wireless subscribers, Jio became the world's number one telecom operator by data consumption in April 2024. Today, Jio is the largest operator in India and the 2nd largest single-country operator in the world, offering services such as connectivity, fibre, mobile devices, apps, and business solutions. There is a rapid roll-out of 5G services in every nook and corner of the country with roaming services in 150+countries.

Website
www.jio.com

Project Summary

As India raced into the digital future, Jio introduced a groundbreaking service: Jio AirFiber. Designed to deliver gigabit-speed broadband over the air using 5G and unlicensed band radio (UBR) frequencies, AirFiber doesn't require traditional fiber lines to the home. Instead, it uses rooftop or in-building equipment to receive wireless signals directly from nearby towers. The result is an internet service that is fast to deploy, easier to install, and perfectly suited for dense urban areas or hard-to-reach regions where traditional fiber buildouts would be costly or slow. But deploying a service like this at a national scale—within months—demanded reimagining how telecom networks are planned, activated, and optimized. That's where GIS stepped in.

Challenges

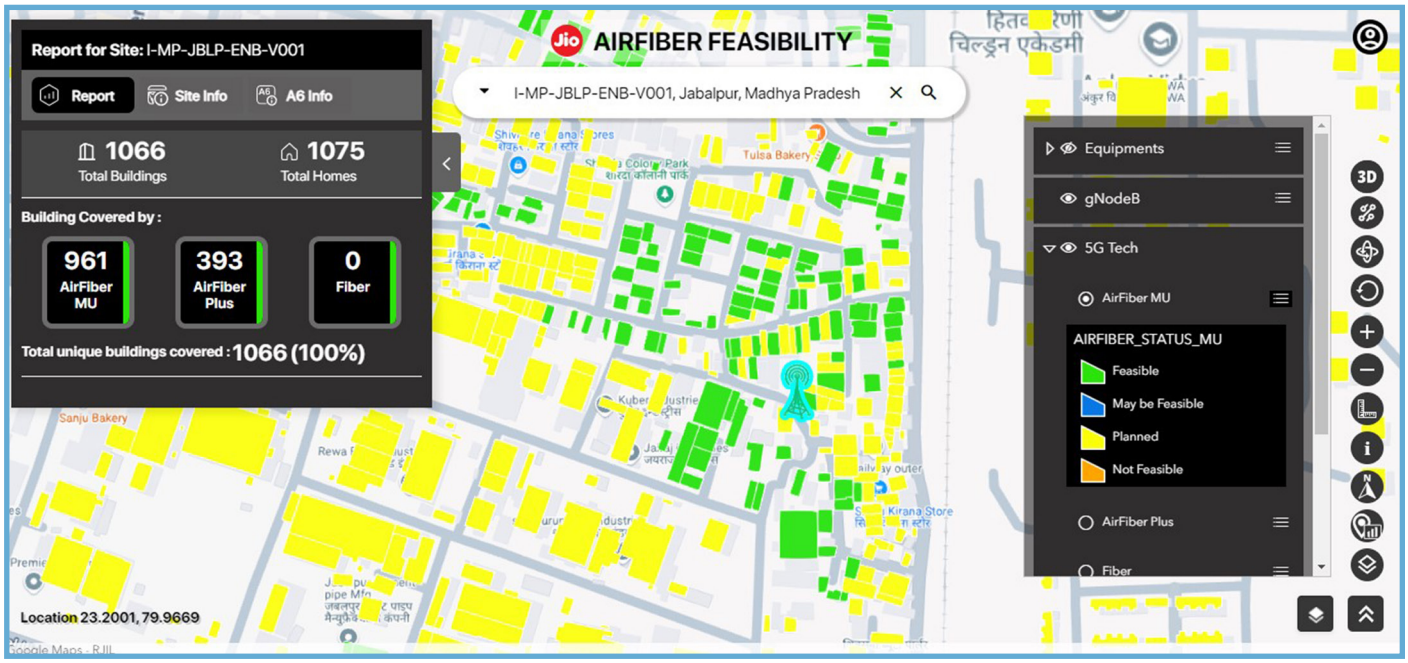
Jio's goal was to offer Fixed Wireless Access (FWA) based high-speed broadband across India in the shortest time possible. But to achieve this incredible goal, their team needed to overcome a unique combination of scale and precision. India spans over 3.28 million square kilometers and includes some of the world's most varied terrain—from high-rise apartment clusters in Mumbai to dense forests, rivers, and rural villages. The UBR based AirFiber solution required precise line-of-sight (LoS) between tower equipment and customer premises, meaning Jio couldn't rely solely on traditional RF coverage models and fiber buildouts. Instead, the company needed to build a comprehensive geospatial system to determine signal feasibility down to the individual apartment floor across tens of millions of buildings.

Adding to the complexity, the AirFiber deployment had to happen in under 12 months. With phased tower activations, leveraging both 5G and UBR technologies, the deployment required real-time prioritization based on customer demand, terrain and built environment interference, and signal strength. Traditional systems were not designed to operate at this data volume or spatial complexity. Jio needed a solution that could support billions of spatial calculations, model 3D signal pathways, integrate with their existing OSS/BSS landscape, and ultimately drive real-time business decisions for marketing, sales, and service delivery.

The Solution

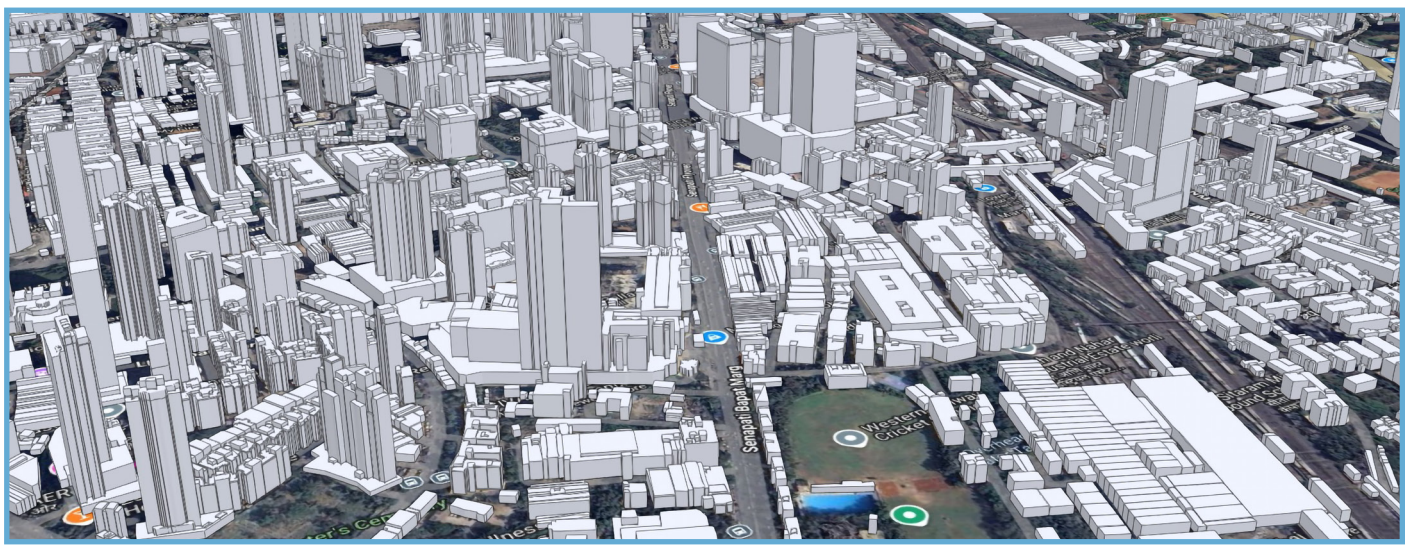
Jio turned to geospatial technology to power every stage of its AirFiber deployment. At the heart of the effort was a national-scale 3D GIS system built on Esri's ArcGIS platform.

What makes ArcGIS a key foundation in this effort is that it's capable of ingesting massive datasets, delivering spatial analytics, and enabling real-time visualization and decision-making across departments in near real-time.



AirFiber Feasibility Mapping

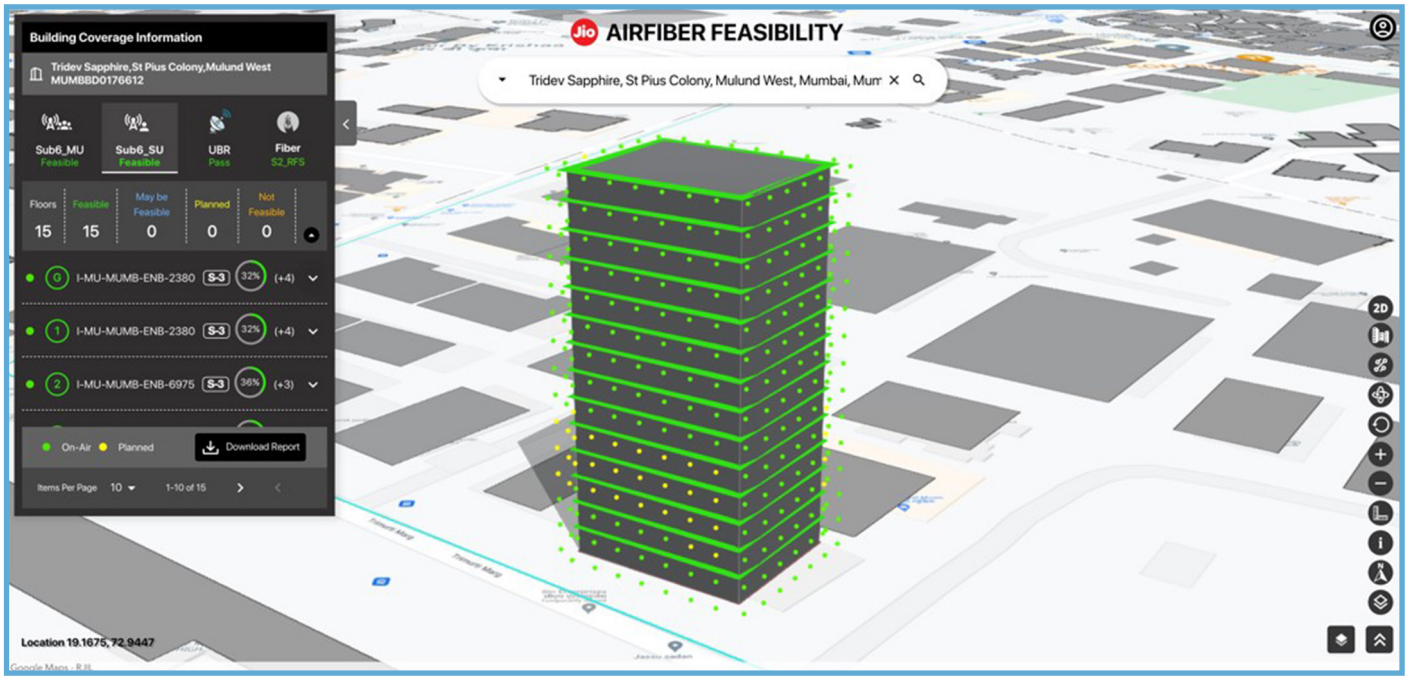
The first step for the team at Jio was creating a foundational 3D building database. Jio mapped over 100 million buildings across India's top 900 cities and towns, achieving 98% accuracy with 1–2 meters of precision. The GIS team then incorporated a rich set of spatial layers, including digital surface models, road networks, vegetation, flyovers, and bridges. Using advanced machine learning algorithms developed by their team in-house, they matched new 3D models to existing 2D data records, estimating the number of residential, commercial, and mixed-use units in each structure.



3D Building Network Database

This building-level intelligence became the cornerstone of Jio's wireless planning. Each structure was further subdivided into 3-meter point meshes to model signal availability at every floor level. This meant every 10-foot by 10-foot section of a building could be evaluated for signal strength and availability, allowing the network team to assess exactly where AirFiber service could be delivered—even before towers were activated.

Next came radio frequency and coverage planning. Jio fed its 3D GIS layers into a third-party RF simulation platform, which used the building geometries, terrain data, and tower locations to produce coverage maps. These maps visually indicated signal strength and quality using color-coded shapes—making it easy to determine which areas had strong signal potential and which needed additional infrastructure. With coverage maps in hand, the business team needed to prioritize tower activations. Not all 300,000+ towers would go live at once, so Jio used spatial analysis to identify which towers could serve the highest number of viable customer buildings. Once the towers were active, the team analyzed billions of mesh points for signal quality and intersected them with building and customer data. The volume of data the team at Jio was using was staggering, with billions of points being processed and then enriched with signal information. To handle this load, Jio leveraged its in-house big data platform alongside ArcGIS Pro, running over 20,000 concurrent licenses under Esri's enterprise agreement. This allowed the company to scale processing capabilities without delay and keep pace with the aggressive rollout timeline. Jio brought the power of GIS to life through a suite of applications that served everyone from network engineers to sales representatives and customer care technicians. Their entire organization was leveraging location-based resources to take on their daily tasks.

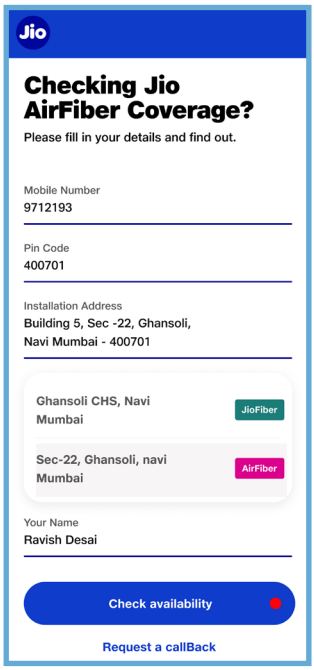


3D Model of AirFiber Feasibility

Their flagship resource was a web-based GIS platform designed for interactive visualization of buildings, towers, and signal coverage. Teams could drill down to individual buildings, floors, and even rooms to see whether a location was serviceable via 5G or UBR. Green and blue indicators made it easy to determine full or partial coverage, helping field teams plan equipment installation and sales teams qualify leads.

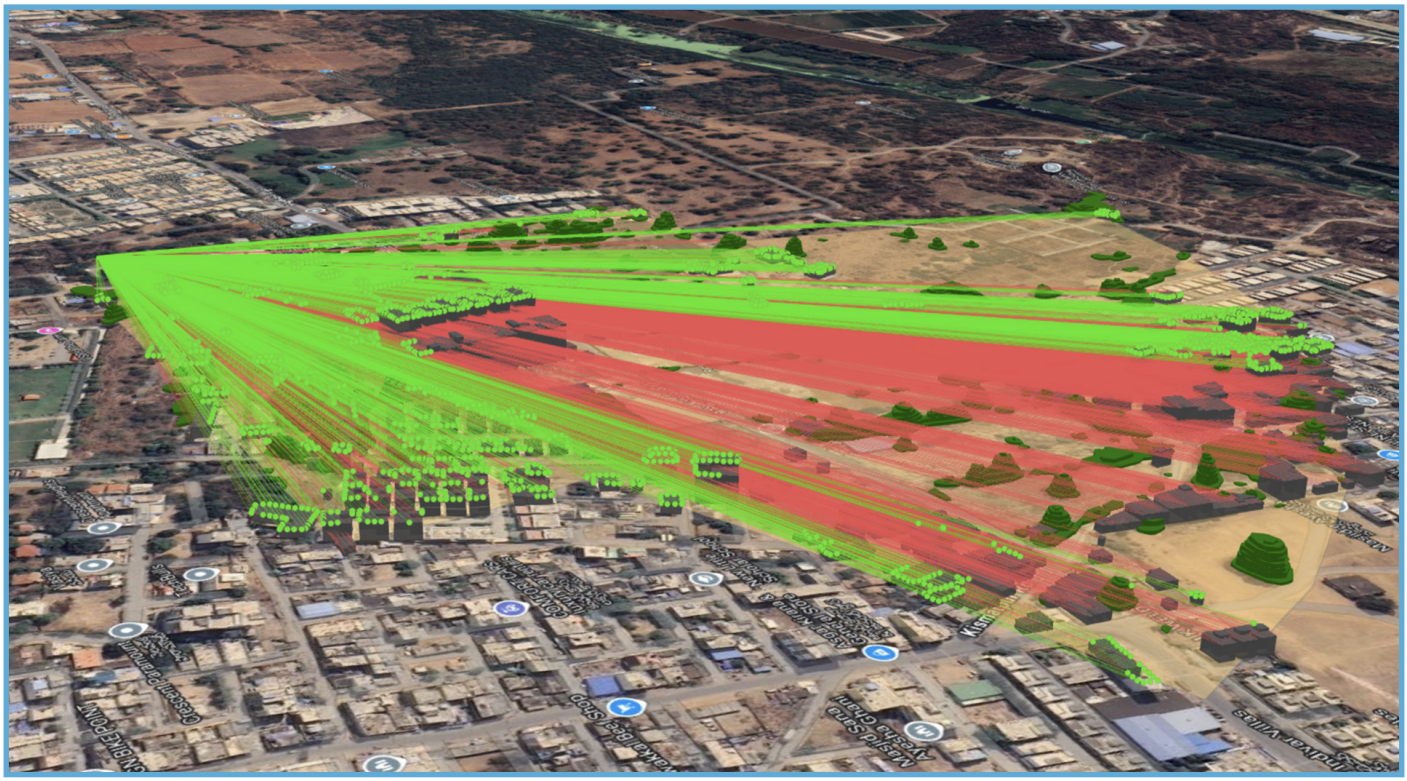
The impact was transformational. GIS enabled same-day installation for AirFiber in many cases, allowing Jio to serve customers immediately after tower activation. A dedicated GIS app for operations helped network operation center teams monitor issues, resolve service requests, and maintain network performance using a single spatial interface centered around location intelligence.

The team at Jio also built mobile apps for point-of-sale systems, allowing sales teams to verify coverage in real time. For instance, if a customer's building wasn't in the system, the app enabled technicians to capture new structure information while on-site—feeding the information back into the GIS for future use. Then, once an order was placed, GIS integrated with Jio's OSS/BSS systems to streamline work order creation, tower inventory lookup, and logical provisioning.



A complete and predictive Line-of-Sight model for UBR deployment

Jio used UBR-based AirFiber, deploying high-power wireless equipment on buildings to create line-of-sight links to surrounding structures. To achieve the planning and design needs, Jio developed a highly customized line of sight (LoS) analysis engine within ArcGIS Pro.



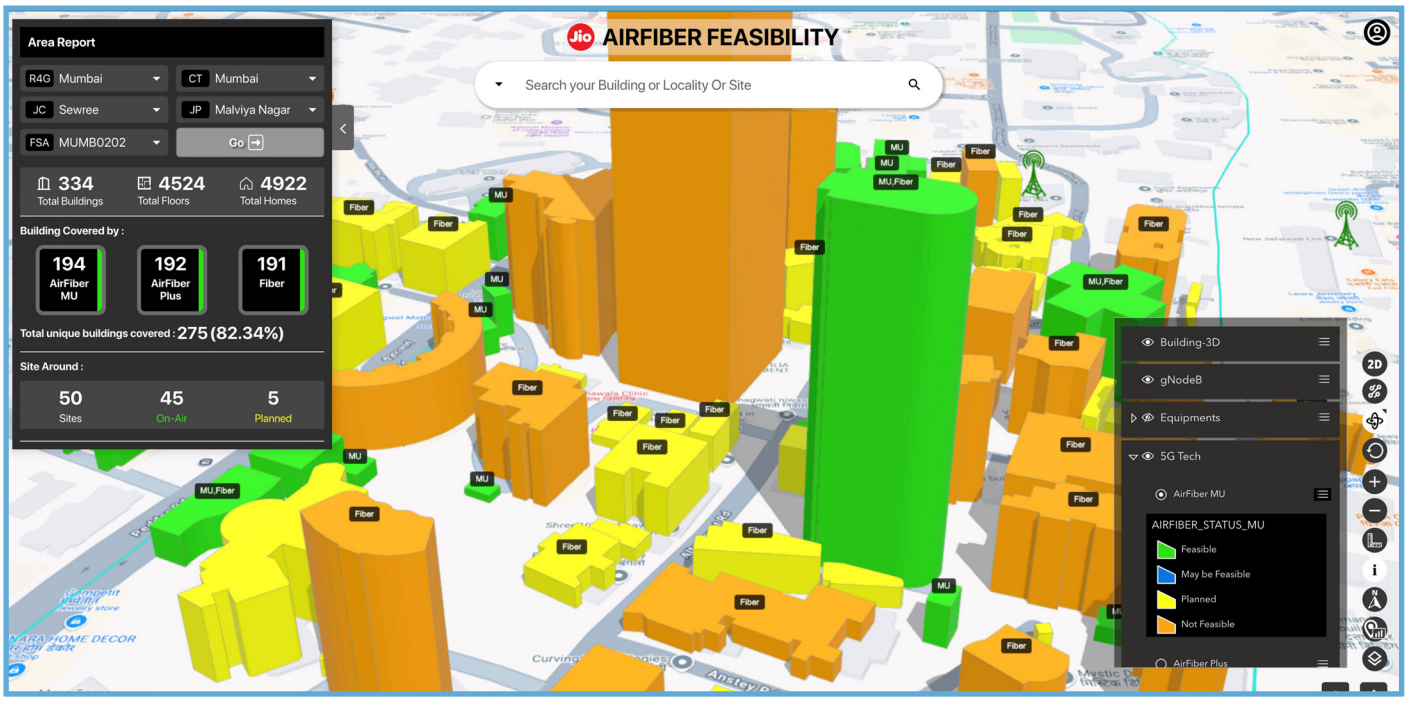
Line of Sight System Modeling

The system evaluated antenna tilt, azimuth, beam width, and customer building heights to determine feasible communication paths. Each floor of a building was modeled with 3-meter horizontal and vertical divisions, and every customer point (CP) was assessed against nearby tower sectors. The process also calculated Fresnel zones and evaluated each CP based on signal clarity and distance.

AirFiber Serviceability Modeling

To meet business requirements, Jio needed to assess nationwide coverage scenarios in under a week. This demanded massive compute power, so the team answered by deploying over 200 high-performance servers—each running 50 to 100 concurrent instances of the Jio LoS model. Jio leveraged ArcGIS Pro licenses at an unprecedented scale. At its peak, the team was consuming more than 20,000 licenses simultaneously—a feat made possible only through Esri's enterprise licensing support.

The result was a complete, and predictive, LoS model for UBR deployment published as a web and mobile application for field verification and service planning alike. Incredibly, **Jio achieved 92% accuracy in its UBR coverage predictions across India's urban centers, dramatically accelerating service rollout and increasing customer satisfaction.**



AirFiber Feasibility 'Go Live' Modeling

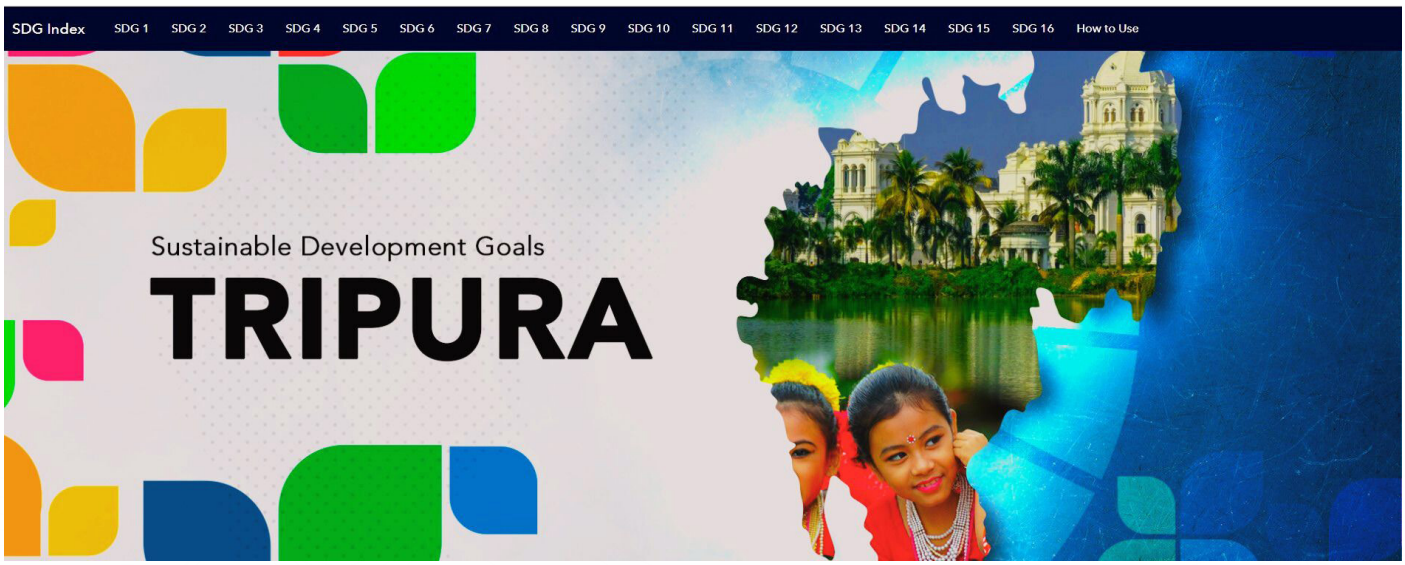
Conclusion

By combining high-resolution geospatial data, custom analytics, and scalable cloud infrastructure, Jio has created a new model for delivering broadband in the 21st century. AirFiber is more than just a wireless product–it's a testament to how location intelligence can transform network economics, customer experience, and digital inclusion.

From data preparation to planning, execution, and maintenance, GIS has been the connective foundation of Jio's AirFiber program. It has unified business units, enabled smarter decisions, and allowed one of the world's most ambitious telecom rollouts to happen on time and at an incredible scale. Looking forward, as Jio continues to evolve its digital platform, GIS will remain at the heart of its strategy–connecting towers to homes, signals to services, and customers to what's important in their lives.

> We at Jio cannot envisage any other system than the one we built at the shortest possible time to support our AirFiber deployment. Super-fast planning and faster deployment helped us disrupt the broadband internet market by positioning AirFiber as a premium and affordable product with same-day installation time. Our continuous investment in GIS data, people, and Esri's technology along with AI and Cloud platforms helped us build these systems in-house at record speed.
>
> **- Dr. Biswaketan Kundu, VP and Headof GIS, Jio Platforms**

Advancing the SDGs: Esri India and Emitech Infosystems Supporting Tripura's Development Vision



The IT vision for Tripura State involves the realization of a new information regime supporting good governance, sustainable development, and citizen empowerment by offering GIS-based decision support services for governance, private enterprise, citizens, and maintaining state-wide, standardized, seamless, and most current GIS-based information for efficient decision support.

Under this vision, the IT Department of Tripura State envisaged implementing a GIS-based web platform that acts as a single window gateway for all geospatial requirements of the State SDG. It brings standardization and convenience to senior executives, department users, other stakeholders, and citizens by providing a simple-to-use, device-independent platform for accessing maps & apps integrated with MIS data and GIS tools for various DSS requirements. The dynamic dashboards, integrated with real-time data from line departments, aid in efficient SDG status monitoring and decision support.

ArcGIS Enterprise-based State SDG GeoHub

Developed by Esri India and Emitech Infosystems collaboratively, the Tripura SDG GeoHub (https://sdg.tripura.gov.in) serves as a centralized platform for monitoring, evaluating, and sharing the state's progress toward achieving the Sustainable Development Goals (SDGs). Designed to promote transparency and foster collaborative governance, the portal enables data-driven decision-making for government departments while empowering citizens with actionable insights into development initiatives.

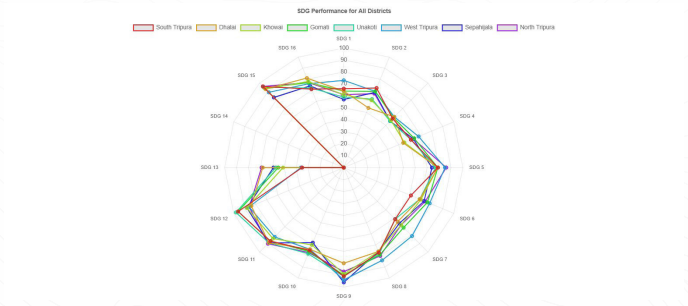
The State SDG GeoHub Enables:

Sharing of open data: Data is vital to decision-making. Whether you are choosing a neighborhood to live in, curious about city projects, or opening a new business, having information you can trust is essential. With GeoHub, organizations can share their authoritative data so that the community can make better decisions.

Better collaboration: GeoHub makes it easy to create teams comprising staff, external community members, or both. You can invite trusted members of the community to collaborate with your organization, which increases the staff's ability to solve problems.

Concrete action: Initiatives can drive engagement by giving community members a goal to rally around as well as a focused way to participate. Presenting information via charts, maps, and stories makes it easier for everyone to have a shared understanding of the goal, which can pave the way to action.

Comparative analysis: The portal allows users to compare the performance of multiple districts or SDG goals. This feature is useful for identifying trends and areas that need focused intervention to improve SDG outcomes.



Using the State SDG GeoHub, the department has been able to:

- Manage & update SDG parameters & geospatial contents.
- Access a set of common basemaps, tools, services, and live feeds.
- Create maps, apps, and dashboards.
- Share maps and apps with others inside or outside the departments for analysis.
- Form groups to collaborate on Sustainable Goals or common activities.

Key Highlights of Tripura State SDG GeoHub

- An authoritative and living GIS portal for all SDG-related information.
- Dashboards with the status of various initiatives, the relevant state data, and integration with program performance and local demographic data.
- Seamless data access, data collection, integration, planning, analysis, and decision support
- Advanced analytics for better planning and decision making.
- Citizen centric GIS enabled apps for data capture.
- Thematic maps and apps that outline the status of SDG impact across various segments.
- Open data portal for SDG-related information to drive inclusive participation by stakeholders, including departments, academia, NGOs, private organizations, and citizens, for awareness, developing apps/ decision making.
- Apps for driving larger awareness about specific SDG goals for the state.

The State SDG GeoHub acts as a single gateway and provides a collaborative platform to facilitate and coordinate the exchange and sharing of geospatial data, services, and apps among different stakeholders.

Conclusion

The Tripura SDG GeoHub is a vital tool for fostering accountability, driving informed policymaking, and engaging citizens in the state's development journey. By leveraging the portal's capabilities, stakeholders can collectively work towards achieving the Sustainable Development Goals in Tripura.

From Forecast to Action: IMD Integrating GIS for Climate Resilience

IMD is primarily tasked with weather forecasting and associated services across multiple sectors, including power, insurance, and transportation. Over time, the demand for highly localized and time-specific weather data has propelled the adoption and evolution of GIS technologies within the department.

Rahul Saxena, Head of the Hydrology Division at the India Meteorological Department (IMD), provides an insightful overview of how Geographic Information Systems (GIS), particularly ArcGIS, have become integral to modern weather forecasting and hydrological services in India.

What is the core mandate of IMD?

The India Meteorological Department is one of the organizations under the Ministry of Earth Sciences. It is the principal government agency for all weather and climate-related services in India. The core mandate of IMD is weather forecasting and all activities related to it. IMD offers services to various sectors, such as power, insurance, and transportation.

How is GIS helping you in weather forecasting?

GIS is inherent to the work that we do on a day-to-day basis. We generate a huge amount of geospatial data, whether it is radar data, satellite data, or model observations. Lately, people have been demanding very location-specific forecasts, and once we say location-specific, it has to be nothing but GIS. Earlier, a very generic type of weather forecasting was given, but now, with the application of GIS, weather forecasting has become very location and time-specific. GIS enables the integration of different weather - related data layers. By analysing this spatial data, meteorologists can identify areas at higher risk of extreme weather events, allowing for targeted early warnings and response plans.

In what ways are you specifically using Esri's technology?

The hydrology division uses both enterprise and desktop versions of Esri's tools. Esri India has developed many applications for us. For instance, our customized Rainfall Information System is based on Esri's technology. As we evolve, we are exploring new capabilities of the technology to achieve more effective outcomes.

How has your experience been working with Esri India?

The working experience has been excellent. The association is almost fifteen years old. I know almost half of Esri India's technical team, and I absolutely love the support that they provide. I can call them anytime; it's not a typical Monday-to-Friday sort of support system. It goes beyond that. We are also happy with the capacity-building support that Esri India provides.

GeoAI - The Nextgen AI Transformative Technology

Geographic Information Systems (GIS) are undergoing rapid transformation with the advent of artificial intelligence (AI), redefining the way geographical data is analyzed and used. GeoAI is the new term coined for 'Geospatial Artificial Intelligence'. The real-world understanding of business possibilities, ecological impacts, and operational hazards can now be enhanced through GeoAI. With the latest pre-trained AI models, GeoAI can analyze complex data, identify hidden patterns, make data-driven predictions, and streamline complex workflows. By extracting rich geospatial data, including imagery, video, point clouds, and text, using advanced spatial algorithms, GeoAI helps create more accurate models, identify patterns, measure changes, and predict future outcomes.

GeoAI is driving innovation across industries, helping businesses tackle challenges and seize opportunities proactively. It is revolutionizing the speed at which we derive insights from complex datasets, enabling us to tackle the planet's most urgent challenges. By uncovering and helping us understand intricate patterns and relationships in ever-growing data, GeoAI empowers organizations to transform raw data into actionable information. With adaptive models that evolve alongside data, organizations are reshaping how they extract value from data.

Latest Trends Shaping GeoAI Landscape

AI-Driven Spatial Analytics: AI-driven insights help GIS software analyze complex systems and vast datasets to deliver insights faster and at unprecedented scale, leading to greater automation capabilities and optimization of resources. Enhanced predictive analytics enables the detection of patterns and anomalies in vast multivariable data, thereby reducing uncertainty, helping spot opportunities, and creating model future scenarios. By enabling automated analytics workflows, it reduces the time and resources needed to unlock deeper insights from data.

Integration with Large Language Models (LLMs): The integration of LLMs in GeoAI is transforming spatial data analysis and applications. LLMs' situational awareness and their capability to perform more nuanced analysis help in quicker decision-making in paradigms like disaster management. The integration of LLMs has also paved the way for autonomous GIS systems, which can automatically collect, analyze, and visualize spatial data without human intervention.

Geospatial Digital Twins: By leveraging AI and machine learning, organizations can create geospatial digital twins, enabling real-time data analysis, simulation, and informed decision-making in applications like urban planning, infrastructure management, and more.

More Data Modalities & Multimodal AI: Combining LLMs with other AI models has led to the creation of multimodal models capable of processing diverse data types, including text, images, trajectory data, knowledge graphs, and geospatial vector data, which capture critical geospatial information. Geospatial Foundation Models for Climate Forecasting: Geospatial foundation models leverage AI and vast datasets to enhance climate forecasting, offering improved accuracy, scalability, and adaptability. These models integrate satellite imagery, historical climate records, and real-time sensor data to predict weather patterns, extreme climate events, and long-term environmental shifts. Flood Simulation is a new tool in ArcGIS. This tool allows users to simulate flood-like scenarios and observe how water would likely flow over space, where the infrastructure is likely to be impacted, and what can be the mitigation measures against this.

Vision-Language Models: Vision-Language Models (VLMs) combine image processing AI with natural language understanding to extract insights from geospatial data. These models interpret satellite images, maps, and aerial photography while incorporating textual metadata, enabling more comprehensive spatial analysis. Key applications include disaster response & damage assessment, automated land use classification, identification of geographic patterns, and more.

Deep Learning Tools for Oriented Imagery 3D Reconstruction and Feature Extraction: Deep learning (DL) has significantly advanced the field of GIS and remote sensing, particularly in areas like 3D reconstruction and feature extraction from oriented imagery. By facilitating more accurate and automatic interpretation of imaging data, the integration of DL models into GIS systems simplifies challenging GIS tasks. For instance, DL techniques have been added to ArcGIS to increase accuracy and efficiency while creating 3D digital twins, using conventional photogrammetry and LiDAR-based approaches. These models make it easier to extract landscape characteristics, building footprints, and other spatial aspects from oriented imagery. Additionally, they can make it easier to extract different aspects from oriented pictures, thus unlocking useful information.

Powering Smarter Decisions with AI-Driven GIS

Governments and companies are exploring the use of GeoAI to automate data collection, classification, and analysis, turning non-spatial and spatial data into insights that can be put to intelligent use.

The Way Forward

GeoAI is rapidly transforming the GIS landscape by enabling automation, efficiency, and more intelligent decision-making across sectors. Its growing adoption will have a significant impact on organizations by improving workflows, ensuring optimal resource allocation, and facilitating data-driven insights to address difficult problems.

ArcGIS Workflow Manager

Orchestrate and Integrate work across ArcGIS

ArcGIS Workflow Manager is a scalable enterprise GIS workflow management system that automates and simplifies performance and manages both GIS and non-GIS work in an organization.

It helps organizations to streamline their workflows, improve data quality, and optimize resource allocation. It reduces cost by improving data quality and accuracy, optimizing resource allocation, and standardizing, centralized, and repeatable workflows across the organization to reduce errors and save time.

What can ArcGIS Workflow Manager do?

ArcGIS Workflow Manager provides step-by-step guidance and tightly integrates Esri's technology to create seamless end-to-end experiences that result in efficient and repeatable workflows.

Automate Workflow: Create a dynamic production system with powerful automation tools to streamline processes such as data ingestion, analysis, and aggregation.

Work in real-time in ArcGIS: ArcGIS Workflow Manager unifies Esri's technology to drive consistent workflows across desktop and web applications. Collaborate and coordinate work across teams, platforms, and locations with synchronized data to drive efficiency improvements. Monitor the status of work in real-time to facilitate informed decision-making.

Increase reliability and accountability: Standardize and centralize data and project information to ensure consistency, accuracy, and quality of data at all stages of a project. Increase process efficiency and transparency to help build accountability and trust between the organization and customers.

Transform the way of work: Capture best practices and configure complex business processes in just a few clicks with a clean, modern user interface. Automate repetitive manual tasks such as data preparation and cleanup to help the workforce stay focused on important tasks. Deliver tools, applications, and data without limitations to get new employees up to speed quickly.

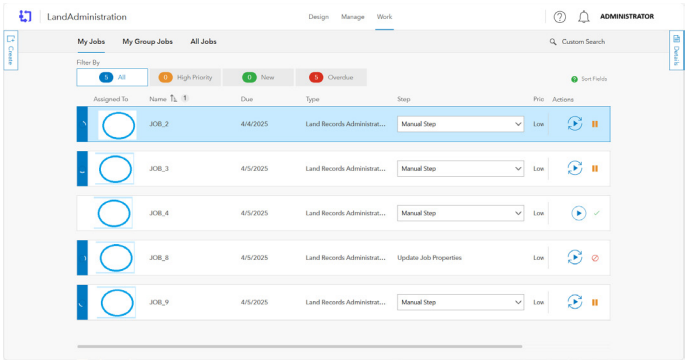
Promote successful communications: The integrated communication tools in ArcGIS Workflow Manager boost productivity and efficiency, reduce downtime, and help cut operational expenses. Track actions in real-time to quickly communicate progress, resource allocation, and status to stakeholders through reports, emails and dashboards.

How ArcGIS Workflow Manager Works?

It enables users to design business processes and task management.

Work

Bring organization's GIS content together in one place so that team members can easily find and carry out their assigned work.

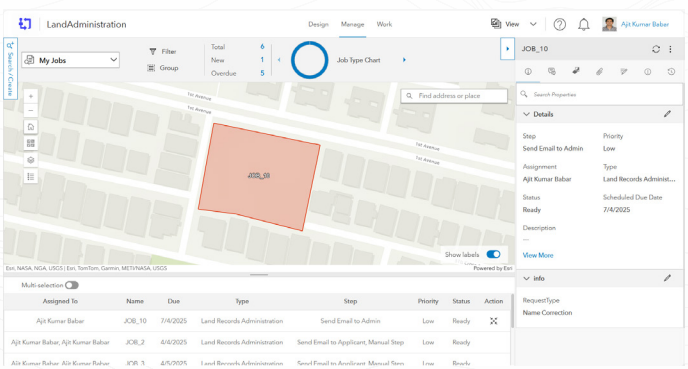


Design

Create standard business processes, automate tasks and reporting, produce shared queries and charts, and manage access to your tools and data.

Manage

Review, summarize, and update organization's in-progress work to make data-driven management decisions and prevent work delays.



Key Features and Benefits of ArcGIS Workflow Manager

Streamlined and automated workflows: Workflow Manager automates and simplifies many aspects of performing and managing work, especially for repeatable processes. It also creates a dynamic production system and powerful automation tools, and streamlines data analysis and integration.

Improved data quality and accuracy: By standardizing workflows and automating tasks, the system helps reduce errors and improve data consistency. It also increases process efficiency and transparency to build accountability and trust between users and the organization.

Optimized resource allocation: Workflow Manager helps organizations efficiently allocate resources by providing tools for managing people, processes, and products. It maintains consistent workflows across different teams and projects.

Enhanced communication: The system facilitates better communication and collaboration among team members by providing a centralized platform for managing workflows and sharing information.

Transform the way to work: It captures best practices and configures business processes in just a few clicks with clean, modern user interface (UI).

Scalability: ArcGIS Workflow Manager is designed to be scalable, accommodating the needs of organizations of varying sizes.

Workflow Manager can be configured to support many types of workflows depending on your organization's needs. The following are examples of some of the many workflows you can create:

- **Web-based, user-driven workflows:** These types of workflows allow users to interact with jobs in the Workflow Manager web app.
- **Desktop-based, user-driven workflows:** These types of workflows allow users with a Workflow Manager extension

license to interact with jobs in ArcGIS Pro.

- **Semiautomated workflows:** These types of workflows complement user-driven workflows and allow you to automate portions of your workflows.

- **Automated workflows:** These types of workflows are available with an ArcGIS Workflow Manager Server Advanced role. This optional role provides improved performance, scalability, and advanced functionality to help you streamline and automate your workflows.

What Can Users Do with ArcGIS Workflow Manager?

- Synchronize information in real time and collaborate with a geographically distributed workforce.

- Manage work in a centralized location, track progress, and analyse history to identify bottlenecks.

- Easily add third-party web apps to the workflow and desktop with no custom code.

- Integrate with ArcGIS Pro to reduce manual repetitive work, such as opening the correct maps and navigating to the work location, and opening the correct ArcGIS Task.

- Automatically managed data versioning on the ArcGIS utility network or ArcGIS Parcel Fabric. Create version, repoint data source in ArcGIS Pro, post updates, and clean up data once the work is complete.

- Send version information to integrate Web Apps and part of the workflow to create a web editing and quality control experience.

- Run geoprocessing services to perform automated actions.

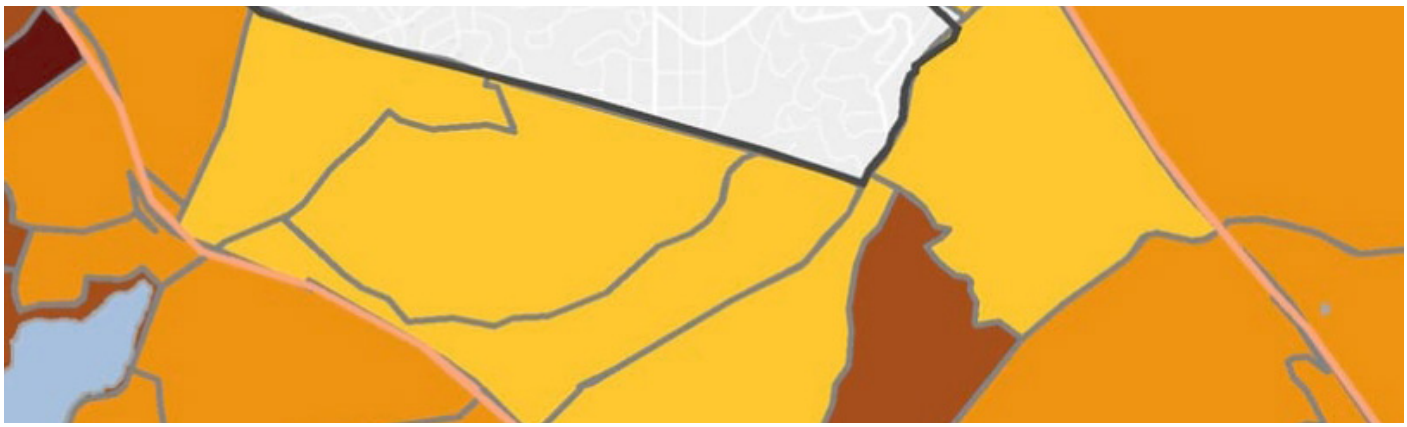
- Schedule data-intensive processes to run after business hours to reduce network load.

- Integrate ArcGIS Survey123 to use survey data within the workflow as an input to geoprocessing tool or an email. Use Webhook to create new work in the workflows manager from Survey123.

- Integrate with ArcGIS Enterprise to bring your maps, data, users, and groups to desktops and workflows.

- Build custom scripts with ArcGIS API for Python as well as apps widgets with the powerful ArcGIS REST API.

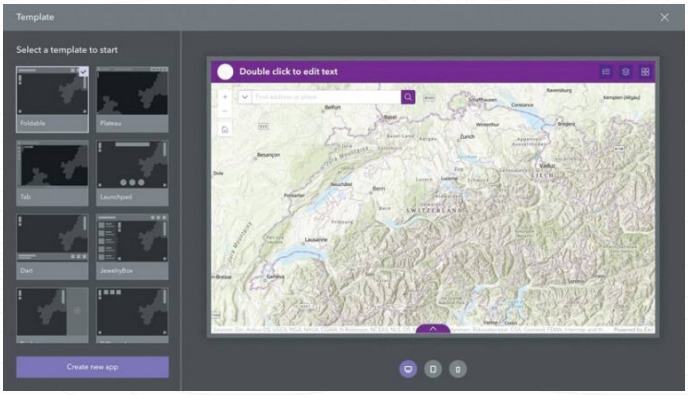
Building Better Apps with ArcGIS Experience Builder and Instant Apps



With the retirement of ArcGIS Web AppBuilder and Configurable Apps coming soon, it's the perfect time to sharpen your skills with ArcGIS Experience Builder and ArcGIS Instant Apps. Here's how to get started and make the most of Esri's modern app creation tools.

Make App Building Simple with Express Mode

ArcGIS Experience Builder now includes an express mode—great for beginners or anyone looking to quickly create a map-focused app. Just select a template and follow a streamlined setup to build an immersive, mobile-optimized experience. This is ideal if you're migrating from Web AppBuilder and want a similar, intuitive workflow.



Express mode in ArcGIS Experience Builder makes the app-building process simple.

Tip: Use express mode for single-map apps that don't require complex navigation or page switching.

Use Widgets to Enhance App Functionality

Widgets are the secret sauce in Experience Builder. Try these newly enhanced tools:

Draw Widget: Now includes text annotations. Add notes directly to your map.

Filter Widget: Supports SQL expressions, so you can create advanced, dynamic filters.

Search Widget: Refine your searches by country or region.

Map Widget: Add a URL parameter to zoom to specific features automatically.

Tip: Combine widgets like Accordion + Search to create compact, user-friendly side panels.

The Draw widget lets users add notes to their maps in Experience Builder.

Visualize Like a Pro with Specialized Widgets

Check out some of the latest additions:

Accordion Widget: Stack widgets and collapse/expand them as needed.

Elevation Profile Widget: View multiple elevation layers and 3D profiles.

Business Analyst Widget: Enable drive-time analysis with real-world travel data.

Near Me Widget: Search and interact with results regardless of layer visibility.

Tip: Use the Elevation Profile widget to analyze terrain impacts in infrastructure or environmental projects.

The Elevation Profile widget in Experience Builder shows multiple elevation layers.

Build Apps in Minutes Using Instant Apps

If you want speed and simplicity, ArcGIS Instant Apps is your tool. Choose from over 20 templates, each optimized for different workflows. No coding needed!

Here are some popular ones:

Manager: Edit map geometry and tabular data.

Reporter: Submit, review, and comment on reports from the public.

Compare: View multiple maps or scenes side-by-side.

Streamflow Viewer: Monitor water flow trends over time using time sliders and interactive graphs.

Observer : Explore 3D data with filters and summaries.

Tip: Use the new language switcher to create multilingual apps for diverse audiences.

The Compare template in ArcGIS Instant Apps allows users to compare multiple maps and scenes.

ArcGIS Pro 3.5 Ushers in a New Era with AI Assistant

Esri has once again raised the bar in the GIS world with the release of ArcGIS Pro 3.5, introducing a powerful and intuitive tool: the AI Assistant (Beta). This integrated assistant, powered by artificial intelligence, is designed to enhance user productivity, simplify complex tasks, and foster a more interactive and efficient GIS experience. This new feature is particularly helpful for both seasoned GIS professionals and beginners, as it enables users to communicate with ArcGIS Pro using natural language.

What is the ArcGIS Pro AI Assistant?

The ArcGIS Pro AI Assistant is a conversational, AI-driven feature embedded directly within the ArcGIS Pro interface. Available as a beta feature in version 3.5, the assistant provides users with contextual guidance, generates code and queries, and even executes specific actions based on user instructions. Whether you're navigating help documentation, working with SQL or openCypher queries, or performing visual or analytical tasks, the assistant is your on-demand GIS companion.

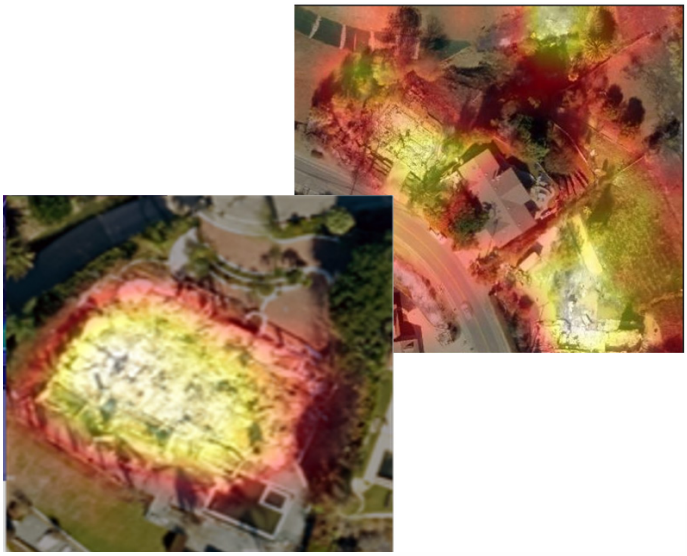
Key Functionalities

The assistant introduces four major functional capabilities:

1. **Help:** Users can ask questions related to ArcGIS Pro's features and receive relevant, concise answers sourced from Esri's official help documentation. This streamlines the learning curve and minimizes time spent searching through manuals or forums. The assistant understands natural language, so users don't need to know the exact terminology.

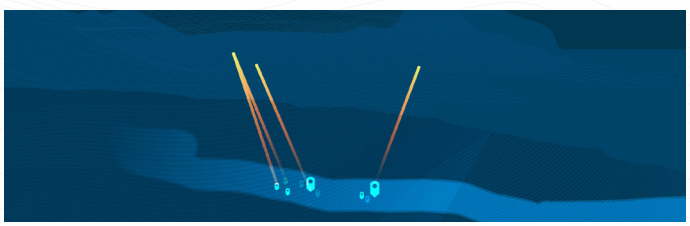
2. **Graph Query:** This feature allows users to generate openCypher queries by simply asking questions about a knowledge graph. Once a graph is selected, the assistant

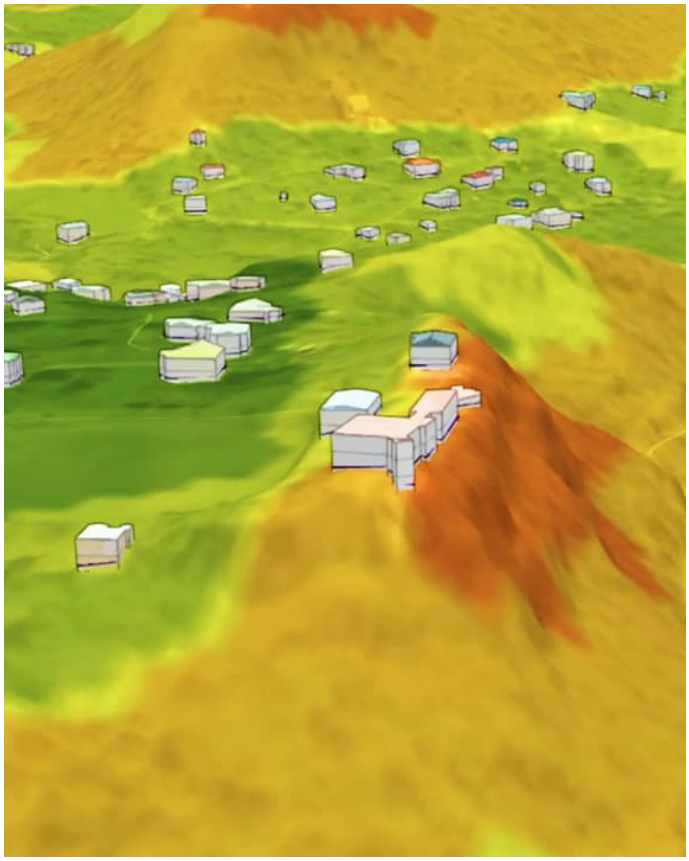
interprets the user's natural language question and returns a relevant query. It even provides an explanation of how the query was formed, making it easier for users to learn and verify the logic behind the scenes.



3. **Query Layer:** Users working with enterprise geodatabases can utilize this feature to create query layers. The assistant uses database connections and table schemas to generate SQL queries based on natural language prompts. It allows users to add these queries directly to maps and even modify them later using an editing interface. This eliminates the need to manually write SQL code for common tasks, saving time and reducing errors.

4. **Perform Actions:** Perhaps the most exciting feature, the assistant can now perform direct actions in ArcGIS Pro. This includes tasks like styling layers using graduated colors, modifying layer properties, opening geoprocessing tools with pre-filled parameters, managing datasets, or even interacting with ModelBuilder. Users can now simply type commands like "zoom to cities layer" or "symbolize the population layer," and the assistant will take care of the rest.





Getting Started with the AI Assistant

To begin using the AI Assistant, users must ensure that ArcGIS Pro 3.5 is installed with the necessary AI features enabled–specifically, Semantic Search and Tool Suggestions. The assistant itself is available as a separate download from Esri's Early Adopter site. Once installed, users can access it from the Help tab in ArcGIS Pro under the Assistant group.

Managing Conversations

Each interaction with the AI Assistant is stored locally and is accessible across sessions and projects. The conversation history is searchable and editable, allowing users to rename or delete threads for better organization. This persistence helps maintain context and improves continuity, especially during multi-step workflows or ongoing projects.

Feedback and Continuous Improvement

Esri encourages users to provide feedback on the assistant's responses. Every answer can be rated as helpful or not, with

the option to add comments. This feedback loop is vital for the iterative improvement of the assistant, ensuring that future updates better address user needs and expectations.

Why This Matters

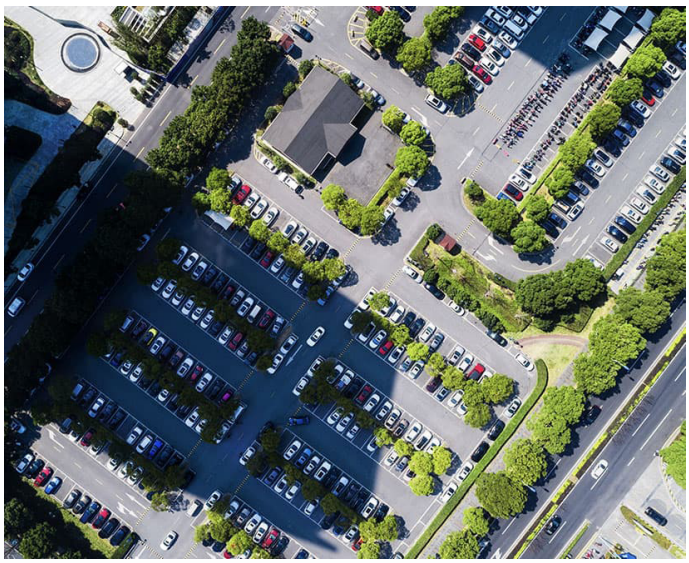
The ArcGIS Pro AI Assistant represents a significant step toward democratizing GIS. By allowing users to interact with the platform in everyday language, Esri is making advanced GIS capabilities more accessible. It reduces the time required to learn the software, eliminates common frustrations in query building, and boosts productivity by automating repetitive tasks.

Moreover, the assistant serves as a great tool for training and onboarding new team members, helping them understand workflows and concepts without needing to consult external resources constantly. For experienced users, it provides an efficiency boost, enabling faster project completion and better utilization of ArcGIS Pro's capabilities.

Limitations and Future Prospects

Currently, the assistant supports a limited set of features and actions, as it's still in beta. However, Esri has outlined plans to expand its capabilities in upcoming versions. This includes broader support for geoprocessing tools, smarter conversation handling, and deeper integration with ArcGIS Online and Enterprise.

The assistant currently cannot access or respond using content from blogs, community forums, or technical support articles. However, within its supported domain, ArcGIS Pro's own documentation and functionality—it performs remarkably well.



Conclusion

The AI Assistant in ArcGIS Pro 3.5 marks a transformative moment in GIS software evolution. It bridges the gap between technical GIS expertise and intuitive user interaction. Whether you're analyzing spatial data, creating knowledge graphs, or exploring new workflows, the assistant stands ready to help you get the job done faster and smarter.

As GIS continues to grow in importance across industries, tools like this assistant will play a crucial role in making geospatial technology more inclusive and user-friendly. Now is the time to explore the potential of this groundbreaking feature and see how it can revolutionize your day-to-day GIS work.

Stay tuned for more updates and enhancements in future releases!

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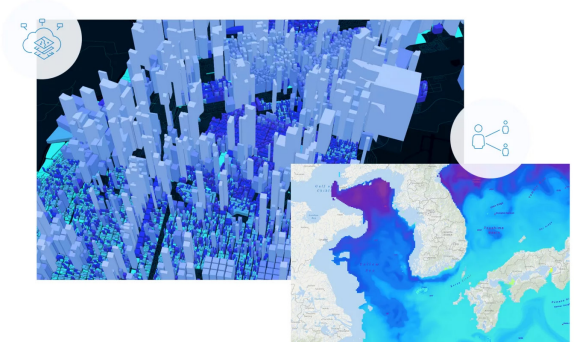

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IIT Tirupati: Developing a New Generation of GIS Professionals

In a compelling conversation with **Prof. K. N. Satyanarayana, Director of IIT Tirupati,** we explored how the institute is reimagining GIS education to meet the evolving demands of the geospatial industry. With a strong emphasis on integrating foundational knowledge with cutting-edge technologies such as AI, digital twins, and GNSS, IIT Tirupati is nurturing a new generation of GIS professionals. As Prof. Satyanarayana shares insights into the institute's interdisciplinary approach, industry collaborations—including with Esri India—and visionary initiatives like the Geo-Intel Lab and TIH, it becomes clear that IIT Tirupati is setting new benchmarks in applied geospatial learning and innovation.

How has the GIS/Geospatial curriculum at IIT Tirupati evolved to reflect the dynamic nature of geospatial technologies and their real-world applications?

At IIT Tirupati, the GIS and geospatial curriculum has evolved to include not just foundational theories but also emerging technologies like AI, remote sensing, digital twins, and GNSS. Through our Technology Innovation Hub (TIH) on Positioning and Precision Technologies, we ensure our curriculum aligns with national priorities and global trends.

In what ways does your teaching approach combine theoretical grounding with practical, problem-solving skills that are essential for future GIS leaders?

Our teaching integrates strong theoretical underpinnings with hands-on problem-solving. Students engage in real-world projects, hackathons, and system-level modelling through TIH-led initiatives, equipping them to become future GIS leaders with both depth and application-driven skills. **A key enabler of this approach is the Geospatial Intelligence and Applications Laboratory (Geo-Intel Lab),** which serves as a live learning environment where students work with real geospatial datasets, develop solutions for digital governance, and contribute to ongoing research and innovation projects. This combination of classroom learning and lab-based application ensures that students graduate not only with technical knowledge, but with the problem-solving mindset required to lead in the evolving GIS landscape.

How does collaboration with industry partners like Esri India enable students to have more applied learning opportunities in GIS?

Partnerships with industry leaders like Esri India have enabled access to advanced geospatial tools, internships, and real-world datasets. This fosters applied learning and gives our students exposure to industry-grade challenges and solutions, enhancing their employability and innovation potential.

What role do you think GIS can play in advancing social and environmental justice, and how do you incorporate this into your teaching?

We view GIS as a transformative tool for equitable resource distribution, disaster management, and climate resilience. Our teaching encourages students to address societal challenges by incorporating real-world case studies and projects focused on sustainable development and governance.

What is your long-term vision for GIS education?

Our vision is to make IIT Tirupati a national leader in geospatial education and innovation, leveraging the TIH as a platform to integrate academia, industry, and governance. Through initiatives like Vidya GIS, we aim to cultivate spatial thinking from the school level to advanced professional training, creating a continuous learning pipeline. The Geo-Intel Lab at TIH, IIT Tirupati serves as the nucleus for applied geospatial research and capacity building, supporting hands-on learning, interdisciplinary collaboration, and technology translation. We aim to develop a new generation of GIS professionals equipped to drive impactful, data-driven solutions across sectors.

How can academic institutions stay ahead of technological and industry developments to ensure they are preparing a workforce equipped for the demands of the future?

Through continuous engagement with industry, R&D, and innovation programs under TIH, we keep our curriculum agile. Regular updates, advisory inputs, and co-development of content with industry partners ensure our students are future-ready.

What advice would you give to students who aspire to become thought leaders in the geospatial field?

Stay curious, embrace interdisciplinary learning, and engage deeply with real-world problems. Leverage platforms like TIH to innovate, collaborate, and contribute meaningfully to the geospatial domain. The Geospatial Policy 2022 provides a tremendous opportunity to unleash the potential of building accurate and robust geospatial models and applications across diverse sectors.

At IIT Tirupati, TIH offers a unique ecosystem for students to nurture such growth. Through dedicated initiatives like the Geo-Intel Lab, students are empowered to build geospatial applications that address critical needs in digital governance, infrastructure, and public good. In parallel, TIH is also establishing a network of Positioning, Navigation, and Timing (PNT) Labs across the country—enabling hands-on exposure to cutting-edge geospatial technologies including NavIC, GNSS, and precision tracking.

These labs are not just spaces—they are launchpads. By engaging deeply with these platforms, students can transform ideas into impactful solutions and shape the future of geospatial science and technology in India.

> “Partnerships with industry leaders like Esri India have enabled access to advanced geospatial tools, internships, and real-world datasets. This fosters applied learning and gives our students exposure to industry-grade challenges and solutions, enhancing their employability and innovation potential.”

Nature-based Solutions for the Unaltered Ecosystems: Addressing Vacant Lands as a Typological Study in Ahmedabad through GIS Methods

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Abstract

Nature-based solutions (NBS) are increasingly recognized in the 21st century by promoting ecological resilience amidst climate change. Unlike traditional engineered infrastructure, which often neglects ecological services, NBS offer co-benefits by integrating natural ecosystems into urban planning strategies. In a semi-arid climate, Ahmedabad, India, faces challenges exacerbated by rapid urbanization, leading to increased heat stress and compromised environmental quality. To address these issues, this research leverages GIS methodology to identify and prioritize vacant lands as a typology to implement NBS, thereby enhancing ecological functions within the city.

The study utilizes GIS to analyze spatial data, focusing on vacant lands that have deteriorated from vital open spaces to stressed environments with reduced water retention capacity and increased runoff during monsoons. By overlaying high-resolution satellite imagery (LISS-IV band set of 5.8m grid resolution) with flood point datasets and contour maps, the research employs supervised image classification to categorize land use classifications. The processing through GIS facilitates the identification of critical vacant lands in the city through a graded grid-rank by a 1km x 1km scale fishnet for statistical raster calculations.

The analysis identifies priority areas where NBS interventions can be most effective for proposing a matrix of solutions catering to different levels of vacant land stress. In conclusion, the research underscores the relevance of NBS as a pivotal strategy for mitigating urban environmental challenges by using applicable GIS methods to identify, rank, and analyze city-level conditions relevant to vacant lands as a typology.

Introduction

In the 21st century of modern growth, globally cities and societies are facing climatic challenges that are leading to precipitous changes or in some cases, irreversible environmental changes (Brears, 2020). Globally, cities are expanding at exponential rates over the past few decades. Higher population prefers living in urban areas because the metropolis is a crucial center of markets and development opportunities. On the parallel, excessive water withdrawal, loss of vegetation and tree cover, and pollution are a few to name that are results of rapid urbanization on the climate. The need to expand and occupy land for human interventions has altered the terrain, its natural positioning of functions, and related ecology.

Contextualizing the case of urbanization and climatic extremities, Indian cities have always been a result of landscape expansions that have not prioritized ecological settings within neighborhoods through planning. In specific, Ahmedabad in western India falls under the hot-semi-arid climatic zone. The city experiences hot and humid weather with scorching summers exceeding 40°C while winters are mild and dry. A recent study conducted at CEPT reveals that people of Ahmedabad experience heat almost 331 days out of the entire year (Shastri, 2023). The city holds a population of about 8 million within 190 square kilometers of the area under the Ahmedabad Municipal Corporation (AMC) limits. The city's built-up area has increased to about 72% from merely 81.68sqkm in 2005. While the city has been expanding at higher rates in the peripheries, several attempts to include environmental developments have been carried out in master plans, one such example being the green belt. However, these did not respond to the market trends and ownership compliances, and proposals have not been fruitful in the development schemes, eventually ending up as highways instead.

In specifics to tree cover and vegetation, there has been a tremendous drop in the tree cover, to only 24%. Concerning public green spaces, AMC maintains about 200 parks, although comprising to regular maintenance in only 4.09% of the sum. Such parks and open spaces, mostly follow a standard design, predominantly being ornamental or manicured landscapes. Looking at vacant lands of the city, these have become spaces that hold public activities like play spaces, large gatherings, and festivities, however have been degrading due to excessive dumping, poor maintenance, and surrounding environmental concerns.

Especially in the context of a semi-arid zone where water is seen as a prized possession, the need to tap into the topographical setting is a prime goal to revive ecological functions on the land. Concerning this concept, open spaces in the city are considered sponges that are of prime importance to soak in water, restore ecological balances, and contribute to regulating the overall urban climate within the city.

Thematic Concern

While the research acknowledges the consideration of vacant public lands in the city, there is a broader spectrum of such classification through the identified set of enquiries. In particular, water is the prime consideration in the context of a city's position in a semi-arid zone to begin with. It underscores a plethora of associated issues in the city with urban flooding, poor water management, resource destruction/pollution, surface drain off, etc. To narrow down further, the study primarily falls under the altered-unaltered spaces in the city by considering 'water' as the thematic concern.

Unaltered landscapes are spaces within the natural environments that have not been highly modified and remain untouched by any developments on the land. This means that there could be a degree of change due to several causes by anthropogenic actions, the surrounding change in development leading to natural changes in the landform, however, not including built-level modifications. Such spaces are identified as prime areas within the city as they hold high potential to serve as lungs for catastrophic changes in the surrounding landscapes over the years. They are essential as they are responsible for public activities and other happenings.

Unfortunately, there has been no development on integrating ecosystem values within these spaces, which has perhaps worsened the situation due to changes in the landform, water flow, surrounding neighborhood developments, and waste disposal. Especially in the context of a semi-arid region, contrary to the belief of viewing water as a mere demand-supply resource, there is only a handful of research on NBS that relates to the concept of wetness, the need to capture water, and surface-level landscape interventions to cater to the application within natural ecologies.

A value greater than 1 in the NCI indicates an increase in backscatter values following the flood, suggesting a potential change in surface properties or conditions due to inundation. Conversely, a value less than 1 signifies a decrease in backscatter intensity, and 1 signifies that there has been no change in the Pixel Values.

NBS Role and Relevance

Societal challenges such as climate change, rapid urbanization, and increased demand for resources can lead to significant environmental changes with adverse impacts on human development. One approach to tackle these challenges is through engineering solutions, which aim for simplicity, replicability, and predictable outcomes, like large-scale physico-chemical bio-filtration processes. An alternative approach involves Nature-Based Solutions (NBS), utilizing ecosystems and their services to address challenges sustainably. NBS entail applying knowledge about nature to solve environmental, social, and economic challenges effectively while benefiting human well-being and biodiversity.

NBS enhance or restore ecosystem services, which are the benefits people derive from natural ecosystems, including provisioning, regulating, cultural, and supporting services. Unlike traditional biodiversity conservation, NBS integrate sustainable solutions that respond to environmental changes while considering societal factors such as poverty alleviation and governance principles.

According to the European Commission, NBS can transform environmental and societal challenges into innovative opportunities, contributing to climate change mitigation, ecosystem restoration, urban development, disaster risk management, and economic growth. NBS prioritize environmental, social, and economic benefits, emphasizing the role of natural capital—the stock of natural assets like soil, water, and biodiversity in generating ecosystem services. Overall, NBS offers a comprehensive approach to address challenges, emphasizing the integration of natural capital in policies and planning for sustainable development.
The accelerating pace of urban development has placed the city on the brink of irreversible damage to nature, contributing to escalating climate challenges.

Open spaces, in that sense, unveil the potential in the relationship between vacant lands and the city, presenting a strategy to absorb urban stresses generated by intensive development, compromised air and water quality, diminishing open spaces leading to derelict spaces, dumping grounds, and limitations on public life. Operating within thresholds, these spaces embrace an empathetic approach to town planning, respecting natural systems and preserving the openness of vacant spaces. This selection of typology thereby advocates for the preservation of these non-normative spaces, emphasizing their importance in accommodating ecosystem services alongside the growth through NBS.

Need for Typology Identification

Vacant lands as a land use classification are so diverse in the context of Ahmedabad, and in the case of this specific study, it is important to allow typological conditions that can be defined to specify applicable NBS. The conditions vary across various neighborhoods, based on the surrounding features and activities, and apply on the land being specific to the moisture regime that it falls under and the scale of the land. While a case-based approach could be considered for land-based evaluation of NBS, the typological study seems preferable as these lands are always undergoing change and would thus require a comprehensive toolkit that can allow the consideration of the typology that it falls under.

Image showing the aerial view of a vacant land in the context of a neighborhood settlement in Ambawadi, Ahmedabad. Source: Author

Research Method

The larger research aims to propose typologically addressed NBS that relate to the context of Ahmedabad's normalization

to provide solutions that can be used to integrate ecologically sensitive development, enabling a nature-integrated environment concerning the vacant lands. It does so by acknowledging the thematic concern of water-urban flooding and related challenges. In order to propose a larger framework as a potential matrix of possible NBS, there is a critical need to rank the vacant lands in the city that need a prioritized approach and representation to schematically identify scalable NBS. Thus, this research article unfolds a GIS-based method to analyze a grid schema that ranks different factors on a suitable weightage that spatially recognizes the critical spots in the city of Ahmedabad, having a higher risk of flooding, wherein NBS could be critically implemented. The method through GIS is described in the following sections in order to determine an overall gridded chart for Ahmedabad's context.

GIS Methodology

I. **Sourcing base layers for mapping the grid:** The mapping involves sourcing of base layers to identify and classify land use. This helps in segregating the vacant lands from other supporting layers like built density, vegetation on ground, farmlands, and water bodies. Similarly, for the case of typology and contour levels, DEM data from the NRSC portal were obtained to develop the stream order and flood potential areas in the city. To support the study with the flood-prone areas as reported from sources, ICLEI's Ahmedabad report has been considered to derive this layer. It pins the points where frequent flooding has been reported, that is primary for the study to understand the criticality of vacant lands in the context of various neighborhoods from a city scale perspective.

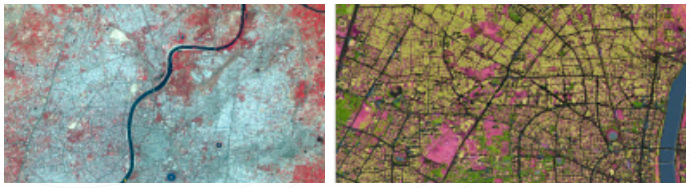


Image showing the LISS - IV Data Bands of Spatial Resolution 5.94m x 5.94m
(Source: Author, NRSC Bhuvan Portal)

II. **Band classification of the layers:** For the base layers, a supervised image classification technique has been adopted to classify the bands from satellite data. LISS – IV datasets with a resolution of 5.8mx5.8m have been acquired from the NRSC - Bhoonidhi portal. The further steps involve merging the RGB bands into a single dataset, providing a combined raster. The raster is then used for spectral band splitting that can be used for land use cover.

Training samples were specified for each category of the required classification, namely vacant lands, vegetation, built density, water bodies, and roads. Each training involved roughly 15 samples to feed in the accurate depictions of the land use classifications. Through a supervised image classification of the base layer, different sets of split raster were then obtained in GIS. After the correction of the base layers through manual reclassification, the layers for analysis were finalized.

III. **Limitations with respect to base layers**

a. The exhaustive list of vacant lands in the city based on ownership status was not publicly available to source to directly apply the grid weightage. For this, a supervised image-based classification technique was considered.

b. Since the derivation of land use has been a supervised image classification, the data obtained would not be highly accurate to the boundaries of the plot, but approximates the grid size that it falls under. This also accounts for further considerations that have been applied, wherein parks and gardens that are publicly owned by AMC have been removed from the primary layer of vacant lands, as it is not under the purview of the research study.

c. From the provided sources and documentation available, the typology has only been able to cater to the western part of Ahmedabad as represented. As the typology schematics would remain the same for the entire city of Ahmedabad, further data into the research can be plugged in for other typology considerations.

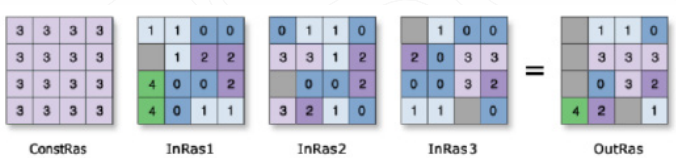


Image depicting the grid study methodology through GIS methods and limitations w.r.t. raster calculations for spatial ranking from point to raster
(Source: Author, Esri ArcPro)

IV. Overlays

With respect to a grid-specific approach other layers are also considered to identify the criticality of the vacant lands and specific typologies that it falls under. Flood points from contour data are identified to consider the spots under stress of flooding based on the topology. This layer is also verified with respect to the stream order lines that denote the higher order levels to be prioritized for criticality.

1. The **flood points** as reported to the complaint cell and government offices are also considered to develop a ground status consideration of the issues within Ahmedabad. This helps in verification of the **topological factors** or in some cases, it adds up the flood prone conditions that may not have been realized only due to the contours derived from DEM.

2. **Built density** has been considered as a high/medium/low classification as it determines the relationship between the vacant land and the neighboring density. This also helps in considering specific NBS that would be relative to the criticality of vacant land.

3. **Roads and impervious surfaces** are classified to determine the capacity that the specific grid can hold NBS for. For instance, if a higher order impervious surface is present, the scale and the NBS technique would change accordingly.

4. **Vegetation and farmland** considerations are made to determine the relative absorption that the grid can percolate within. In this case the higher order vegetation in a grid would require considerably small scaled-NBS or rather the criticality remains considerably low.

5. **Water bodies and wetlands** are considered to allow the flow of water within the grid (a dissolve radius of 2.5km is also considered to consider the impact around the region), this would allow the vacant lands to have a low order of criticality as the flood plain would be directed to these bodies and would thus require minimal intervention. However, protecting and restoring NBS would be critical for this scenario.

V. Grid analysis of the Layers

For the calculation of weighted spots in the city that would mark the criticality of the vacant lands, a grid-based technique was considered. The grid cells are fixed to 1kmx1km and are divided across Ahmedabad's AUDA limits. The areas calculated from the raster layers were individually classified as points under each grid. Based on the number of points that each of the grids have been incurred with, the cells are ranked accordingly. The gradation thereby gives a city level classification of individual layers depicting hotspots.

Sl. No.	Layers applicable for raster value ranking	Weightage
1	Flood points (recorded report)	+3
2	Flood Points (contour-based grading)	+2
3	Built Density	+1.5
4	Roads and Impervious Surfaces	+1.5
5	Vegetation and Farmlands	+1
6	Water Bodies	+1

Weighted Overlay Ranking chart for identified layers

VI. Grid Ranking and cumulative analysis

To run a rank-based simulation to support the criticality of the vacant lands, the grid is used to mark values for each layer. This allows a method to analyze a relative grading of layers that can depict the relationship of which layer accounts to the ranking that the cells would depict in the map. The below chart indicates the ranking values that would sum up to a given tally, while each cell representing the typologies would be a depiction of the vacant land's criticality.

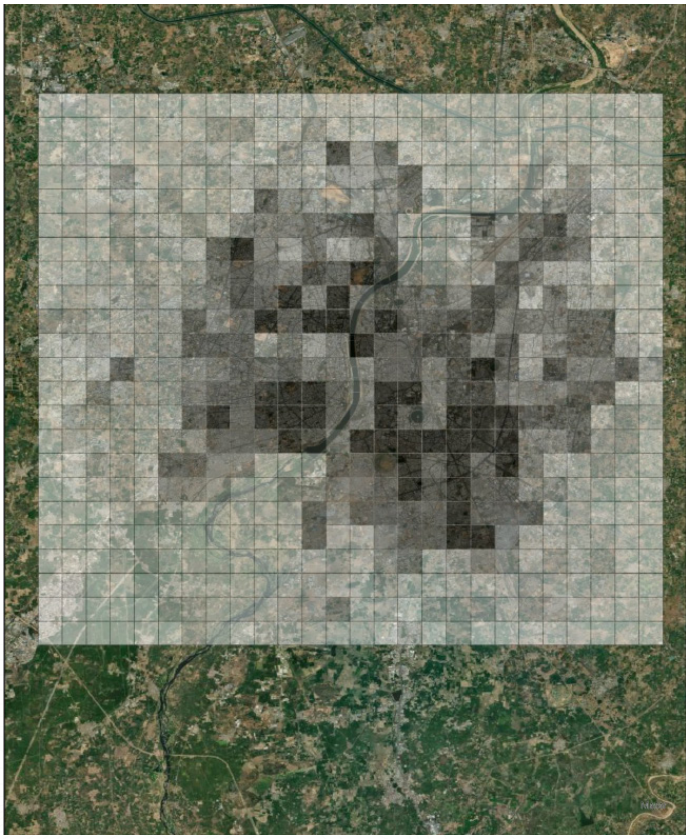
The layers are split into two categories:

i. Roads, built density, contour factor and flood-prone points that have been ranked to give a sense of critical sites as typologies within the city that have been affected, while

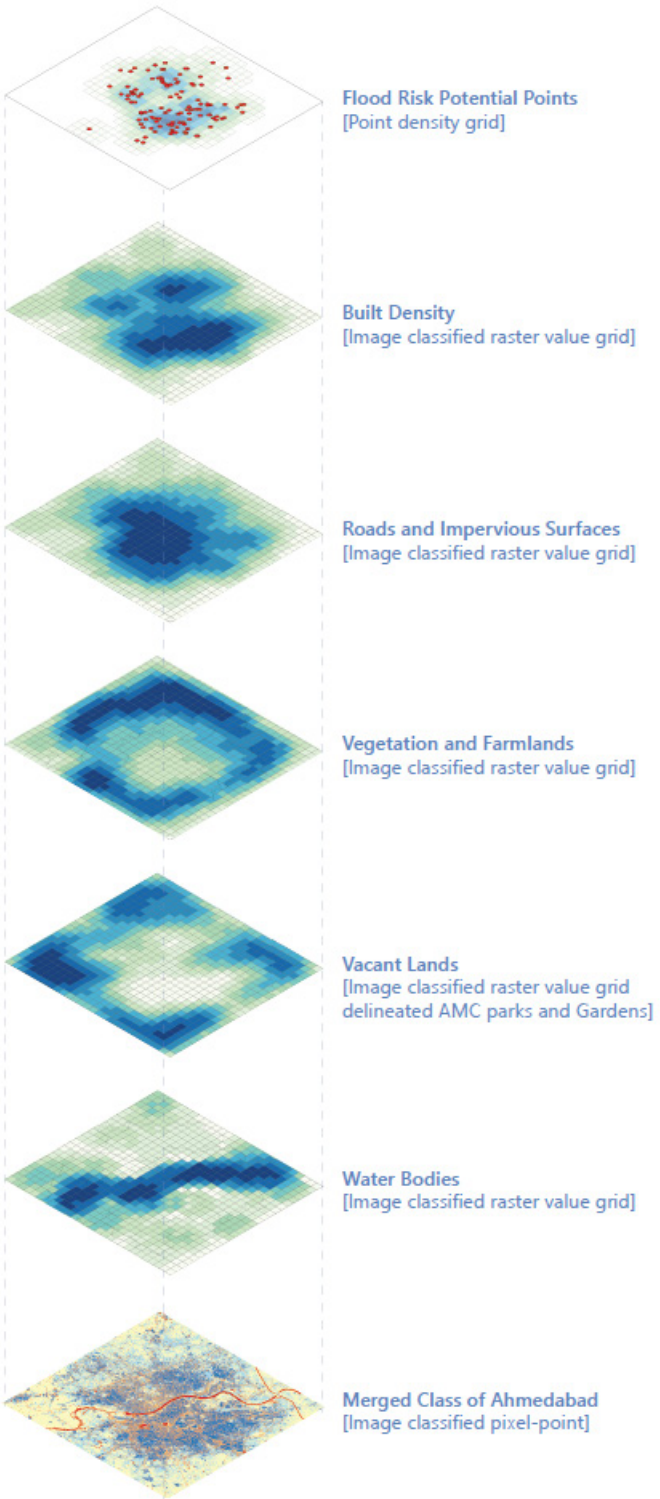
ii. Vegetation and water bodies that can contribute as potential spaces that can be conducive of letting water to percolate at higher infiltration rates.

So, the relative grading of each cell out of the weighted score of 10 would indicate the relationship with vacant lands (removed layer from public parks and gardens to only allow the consideration of unaltered- public lands). The ranking allows a graded understanding of the typical conditions that vacant lands are positioned at, and their relevance within the context of other parameters as listed under the various layers.

The grid analysis thereby gives a comprehensive ranking on the criticality of the vacant lands within various typologies and the need to accommodate necessary NBS that can further be plotted in the matrix (protect, create, restore) across various scales of intervention in further research.



GIS weightage-based ranking of all the cumulative layers. (Source: Author)



GIS weightage based ranking representation of the cumulative layers as isometric layering. (Source: Author)

Conclusion

The research aimed at identifying critical conditions in Ahmedabad based on the identified thematic concern of urban flooding and its relation with the land-water continuum. The underlying factors were spatially demonstrated through GIS tools/processes by sourcing base/calculated layers that together overlay as a grid chart for the city of Ahmedabad. The cumulative map thereby demonstrates the hotspots in the city that are vulnerable to flooding and the prioritized need to adapt NbS. While the ranking charts represent the hotspots, it also indicates an overall understanding of the city w.r.t to the potential of the vacant lands as a typology within the public realm for adaptability.

While the current study primarily focuses on water and vacant land as typology, the methodology allows for multiple such cases for enquiries that can be modified within the proposed suitability matrix. This would allow for the possibility of various such plugins that can contribute to a wider applicability of NBS for cities.

In conclusion, NBS can be applicable to address various societal challenges in cities, while simultaneously delivering multiple environmental, economic, and social benefits if addressed locally through the considerations of urban context. In order to scale up the solutions on ground, there could be more comprehensive studies that can take into several climatic enquiries that could be addressed within cities. A framework through GIS methods as demonstrated in this article, provides key insights on how various factors can be compared and analyzed for a comprehensive matrix that promotes relative solutions and impacts. As a way forward, an adaptive management guide with possible matrix of applicable solutions would cater to all the involved stakeholders to be able to engage with the implementation of NBS.

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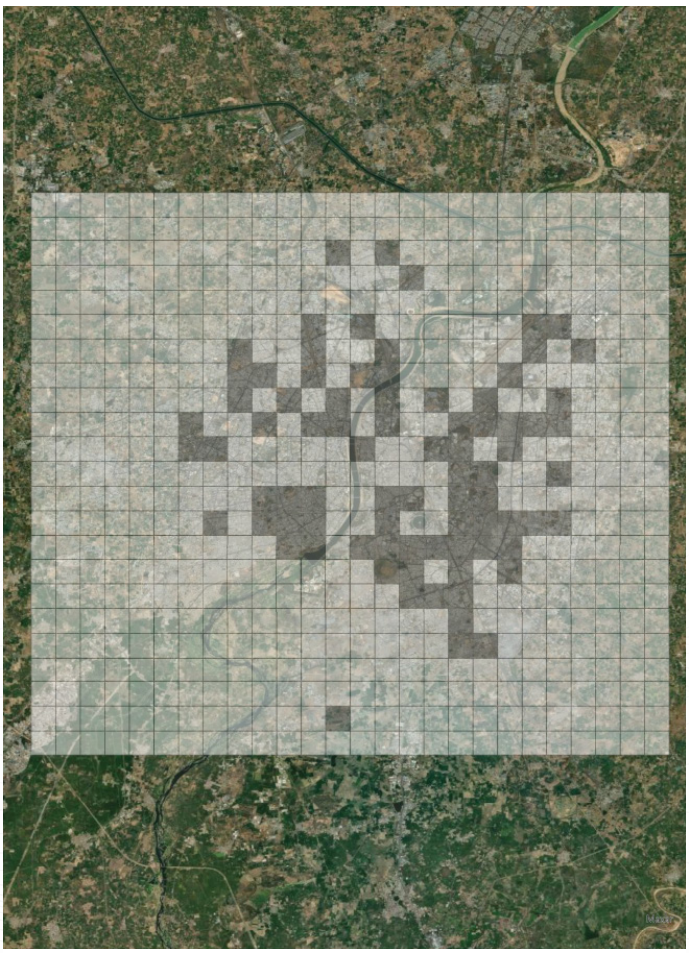
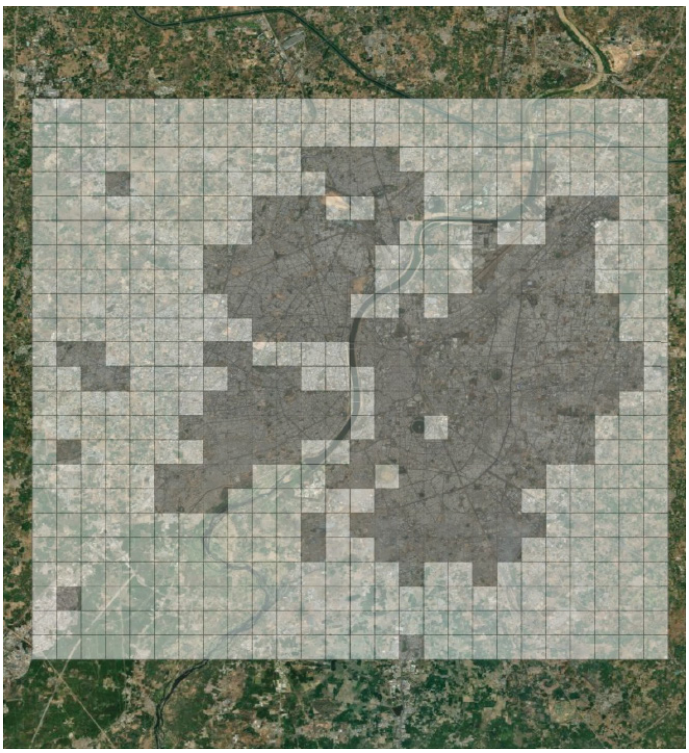
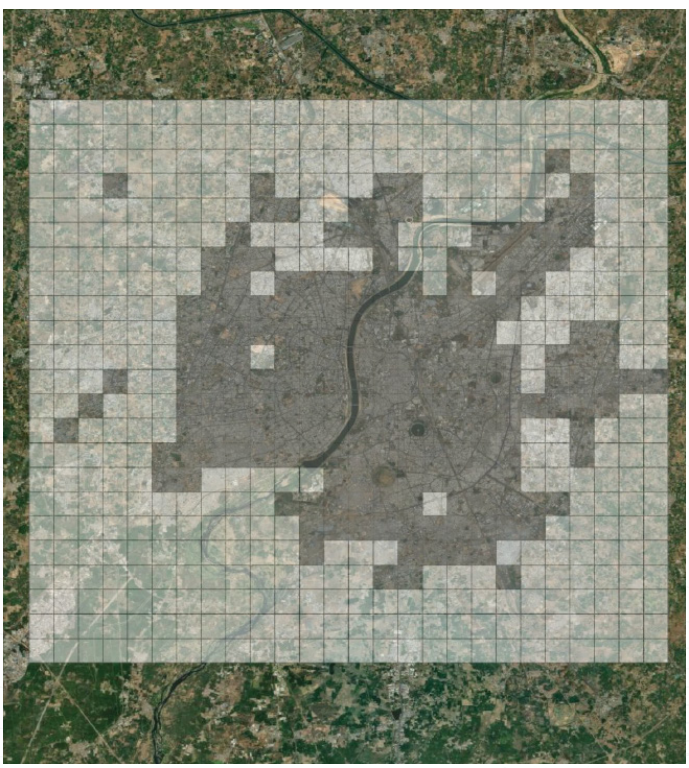
Additional maps as layers generated through matrix grading







The Real Estate Team Gets a Side Hustle

By Gregg Katz

A corporate department long viewed as a cost center is carving out a new reputation.

Corporate real estate teams are using digital technology to expand beyond important but mundane tasks like lease renewals and into strategy. With smart maps, these professionals help executives uncover new sources of revenue from existing properties and business opportunities competitors have missed.

They're doing so as developers seek land and property for everything from residential housing and sports arenas to new energy sites and recreational retreats. According to a recent survey by commercial real estate firm JLL, 62 percent of decision-makers believe they must achieve better utilization of their corporate real estate portfolio.

Innovative real estate groups are using geospatial technology known as a geographic information system (GIS) to achieve this optimization. Like a grandmaster before a chessboard, a real estate leader equipped with a basemap of company assets can quickly spot opportunities, gaps, and risks others don't see.

In industries as diverse as natural resources, retail, and health care, a smart map with vital property statistics—acreage, value, zoning, infrastructure, accessibility, carrying costs—can suggest potential uses. That might mean transforming a shuttered hospital into multifamily housing, converting a former mineral extraction site into a solar energy farm, or transferring unused land to a conservation group for preservation and recreation.

Real estate groups looking to take a more strategic role should consider these four keys to becoming a revenue adviser.

Key 1: Establish the Operational Basemap

Given several weeks or more, most real estate teams can assemble a dossier on any property in the corporate portfolio. But the team with that information always accessible on a smart map is a CXO's MVP.

The real estate group at one Fortune 50 oil and gas business used this technique as part of a corporate push to generate cashflow from thousands of assets and land parcels. The first step was to consolidate all the company's property data in a GIS database.

With that backbone, the firm created an operational basemap—a centralized view of its real estate portfolio. The tool, built with geospatial technology and accessible across the enterprise, allows any knowledgeable party to contribute insight on potential asset dispositions. Now property analysis that once required eight months and the input of 30 employees can be accomplished in seconds.

An operational basemap is foundational to each of the following steps. By consulting a map populated with data on land and facilities, real estate teams can quickly advise on the highest, best use for company property.

Key 2: Understand the Broader Organizational Mission

To advise decision-makers, real estate teams need to consider the company's overall strategy—not just narrow departmental goals.

For a company focused on supporting local communities, real estate analysts could identify opportunities for land that might be sold for conservation or recreation purposes, parcels with high potential for solar energy development, or office buildings primed for conversion to residential housing.

For an industrial equipment manufacturer looking to grow sales in a particular market, the real estate team can analyze municipal permits and zoning changes. Sites slated to become manufacturing plants, retail plazas, or warehouses would tip the sales team to opportunities to sell excavators, dump trucks, and road graders.

That location insight could lead to a burst of sales—and it starts with a real estate group whose geospatial technology skills support the company mission.

Key 3: New Data Reveals the Highest, Best Use of Real Estate Assets

Before greenlighting such moves, executives want data on risks, liabilities, and benefits. A real estate team armed with location insights serves as a strategic adviser, providing a basemap of corporate properties with data on each asset, including:

- Environmental regulations
- Square footage
- Zoning
- Foot and vehicle traffic
- Energy usage
- Physical and natural hazards

A prominent national lab used a GIS map loaded with location data to identify seven new sites that complemented the organization's multi-decade expansion plan—a task that would have been daunting without an operational basemap.

If the City of Miami opens the bidding process on a new casino or sports arena, a corporate real estate team could search its geospatial database for properties attractive to the developer. By quickly filtering a smart map, analysts can identify properties with the right acreage, road access, parking potential, and neighboring businesses.

Key 4: Know the Audience When Communicating Insights

To communicate effectively with executives, innovative real estate teams are embracing interactive maps and detailed infographics focused on metrics like ROI. With location software, they can tailor these analyses to their audience.

When one of the country's largest commercial real estate firms began using geospatial technology not just to analyze information but to tell stories, win rates rose for the sales teams using GIS.

To the CEO of a mall developer, for instance, charts detailing a site's performance might tell only part of the story. Placed on a map, that same data shows executives how foot traffic patterns at different times of the day correlate with fluctuations in store visits, as well as the demographic groups the site is attracting. With that insight, the sales team might pitch a vacant retail space to a spa owner rather than an indoor golf simulator.

These four keys can help a real estate group transform from cost center to strategic asset–but they're just the beginning. A basemap is endlessly customizable–able to provide context to the questions Which properties can we dispose of right now? and What can we buy in the next five years?

Armed with location insight, real estate teams can look forward to a role that will only grow in strategic importance.

Gregg Katz

Gregg Katz *is the director of business industry solutions for real estate at Esri. He provides thought leadership to create awareness, promote education, and influence innovation in commercial and corporate real estate. He also delivers subject matter expertise on retail and consumer trends. Gregg has held leadership roles at RetailStat and TSCG (The Shopping Center Group) as part of teams that created and implemented strategies for real estate and retail data, location analytics, industry trends, social media, websites, and geospatial solutions. Currently residing in Atlanta, Gregg is a graduate of Boston University and received an MBA from the University of Florida (Go Gators!).*

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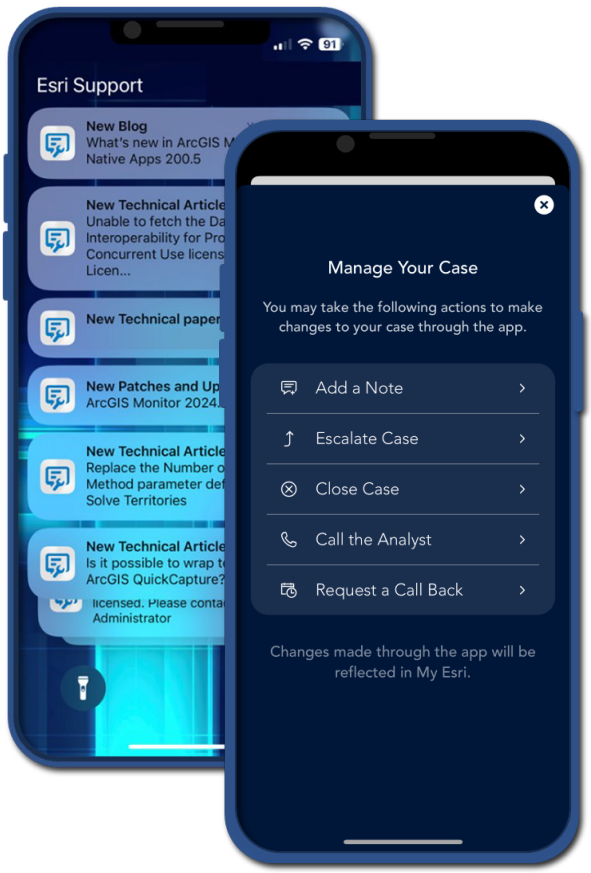

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