esri India

ArcIndia News

Cover Story
Harnessing Geospatial Value for Inclusive Growth

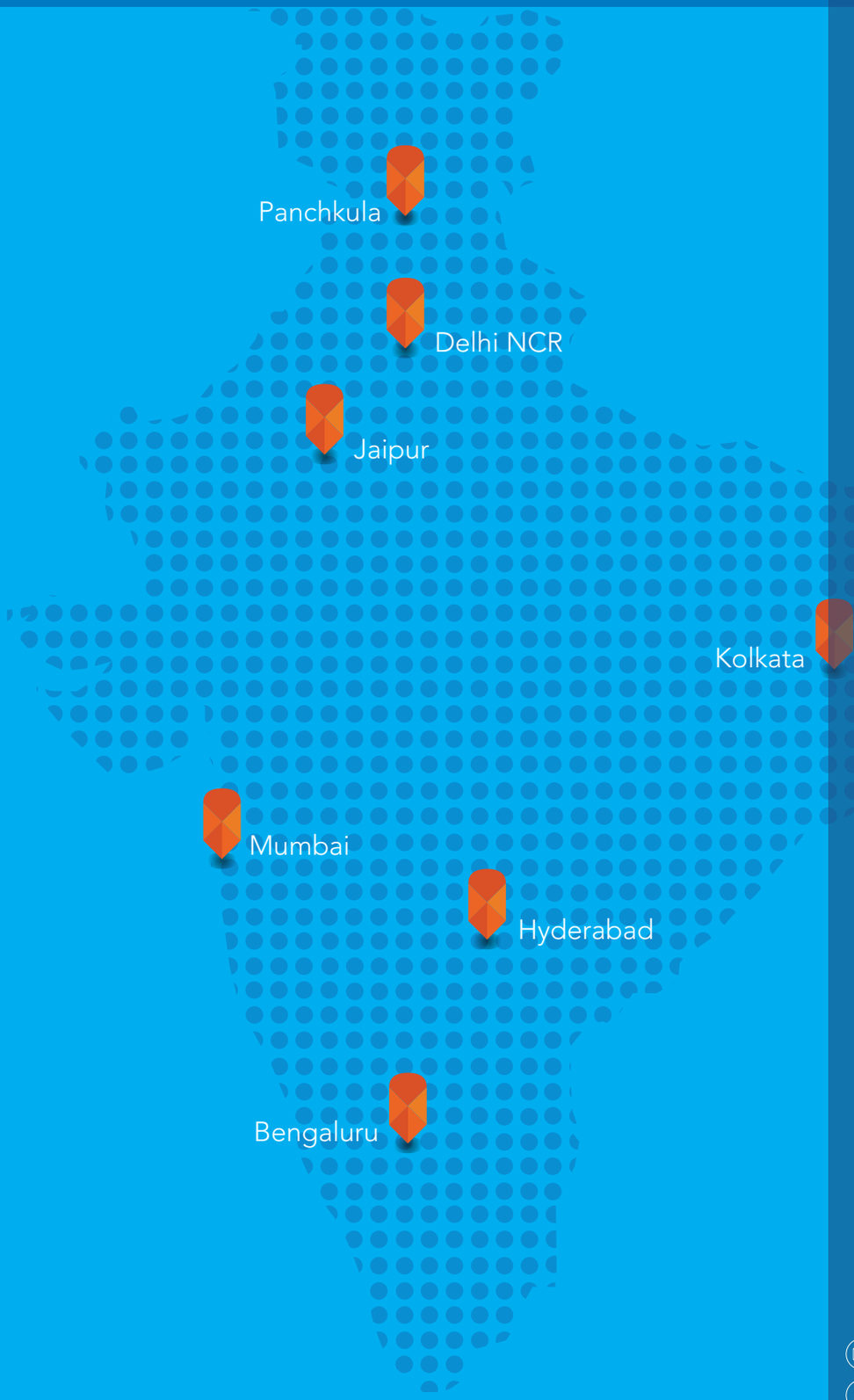
Article
Geospatial Value Impact on Environmental Capital

Product Review
Indo ArcGIS: 100+ Solutions, Products, and Applications

Case Study
Sterlite Power: Optimal Power Line Route Generation with GIS

Vol 16, Issue 2 I For private circulation, not for sale

Esri India Locations



Delhi NCR
Noida
10th Floor, Max Towers, Sector - 16B,
Noida - 201301, Uttar Pradesh
Jasola
ABW Elegance Tower,
#505 & #506 , Jasola-110020 , New Delhi

Bengaluru
70, 1st Floor,
Above ICICI Bank,
45th Cross, 8th Block, Jayanagar
Bengaluru - 560082, Karnataka

Hyderabad
Apeejay Business Center, Tresorie,
1st Floor, The PARK, 22, Raj Bhavan Road,
Hyderabad - 500082, Telangana

Jaipur
6th Floor, C Scheme, Anukampa Building,
Ashok Marg, Jaipur, Rajasthan - 302001

Kolkata
Block DN - 62, Sector - V, 12th Floor, Tower II,
Millennium City Information Technology Park,
Bidhan Nagar, Salt Lake
Kolkata - 700091, West Bengal

Mumbai
AWFIS Space Solutions Private Limited,
Auram Q Park, Building Q2,
8th Floor, TTC, Thank Belapur Road,
Ghansoli, Navi Mumbai- 400710

Panchkula
Plot no - 16, Sec - 22, 3rd Floor, Panchkula IT Park,
Panchkula - 134114, Haryana

Board no: 1800-102-1918
Email: info@esri.in

CONTENTS

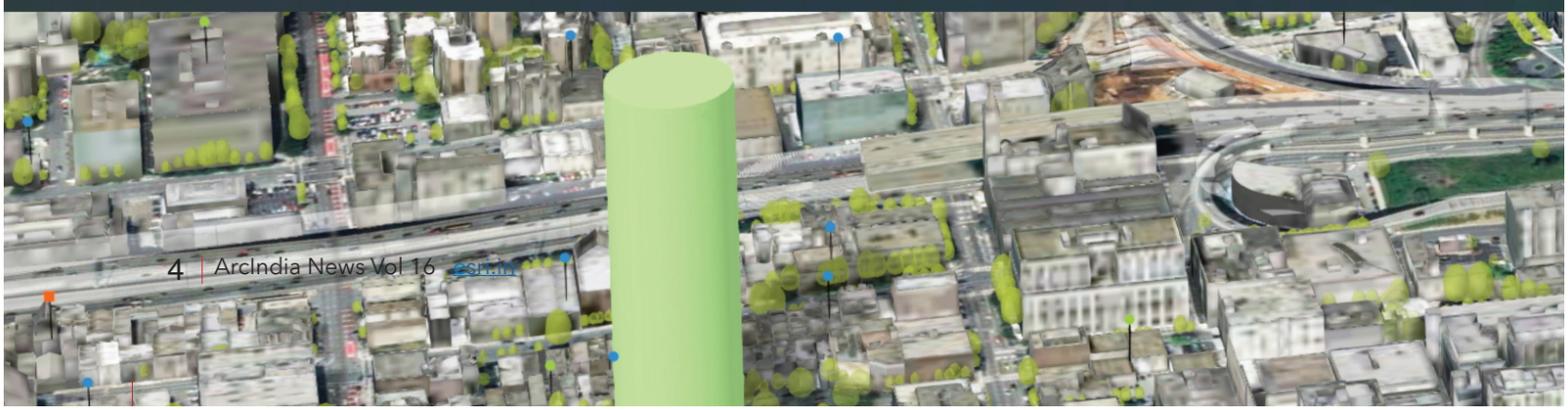
From the MD's Desk

Agendra Kumar
Managing Director, Esri India

Sustainability is the new order of the world. Nations are now contextualizing the economic activities with their societies and environment for sustainable growth. Having consigned natural capital and social capital as trade-offs for long, for an economic growth that is inclusive as well as sustainable, equally balancing the economic, social, and environmental capital becomes paramount for India's growth aspirations and so does the spatial approach.

As technology becomes a key facilitator for economies and livelihoods, "The Science of Where" is increasingly becoming a critical success factor for spatiotemporal understanding and managing complex interactions between economic, social, and environmental aspects. The Government of India's digitization-driven broad-based approach to economic growth attempting to balance the development across all the dimensions is a welcome move in this direction. As critical input, geospatial knowledge adds value across all economic activities and is progressively becoming indispensable.

With geospatial infrastructure playing a vital role in integrating physical, social, and economic infrastructure, geo-intelligence offers numerous opportunities to address ABCDE (Assess, Build, Connect, Demonstrate, and Empower) of sustainable economic development. Promoting a spatial approach, pan-



India geo-enabled initiatives like Gati Shakti, Svamitva, Smart Cities, Namami Gange, etc. are already harnessing geo-intelligence and have started making their mark in the Indian growth story.

Economists and researchers at the Institute for Social and Economic Change (Bengaluru), governments of Maharashtra, Meghalaya, Haryana, and many others are using ArcGIS for policy formulation and decision support, strengthening their capabilities to address complex social, economic, financial, and environmental challenges. Smart Cities and Urban Local Bodies (ULB) are leveraging ArcGIS Geospatial Management Information System (GMIS) for sustainable urban development. Playing a critical role across the business life cycle, Esri's ArcGIS has become an important tool across various industry sectors for optimizing economic capital.

By fostering participation and collaboration of stakeholders, ArcGIS is empowering social and environmental ecosystems with geo-intelligence for strengthening inclusive governance. As a part of 'The SDG Data Alliance', ArcGIS empowers governments, businesses, and people globally to respond to and manage shared global challenges. With cutting-edge web resources and no-code applications, Esri's 'GIS for Climate Hub' provides resources for assessing potential climate impacts and addressing them.

Geospatial value impact is invaluable in facilitating the creation and maintenance of harmonious conditions for the coexistence of human society and nature in the pursuit of economic growth. As an unsung hero, geospatial technology has proved to be a force multiplier in the past and will undoubtedly be critical to our current efforts to accelerate sustainable economic growth. Esri India's Indo ArcGIS offers solution products and geospatial content to meet the requirements of several segments.

Newer opportunities to capitalize on geo-information using AI/ML and deep learning are waiting to be exploited and offer the potential to amplify the rupee value impact of geospatial technologies on the Indian economy. By exploiting this untapped potential of ever-increasing geoinformation, the Geospatial Value Impact (GVI) can be doubled in the next five years making a profound impact on India's growth story.

As time slips into the future, it is for us to capitalize on this golden opportunity and not let it slide.

Esri India Shares a Perspective on Budget 2022-23 with TOI

Times of India presented an exclusive perspective of Esri India on Budget 2022-23. The perspective, which was shared by Agendra Kumar, MD, Esri India, highlights the following:

- The investments to be made under the *Gati Shakti* program, which includes the construction of 25,000 Kms of highways, multimodal transport, modernization of land records are welcome steps. GIS and other geospatial technologies can facilitate the efficient implementation of these schemes.
- For efficiently using drones for crop assessment, digitization of land records, spraying of insecticides and nutrients as suggested in the budget, Cloud-based drone data processing systems are required.
- The introduction of Indo ArcGIS and cloud-based drone data processing system – Site Scan for ArcGIS by Esri India are a few steps that will make it easier for the government and private organizations to use geospatial data, technologies and drones for survey and data collection activities.
- The Government aims at providing tap water to 3.8 crore households in 2022-23. GIS-based water distribution network planning, execution and operations can a go long way in making this plan a reality.
- Raising the overall outlay for capital expenditure by 35.4% to INR 7.50 lakh crore in 2022-23 will help in stepping up the post-pandemic recovery. This is also likely to be a motivator for higher investments by the private sector.

To read the complete opinion piece, go to:
https://timesofindia.indiatimes.com/blogs/voices/budget-2022-23-and-the-science-of-where/

Esri India Certified as a Great Place to Work® for the Second Time in a Row

Esri India participated in the Great Place to Work® study for the first time in 2021 and earned the certification. Scoring higher on Credibility, Respect, Fairness, Pride, and Camaraderie, the company bagged the certification in 2022 as well.

Agendra Kumar, Managing Director, Esri India, shared on the occasion, "Trust, Transparency and Teamwork are intrinsic to Esri India's DNA. We empower our employees and provide them opportunities for learning and growth. Our values form the basis of our initiatives to foster a diverse, inclusive, and sustainable workplace. We are honoured to be Great Place to Work-Certified™ for the second time. The certification reiterates our commitment towards providing equal opportunities to all employees while building a people-centric & purpose-driven work culture, where everyone feels respected and valued."

Esri India has always shown a strong commitment towards creating a collaborative, transparent and growth-oriented work culture. The pandemic necessitated the adoption of novel initiatives to ensure the well-being of the employees while encouraging them to remain productive and positive. Esri India led the way through several unique programs such as leadership talks from the senior management and sessions on digital well-being, stress management, etc. Esri India also gives a lot of emphasis to Gender Diversity; currently, women form over 30% of the workforce. Many women are holding key positions and making valuable contributions to the success of Esri India and its customers. Such factors have even led Esri India to recently win an award as a Great Mid-Size Workplace (Rank 15).

Esri India Joins Hands with NRIDA to Build a Stronger Rural India

PM's vision of *Aatmanirbhar Bharat* can be achieved only by developing rural India using rural infrastructure data. Following this belief, Union Minister Shri Giriraj Singh recently released Rural Connectivity GIS Data in Public Domain. This includes GIS data for 8,00,000 rural facilities as points, 1 million+ habitations and 25,00,000+ km of rural roads which have been collected and digitized using the GIS platform developed for the PMGSY scheme.

National Rural Infrastructure Development Agency (NRIDA), the nodal implementation agency of the PMGSY scheme signed an MoU with Esri India, along with two other firms & collaborated with *Gati Shakti* for releasing this data. This GIS data will help in bridging the gap between urban and rural India. The data will be beneficial to startups, entrepreneurs, businesses, civil society, academics and other government departments to build products, conduct research, plan investments, improve service delivery and quick disaster response.

The pace of construction of rural roads under PMGSY has seen massive growth during the last seven years and emphasis has been given to new technology, leading to savings of about INR 5,000 crores. The availability of Rural Connectivity GIS Data in the public domain will infuse new life into this pace of development.

Indo ArcGIS Gains Attention as the Geospatial Industry Commemorates 1st Anniversary of the Release of Geospatial Data

On 15 Feb 2022, the government, academia and private sector came together to celebrate the 1st Anniversary of the Release of Geospatial Data. The event was organized by the Association of Geospatial Industries (AGI). Dr. S. Chandrasekhar, Secretary, DST; Agendra Kumar, Former President of AGI; Sanjay Kumar, Founder and CEO, Geospatial World, Prof. Bharat Lohani, IIT, Kanpur, among others joined the event.

As the chief guest of the event, Union Minister of State (Independent Charge) Science & Technology; Minister of State (Independent Charge) Earth Sciences; MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space, Dr. Jitendra Singh said that the Trinity of Geospatial Systems, Drone Policy and Unlocked Space Sector will be the hallmark of India's future economic progress. The Minister also drew attention to the launch of Indo ArcGIS by Esri India to address the need for ready-to-use GIS-based solutions and data products in the areas of Forest Management, Disaster Management, Electrical Utilities, Land Records, Water Distribution, Property, and many more. Dr. Singh termed Geospatial technologies as the nation's "digital currency" that finds dynamic applications in multiple sectors like Infrastructure, Manufacturing, Health, Agriculture, Urban Planning, Highways, and Service Delivery. He mentioned that the Indian Geospatial market is likely to grow to INR 36,300 Crore in 2025. As the Government of India pursues the vision of a $5 trillion economy by 2025, geospatial technologies will be a key enabler.

Esri India and RailTel Sign MoU to give Thrust to 'GIS on Cloud'

Esri India and RailTel Corporation of India Ltd., a Central Government PSU under the Ministry of Railways have signed an MoU to provide Cloud-based GIS solutions to Indo ArcGIS users. Based on this, partnership Indo ArcGIS would now be available on RailTel Cloud, giving customers the much-needed advantage of scalability, agility and cost-efficiency. Joint offerings would include software, cloud infrastructure and related services. This will especially help government organizations to reduce costs and complexity by moving from on-premises infrastructure to Cloud and speed up the use of GIS in their initiatives and programs.

Talking on the partnership, Mrs. Aruna Singh, CMD, RailTel said, "Geospatial Infrastructure is fast becoming the backbone of many new strategic initiatives of both central and state governments in India. RailTel with its 2 Tier III data centers and over 61,000 Kms of Optic Fiber Network is uniquely positioned to support government organizations in deploying their GIS applications on a secure public cloud. Through this partnership with Esri India, we intend to offer a reliable, secure and managed GIS Infrastructure for large government programs and projects."

Agendra Kumar, Managing Director, Esri India shared, "The convergence of GIS and Cloud technology opens new avenues for building the Geospatial Infrastructure in India. The solutions and data products included in Indo ArcGIS are created with the aim to help the government and private organizations solve the most pressing problems of the country effectively with GIS. To facilitate enhanced collaboration and more informed decision-making at a lower cost, we are now offering Indo ArcGIS on Cloud. RailTel offers the best-in-class secured Cloud infrastructure. Our partnership with RailTel will foster accelerated GIS deployment and provide the power of 'geospatial infrastructure on Cloud' to our Indo ArcGIS users."

Esri India Recognizes India's Top GIS Talent by Way of The Young Scholar Contest Once Again

Esri India Young Scholar Contest is a coveted platform that brings together students from across the country, providing them a unique opportunity to share their work with the world. Every year it creates phenomenal stories as the students share creative ideas for solving the most pressing problems of the world using GIS.

This year again in April 2022, close to 200 students participated in the contest and showcased interesting projects right from the application of GIS in reducing health inequity among the underserved to analyzing social media data to improve citizen services to the assessment of groundwater level variation and more.

Agendra Kumar, Managing Director, Esri India shared on the occasion, "As the Indian economy leaps from one pillar of strength to the other, geospatial technology is becoming more prominent. Geospatial literacy is key to solving the challenges the country is facing today and thus the need to develop the right talent is paramount. The Esri India Young Scholar contest is one among many of Esri India's efforts to encourage and acknowledge the out-of-the-box innovations of young scholars. Our aim is to provide this platform for students to develop a geographic & spatial thinking approach and apply GIS technology to solve real-life problems."

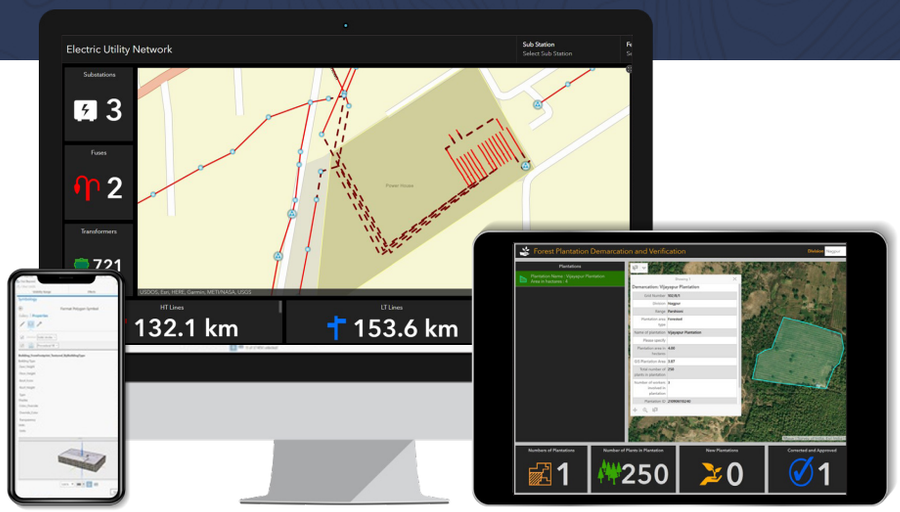
The following projects were selected as the top three winners of the contest:

- **Project 1:** Using Twitter Data to Assess Commuters' Perception of the Delhi Metro by Apoorv Agarwal from IIT Madras
- **Project 2:** Analyzing the Access to Educational Facilities in Dahod District by Yash Doshi from CEPT University
- **Project 3:** Automatic Ridge-Line Detection using Digital Elevation Modelling by Kalyan Nath Somavarapu from the National Institute of Rural Development and Panchayati Raj

Apart from becoming a proud recipient of the 'Esri India Scholar of the Year' trophy, the top winner gets the opportunity to showcase his/her work at the global level at the Esri International User Conference.

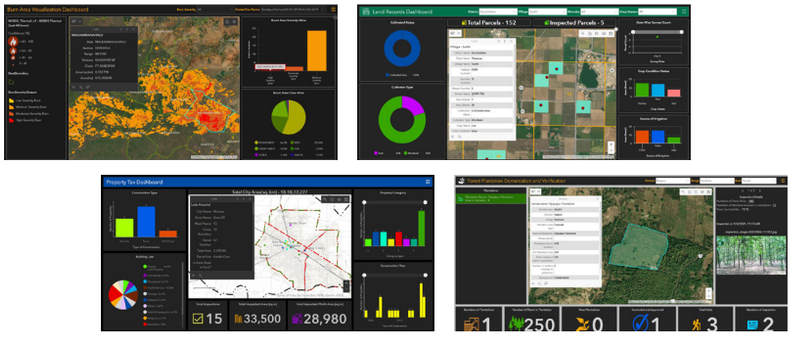
Indo ArcGIS®

esri India



ArcGIS with ready-to-use GIS solutions and data products engineered for India

Indo ArcGIS is the one-stop destination for all your GIS needs. Powered by industry leading ArcGIS technology, Indo ArcGIS offers out-of-the-box solutions and data products developed by Esri India's engineers to solve some of the most challenging problems the country is facing today.



Contact us to get started

go.esri.in/indo-arcgis

Tel: 1800-102-1918
Email: customercare@esri.in

Harnessing Geospatial Value for Inclusive Growth

Barring a few setbacks, world economies in the last three decades have leveraged their resources very efficiently to achieve an impressive growth rate and improved the prosperity of their people. The Indian economy too had a great run with an enviable GDP growth. Taking huge strides across the economic sectors, India rapidly rose the ranks. Having emerged as the world's 'fastest growing, free world democracy', India is expected to be one of the top three world economic powers in the next decade.

Geospatial Technologies: Driving Growth Like Never Before

Geospatial applications are improving efficiencies and productivity through spatial data and insights. Playing a critical role in planning, monitoring & analysis, stakeholder collaboration, operational readiness, asset management, improved customer services, and so geospatial technologies have become an integral part of the business workflows. Citizens are looking for location-rich insights that can help with a better understanding of the situations and aid in better decisions and in-turn make better use of their time and resources.

By fostering inclusiveness, participation, and collaboration of stakeholders, geospatial knowledge is empowering ecosystems with actionable intelligence for informed decisions, strengthening governance and citizen welfare.

From an Indian context, geospatial technologies have architected an ecosystem of their own. Over the last five decades, the geospatial industry in India has seen significant growth in size and sectorial adoption. From mapping and cartography in the 1980s, today advanced geospatial technologies are driving digital transformation initiatives by providing enhanced situational awareness and actionable intelligence for informed decisions. The geospatial value chain today covers - data acquisition, data processing and analysis, workflow integration and dissemination for different sectorial applications contributing to local, regional, and national economies, benefitting every segment of society. Increasing adoption and technological advances are triggering the rapid expansion of this Geo-ecosystem, fueling demand for manufacturing and services across the value chain. The benefits of geospatial technologies can be grouped as:

a. **Operational Benefits** – Direct/Indirect benefits to business/government operations resulting in improved planning, efficiency and productivity, enhanced decision support, reduced labor, cost savings and cost avoidance.

b. **Consumer Benefits** – Direct/Indirect benefits to the consumers through the use of geo-information and/or spatial analytics resulting in improved transparency, enhanced convenience, time savings and better quality of life and mobility.

c. **Societal Benefits** – Direct/Indirect benefits in terms of employment generation, sustainable natural resource management, environmental conservation/restoration, better response to disasters and minimizing collateral and financial impact and community empowerment for timely informed decisions.

Geospatial Value Impact (GVI)

Geospatial Value Impact (GVI) can be defined as the fiscal benefit derived by governments, businesses, or consumers/citizens directly, indirectly or in an induced form by the use of Geospatial Knowledge.

- For Economic capital, GVI is measured as changes in operational efficiencies, business revenue, profits, employment and wages.
- For Social capital, GVI is measured as change in education, inequality, community safety, social support and human well-being.
- For Environmental capital, GVI is measured as a change to the environment through the effect of socio-economic activities and natural events to the components of the environment covering air, water, soil, ecology, ecosystems, biodiversity, and pollution.

Today, as a critical input, geospatial knowledge adds value across all economic activities and is progressively becoming indispensable. The proliferation of location rich data and advanced geospatial technologies are providing newer opportunities to augment the geospatial value impact. Be it for supporting economic profit growth, ensuring equal opportunities, reducing inequalities, improving living standards, reduced climate risk or strengthening the policy framework, GIS plays a vital role in facilitating the creation and maintenance of harmonious conditions for the coexistence of human society and nature in the pursuit of economic growth. By exploiting the untapped potential of ever-increasing geoinformation, Geospatial Value Impact can be doubled in the next five years making a profound impact on India's growth story. It is for us to capitalize and not let this golden opportunity slip away.

Want to understand the concept of 'Geospatial Value Impact' better? Don't miss the other articles in this issue!

Article

Geospatial Value Impact on Economic Capital

Traditionally the use of geospatial technologies has been focused on core sectors of the economy for maximizing economic capital. The Geospatial Value Impact on the economic capital in the Indian context is estimated at Gross Value Add (GVA) of INR 10.34 lakh crores for 2020 along with employment generation of 9 lakhs. The Government of India has recently commenced work on the blueprint of the India@2047 project, a vision plan for a 'future-ready India' that befits the 100th year of Indian Independence. Let's take a look at the Geospatial Value Impact on major economic sectors identified as key areas for economic growth.

Energy and Net Zero

Every aspect of modern life, economic growth and prosperity is underpinned by energy and its networks. Despite being the world's largest electricity producer-heavy dependence on fossil fuels, poor infrastructure, inefficient operations, and high transmission losses, are major hurdles the energy sector is faced with. With the increase in population and urbanization, the demand for energy has been increasing rapidly. Climate-related impacts on these resources add further stress to energy security, making it an uphill task to achieve net-zero emissions.

Governments and energy producers have been using GIS to manage the energy balance, gain visibility into regions' natural resources, plan and design energy projects, and optimize the generation, distribution, and transmission activities along with judicious use of the natural resources. GIS technologies contribute to energy economics by aiding in energy infrastructure management, optimization of raw material/fossil fuels, improving distribution and transmission efficiencies, minimizing outages, and rapid emergency response.

Improving Efficiencies and Advancing Energy Access

Today most power utilities in the country, including Reliance Infrastructure, Sterlite Power, Tata Power, BSES Yamuna, and State-owned discoms (under The Restructured Accelerated Power Development and Reforms Program (R-APDRP)) are powered by Esri's ArcGIS. Integrated with their traditional power distribution network and legacy systems ArcGIS powered platforms are helping utilities to improve their operational efficiencies, and reduce AT&C losses while providing enhanced services to their consumers. Geo-enabled network mapping and asset mapping are enabling quicker detection of faults for faster action while at the same time achieving better management of their assets and resources. Other benefits include:

- Enhanced visibility of distribution networks with actionable intelligence for faster decisions.
- Improved consumer services and revenue recognition.
- Efficient management of network assets and resources that are spread geographically.
- Rapid response to emergencies and disasters, faster restoration of supply and minimized outage times.
- Richer insights and analytics for strategic planning and meeting rapidly increasing energy demand.
- Access to a Customer Information System to improve profiling, visualize customer demographics, and develop better business insights.

Towards strengthening energy resilience, National Smart Grid Mission Project Management Unit (NPMU) and some utilities have taken a step forward by integrating their ArcGIS Enterprise implementations with IoT, SCADA, SAP, and other ERP systems and extending them to ArcGIS-based field tools to leverage their investments for advanced distribution management operations. These systems have significantly reduced the cost of a breakage/shutdown for the utility and its rate payers, while improving utilities capability to provide 24x7 quality power, while at the same time improving the overall productivity of the engineers by 20 per cent.

Healthcare and Assistive Technologies

It goes without saying that for a healthy economy, society must be equally healthy. COVID-19 pandemic and its impact on the Indian economy has undoubtedly brought healthcare back into focus. Strategic oversight, predictive analytics for disease behavior, evidence-based decision support and interventions, advocacy for strengthening regulatory and legislative controls; and empowerment of the communities are some of the critical aspects of the healthcare ecosystem in the country that need attention.

Playing a central role, GIS-based healthcare contributes to health economics by fostering enhanced situational analysis with real-time data in a spatial context. This is critical for understanding healthcare and its interrelationships for effective planning, response, decisions, and actions for healthcare programs. Spatial Modelling and Predictive Analysis aid inaccurate assessment of the likely impact of diseases, their geographic spread, hot spots, priority areas, appropriateness, and efficacies of interventions. Geo-enabled body area networks (BAN) aid in remote healthcare monitoring, assisted living and telemedicine thus supporting affordable healthcare and strengthening the healthcare sector.

Towards Malaria Elimination by 2030

As a center of excellence for the impact of climate change on vector-borne diseases, The National Institute of Malaria Research (NIMR) (A premier institution under the Indian Council of Medical Research (ICMR)) is leveraging ArcGIS for carrying out epidemiological and climate change studies. Supporting the National Strategic Plan for Malaria Elimination, which aims to eliminate indigenous cases by 2030, stratified healthcare information on ArcGIS is helping NIMR to understand the ecological conditions, climatic resonance, and the thresholds of disease transmission for effectively monitoring the vector borne disease outbreaks in the country and undertake informed interventions.

As a WHO-recognized center for phase-I pesticides and malaria RDT lot-testing laboratory, NIMR is harnessing the power of ArcGIS to understand the transmission dynamics of malaria under different eco-epidemiological regions and its outcomes have found widespread application through the National Vector Borne Disease Control Program (NVBDCP). These include mapping of breeding habitats, the distribution of vectors, faunal surveys, and genetic studies.

Infrastructure and Communications

Modern life without infrastructure and communications is unimaginable. While infrastructure makes a significant contribution to the economy, it also plays a vital role in social stability and environmental sustainability. Communication technologies have transformed the way we see, the way we think and the way we work. The advent of 5G and other ICT innovations viz. edge computing, deep learning, Internet of Everything (IoE), Everything as-a-service (XaaS), etc. are further expected to bring connectivity to the centre stage in all the digital transformation initiatives. Contextualized infrastructure is not only important for economic growth but also promotes inclusiveness. The lack of contextualized infrastructure impedes economic development and imposes additional costs in terms of time and money.

With infrastructure projects growing complex by the day and demand on resources becoming more challenging, 'Science of Where' and contextualized information are playing a vital role in demystifying the complexities. With capabilities to address infrastructure projects across their lifecycle namely planning, design, construction, operations, and maintenance, GIS technologies play a central role in infrastructure development. This clubbed with the economic activities required for spatial analytics, earth observation and Scanning, geospatial technologies make a significant impact on the infrastructure economy.

Transport and Mobility

Increasing population and changing lifestyles have been constantly accelerating the demand for movement of people and goods. Poor technology adoption and inadequate digitization of transportation processes are contributing to many challenges while crippling the sector's competitiveness and growth. India's transport network is severely constrained and operates under-capacity, while there is a compelling need for multi-modal transport to optimize the transport infrastructure and reduce CO2 emissions.

Conventional GIS offers powerful tools for collection, storage, management, analysis and intuitive visualization of transport data from multiple disparate sources. The benefits of GIS to transport economics extend to optimizing fuel consumption, reduction of CO2 emissions and minimizing empty truck returns thereby improving the economic viability of the operations.

Urbanization and Housing

Cities and metropolitan areas are powerhouses of economic growth contributing about 60 per cent of global GDP. However, they also account for about 70 per cent of global carbon emissions and over 60 per cent of resource use. Rapid urbanization is resulting in a growing number of slum dwellers, inadequate and overburdened infrastructure and services (such as waste collection and water and sanitation systems, roads and transport), worsening air

pollution and unplanned urban sprawl. Be it providing safe and affordable housing and basic services, urban space or transportation or utilities or public safety or recreation, there is increasing pressure on each one of these.

Geospatial Management Information System (GMIS) a web application developed on Esri's ArcGIS is assisting urban development authorities in sustainable urban development including managing the Smart Cities program efficiently. Bringing together data from multiple data repositories on ArcGIS, GMIS provides tools for urban planning and management. Varanasi Smart City, Visakhapatnam Smart City, Bhopal Smart City and many urban local bodies have been leveraging ArcGIS capabilities for:

- Actionable insights for informed decision-making.
- Improved business processes and workflows by smart integration of disparate systems on a common GIS platform.
- Improved inter-department collaboration.
- Improved asset management resulting in better citizen services.
- Enhanced public confidence and participation.

An efficient urban information system is a vital prerequisite for planned development as the ever increasing demands in urban planning and management call for coordination with multiple stakeholders across the ecosystem, for sustainable development of urban areas. GIS technology is one such powerful tool that helps to integrate and analyze various aspects of urban development to provide numerous economic benefits.

Rural Development and Agriculture

Rural communities face unique challenges. Poverty, social inequalities, and lack of education make them disproportionately vulnerable to disruptions including natural disasters and health related hazards. Even without climate change, world food prices are expected to increase due to growing populations and rising incomes, as well as a greater demand for biofuels. The effects of a changing climate will have a significant impact on the world's food supply. Seasonal water scarcity, rising temperatures, changing rainfall patterns, and intrusion of seawater threaten crop yields, jeopardizing the country's food security.

By bringing together all the rural subjects together on a GIS platform aid the agricultural economy by supporting the strengthening of rural resilience and empowerment of the rural communities. Food producers and agriculturists need GIS to understand the dynamics of agro-climatic features, evaluate risks and work towards adopting sustainable agricultural practices and strengthening resilience. By integrating location intelligent IoT-based devices, and farm infrastructure, geo-enabled precision agriculture offers transformative economic potential for sustainable climate-smart-agriculture. Integrating location intelligent supply chain infrastructure with financing and farming activities on a GIS platform strengthens the market linkages and reduces losses.

Geospatial information combined with socio-economic and other statistical data provides critical inputs to economists for addressing complex socio-economic-environmental challenges. Bringing together the diverse multi-disciplinary datasets, spatial modelling, and predictions aid in a better understanding of the likely scenarios thus helping in the mitigation of the impacts of disruptions in an effective manner.

GIS technologies not only help with operational improvements, cost savings and a better understanding of the evolving situations, but also provide capabilities for effective collaboration and communication amongst stakeholders fostering community-based problem solving and decision support with scientific rigor. While aiding in the democratization of geoinformation, GIS is empowering stakeholders with contextualized experiences anywhere, anytime, encouraging higher uptake and productive outcomes for efforts towards inclusiveness.

Geospatial Value Impact on Social Capital

Social Value Impact refers to the quality and quantity of social interactions which eventually impact economic activity directly or indirectly. These contribute to social cohesion; strong, vibrant, and secure communities; and good governance, and help fulfill basic human needs such as participation, affection, and a sense of belonging. The geospatial value impact on the social capital in the Indian context is estimated at INR 10.26 lakh crores per annum (2020 GDP figures).

Eradicating Poverty

Eradicating poverty in all its forms remains one of the greatest challenges facing humanity. Ensuring social protection for all children and other vulnerable groups is critical to reducing poverty.

Given the complexity that arises due to the geographic and cultural diversity of the country, contextualized intelligence plays a vital role in identifying the challenges to start with. By demystifying the inter-dependencies and inter-relationships GIS helps with actionable intelligence for informed decisions in regard to equal rights to economic resources, access to basic services, ownership and control over land and other forms of property, inheritance and natural resources.

Achieving Zero Hunger

For sustainable economic growth, the nation needs to ensure access to food for all people, in particular, the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round. Current agrarian economics are disheartening with a majority of the country's small holding farmers shifting away from agriculture owing to financial constraints, poor return on investment and unpredictable weather patterns.

By helping farmers and agriculturists to plan, manage and monitor GIS technologies can foster the creation of sustainable food production systems and the implementation of resilient agricultural practices that increase productivity and production.

Gender Equality

Gender equality is not only a fundamental human right but a necessary foundation for a peaceful, prosperous and sustainable world. Women's economic empowerment has a direct bearing on the gender equality, poverty eradication and inclusive economic growth of a nation. At the same time, gender inequality has deep roots in the complex social and cultural practices which need to be demystified and untangled.

For increasing women's participation and providing equal opportunities at all levels of decision-making, the need for contextualized understanding of the situations on the ground becomes paramount. Information Poverty is one of the major hurdles in women empowerment. GIS technologies play a vital role in addressing the intersectionality of women empowerment, provide actionable intelligence and decision support for designing and implementing sustainable interventions.

Fintech and Inclusion

As a large country with 1.4 billion population and a diverse socio-economic profile, financial Inclusion continue to be a big challenge for India, which is critical for sustainable economic development. Non-availability of suitable financial products, lack of awareness, infrastructure inadequacies, high cost to access digital services, inadequate collaboration, and community participation are the hurdles to achieving desired financial inclusion.

To address these challenges, 'Science of Where' becomes crucial. Given the diverse socio-economic challenges the nation is faced with, understanding the situations and their interdependencies becomes critical for bridging the gaps and expanding the financial operations. Be it the location of the customers, assets, or resources their demographic distribution, socio-economic distribution or location-enabled devices/solutions, geographic context and spatial dependency take a center stage for economic activity.

Article

Geospatial Value Impact on Environmental Capital

Environment and its resources have a significant impact on the sustenance of a nation's economic growth. Natural resource depletion and adverse impacts of environmental degradation, including desertification, drought, land degradation, freshwater scarcity and loss of biodiversity, add to the list of challenges that economies face today. The geospatial value impact on the environmental capital in the Indian context is estimated at INR 56,000 crores per annum (2020 GDP figures).

Water

While India has a wealth of water ecosystems that have been a lifeline for economic development for centuries, these are under tremendous stress today due to rapid urbanization, industrialization and agricultural intensification, manifested by the shrinkage in their areal extent, and decline in the hydrological, economic and ecological functions they perform.

Strengthening Water Resilience

Powered by ArcGIS, India's web enabled Water Resources Information System popularly known as India-WRIS provides holistic information on the state of water resources, and aids in decision support for water resource planning and management strategy. Allowing users to Search, Access, Visualize, Understand and Analyse comprehensive and contextual water data for the assessment, monitoring, planning and development of water resources for Integrated Water Resources Management (IWRM), developed jointly by the Central Water Commission (CWC) and the Indian Space Research Organization (ISRO), this centralised platform is now India's national repository of water resources and associated data with administrative granularity. This data includes hydrological, hydro-meteorological real-time information and data acquired using public funds available for legitimate use, enabling better decision making and meeting society's needs.

Namami Gange, the flagship program of the Government of India for the rejuvenation of Ganga and its tributaries is leveraging ArcGIS for comprehensive river rejuvenation including pollution abatement (Nirmal Ganga); improving flow and ecology (Aviral Ganga); strengthening people, river connect (Jan Ganga) and research, knowledge management (Gyan Ganga). In addition to wide range of GIS-based research projects touching different aspects of river rejuvenation ArcGIS is aiding in legislative and policy development, allocation and management of water resources, river system spatial planning, monitoring & basin management and outreach programs. Namami Gange's major components include the creation of sewerage infrastructure, solid waste management, industrial pollution abatement, rural sanitation and water quality monitoring, environmental flow, river front development, afforestation and biodiversity conservation, sustainable agriculture, public participation and policies, research & innovation.

Water Efficient Thrissur (WET) initiative was conceived on the ArcGIS Enterprise platform to address the challenges by enhancing the situational awareness of the water utility network and assets and arm the administration with real-time actionable intelligence and decision support. Designed and built on an authoritative spatial repository integrated with non-spatial data and sensors (Smart meters and IoT devices), Esri's geo-enabled decision support platform has taken the centre stage in delivering data driven insights and rapid decision support to all the WET stakeholders. WET is strengthening Thrissur's water governance and resilience by helping stakeholders to prepare strategically, respond rapidly and recover methodically in the event of any disasters or disruptions.

India Water Tool Version 3 (IWT 3.0) is a comprehensive, high-resolution, user-friendly tool that helps companies and other users evaluate, assess, and plan their water management interventions. With ArcGIS at its core, India Water Tool is a decision-support tool for organizations to measure and map water risks associated with their businesses and operations. Targeted at companies and investors who need to understand the water risks for their operations, supply chains, investments and plan their water management interventions. Communities can use the tool to plan collective recharge and conservation efforts. Organizations can use IWT 3.0 to generate reports with key water indicators mandated by corporate disclosure initiatives (GRI, CDP Water, DJSI, Bloomberg, and UN CEO Water Mandate).

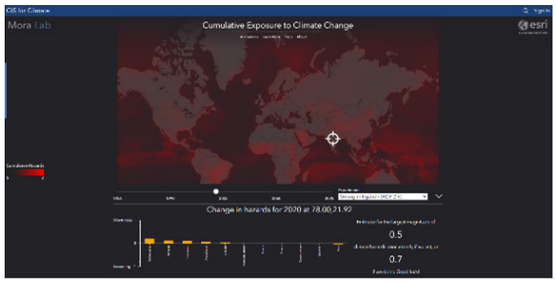
Playing a central role, GIS technologies bring together all the processes and sub-systems of the water related ecosystems on a unified platform aiding in monitoring, planning, implementation and improvement of various processes from "source to tap". With multiple stakeholders responsible for the restoration and conservation of water ecosystems, with real-time spatial insights and capabilities to collaborate GIS technologies become very crucial.

Climate Action

Climate change is affecting every country on every continent. It is disrupting national economies and affecting lives. Weather patterns are changing, sea levels are rising, and weather events are becoming more extreme. Saving lives and livelihoods requires urgent action to address both the pandemic and the climate emergency. There is a need for strengthening resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

With multiple factors at play, GIS technologies offer great potential in addressing the challenges posed by climate change. GIS technologies aid scientists and conservationists acquire, manage, analyze, and visualize climatic data. It also acts as an aid in monitoring and examining the effectiveness of conservation and restoration practices. GIS aids in discovering how natural atmospheric processes might affect global warming, creating models to show how a warming climate might impact the ecology and biodiversity of various regions, and examining the relevance of shifts in land cover, deforestation, urban activity, wildlife, etc.

Assessing Potential Climate Impacts and and its Mitigation



From collecting data in the field, to managing, mapping and analyzing the data, or sharing it for everyone to use with cutting edge web services or no-code applications, ArcGIS supports all aspects of assessing potential climate impacts and developing solutions using location intelligence. Powered by ArcGIS, Esri's "GIS for Climate Hub" provides a variety of resources to get you started in climate analysis or help develop more advanced workflows. From web services and big data in the cloud to CF-compliant netCDF downloads, this curated collection of climate data is easy to use, trustworthy, and flexible for a variety of analysis projects. From maps to charts and graphs, this gallery provides the most useful visualization types for climate analysis, along with tips, tools, and code to replicate them in your own projects with ease. New capabilities of ArcGIS allow you to map, analyze, and interpolate data in 3- or 4-D. By leveraging Python libraries such as Matplotlib or developing apps with the ArcGIS API for JavaScript, many additional avenues are available for advanced climate data visualization including - Find Patterns in Complex Data, Simplified Analysis of Multidimensional Raster Data, Understand Patterns Across Time, A Deeper Dive into Time, Are Things Getting Better or Worse? and Assessing Frequency and Risk.

Life on Land

Providing us with our oxygen, regulating weather patterns, pollinating crops, and producing food - nature is critical for life on land. With human activities rapidly altering the ecosystems, today we have encroached on fragile ecosystems by creating human-wildlife conflicts, enabling pathogens in wildlife to spill over to livestock and humans and increasing the risk of disease emergence and amplification.

Protecting Forest Ecosystems

With a mandate for assessment and monitoring of the 7 lakh sq km forest cover and its rich resources in the country regularly, the Forest Survey of India (FSI) has been leveraging a web-based application powered by ArcGIS for qualitative, quantitative and administration information about forests that is enabling fast and effective decision-making. Being confronted with the complex, dynamic and multi-dimensional nature of the forest ecosystems, FSI was challenged by issues related to inventory, land administration, sustainable planning, better forest management and adherence to regulatory compliances. FSI has partnered with Esri India to overcome these challenges towards reducing the time-consuming process of permitting forest land diversions and indetifying inviolate forest areas. While enabling FSI and MoEF & CC (Ministry of Environment, Forest and Climate Change) to hasten the process of providing clearances to forest area diversions, ArcGIS is facilitating timely forest clearances promoting ease of doing business and promoting investments for economic growth.

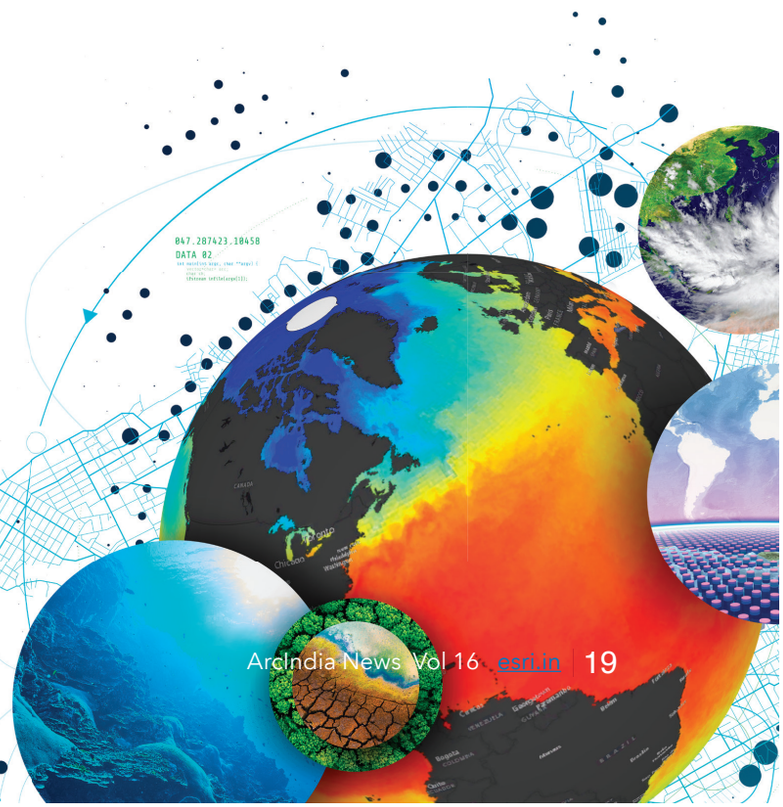
Wildlife Institute of India (WII) is also leveraging ArcGIS tools for wildlife research and management spanning the length and breadth of the country. Supporting All India Tiger Monitoring, Biodiversity Conservation and Ganga Rejuvenation project, Endangered species recovery program (Great Indian Bustard, Dugong, Gangetic Dolphin, and Manipur Brow-antlered Deer), WII uses ArcGIS for wildlife tracking and monitoring enabling ecological and environmental data collection; contributing towards a much greater understanding of species, monitoring of animal movements over vast distances and time and distribution modeling of species. The integration of satellite tracking, remote sensing, and GIS mapping is helping WII to tackle largescale conservation questions through conservation strategies and sustainable management of wildlife resources.

Covering 94,000 sq kms of forest area in Madhya Pradesh, the Forest Department, Government of Madhya Pradesh is aspiring to densify the forest cover in the state. ArcGIS is helping the forest department to increase its forest cover while at the same time supporting monitoring the production of forest produce such as timber, fuel, minor forest produce, medicinal plants, etc. while at the same time supporting keeping track of the wildlife and the health of their habitat.

Overcoming the challenges posed by the paper maps, ArcGIS is helping the state in the management of complexities with ease. Esri ArcGIS Online supports interaction with the field staff for real/near-real time monitoring that enables faster corrective actions.

Protection and restoration of forests and their ecosystems, whether against anthropogenic or natural or human activities calls for a spatial understanding of the situations in real-time. With climate change concerns restoration efforts need to be ecologically, economically, and socially sound. Geo-enabled restoration efforts aid stakeholders with informed decisions for striking the right balance between increasing productivity and minimizing the negative impact on biodiversity and livelihoods of forest dwellers.

In a connected world, information and communication technologies have become the backbone of economies and livelihoods. With this also comes the need for dynamic capabilities for course correction and decentralizing decision support to support balanced and inclusive growth. “The Science of Where” has become important more than ever for understanding and managing complex interactions between economic, social, and environmental factors. Geospatial technologies are shepherding a new era of contextualized ecosystems by their ability to bring together every aspect of the economy in a unified environment, with geography as a binding factor.



Article

Economic Growth with Geospatial: A Focus on Financial Inclusion

It is globally acknowledged now that 'Financial Inclusion' plays a catalytic role in equitable macroeconomic growth and promoting income equality. Increasingly it is becoming a vital component of modern economies for achieving inclusive and sustainable development.

Even for India's metamorphosis into a global economic powerhouse and a $5 trillion economy, financial inclusion holds the key. However, as a large country with 1.4 billion population and a diverse socio-economic profile, financial Inclusion continues to be a big challenge for India.

Challenges and "The Science of Where"

While policy interventions are opening newer opportunities for business growth and employment generation, banking and insurance sectors continue to face challenges including - non-availability of suitable financial products, lack of awareness, infrastructure inadequacies, multiple IT systems, and their integration, high cost to access digital services, inadequate collaboration, and community participation.

To address these challenges, "The Science of Where" becomes crucial. Given the diverse socio-economic challenges the nation is faced with, understanding the situations and their interdependencies becomes critical for bridging the gaps and expanding the financial operations. Recent government interventions encourage the flow of credit to deficient districts across the country, the inclusion of startups, emphasis on health infrastructure and renewable energy, etc. For these interventions to mitigate regional disparities in the deployment of credit and ensure greater credit flow to the targeted sectors, the context of location is vital. Be it the location of the customers, assets, or resources their demographic distribution, socio-economic distribution, or location-enabled devices/solutions, geographic context, and spatial dependency take the center stage.

From a regulatory standpoint, a data-driven, insight-rich approach to regulation enables effective monitoring of the markets and facilitates faster "knowledge" based, informed decision-making for all stakeholders. "The Science of Where" is a force multiplier to the government and regulators in fostering an agile and dynamic regime that while keeping pace with the social and technological transformations, reduces the information asymmetries, optimizes cost, and enforces effectively.

As knowledge becomes critical to success in such dynamic environments, banking and insurance sectors are constantly forced to seek answers to many questions to calibrate their strategies to stay ahead in the market. These include:

- What are the various factors (Geographic, socio-economic, demographic, etc.) impacting our business in different regions?
- What infrastructure is available? How has it changed over time? What more do we need to do to increase our market share?
- Are the right products offered at the right places at the right times? Is the pricing aligned with customer spending patterns? Do we need to change product offerings to suit social, demographic, and socio-

economic conditions?

- What is the scope for introducing new products and services in existing geographies and new geographies?
- Where are our customers located? How has their profile changed over time? Who are our valuable customers? Where do they live? How satisfied are they?
- Are we easily accessible? How strategically are our branches located? How profitable are they?
- How strategically are our agents located? How efficient are they? How secure are they?
- Where are our assets located? What is the ROI we are getting on our assets? Are we using the right technologies to minimize cost and maximize efficiencies? Is the choice of our technology aligned with the emerging technological challenges?
- Who are our competitors in different areas? What is our market share? How are we placed vis-à-vis our competition?
- Are there any patterns and trends which can/are impacting the business growth?

Geospatial technology innovation and the explosion of data are throwing up numerous opportunities for banks to leverage it in a bigger way, across the enterprise. With about 80% of the data generated rich with the context of location, financial institutions can find answers to most of the above questions.

Geospatial Technologies as a Force Multiplier

As big data, artificial intelligence, machine learning, and the Internet of Things (IoT) drive digital transformation initiatives in banking and insurance, there is an increasing need for making better sense of the petabytes of data churning out at a rapid pace for strategic and operational decision support. Without contextualizing, there is a limited value that can be derived from the large volumes of data.

Geospatial technologies are best suited to deal with the complex challenges posed by ever-increasing volumes of location-rich data by enabling visualization, analysis, and predictive modelling to get deep insights.

With cloud-based GIS and Platform-as-a-Service (PaaS), access to GIS is becoming easier, faster, and cheaper. With faster computing available at lower costs, by integrating their non-spatial enterprise systems with ever-increasing volumes of geo-data along with crowdsourced data, financial institutions are now able to rapidly transform data into location rich contextualized intelligence for informed decisions.

Geo-enabled fin-tech and insure-tech mobile tools can transform the financial services landscape rapidly by offering dynamic, proactive, and even prescriptive location-specific personalized experiences to diverse consumers thus helping in higher penetration and better inclusiveness, while aiding in significant cost savings. While aiding in the democratization of geoinformation, mobile tools empower stakeholders with contextualized experiences anywhere, anytime, encouraging higher uptake and productive outcomes for efforts towards financial inclusion.

In Closing

Growing economies, exploding population, increasing urban migration, ageing population, shifting agricultural patterns, climate change, and the pandemic have transformed societal dynamics and impacted every sphere of our lives along with disruptions. Geospatial information combined with socio-economic and other statistical data provides critical inputs for addressing such complex challenges. By bringing together the diverse multi-disciplinary datasets, spatial modelling and predictions, GIS aids in better understanding of the likely scenarios, thus helping in mitigation of the impacts of disruptions in an effective manner.

GIS technologies not only help with operational improvements, cost savings and a better understanding of the evolving situations but also provide capabilities for effective collaboration and communication amongst stakeholders.

As a force multiplier, geospatial technologies have a big role to play in facilitating universal access to financial services at a reasonable cost and finally improving the availability of financial resources and fostering sustainable economic growth.

Tête-à-tête with Dr. Dheeraj Kumar on GIS Fostering Sustainability

Using GIS, we can find out how the natural conditions are changing; how much change is happening in water bodies, forest areas, among others. This information finds useful applications in land change, deforestation assessments, urbanization, habitat fragmentation, etc.

– Dr. Dheeraj Kumar, Deputy Director, IIT (ISM) Dhanbad

What role does GIS play in creating a more sustainable world?

GIS has an important role to play in creating a more sustainable world. Out of the 17 SDGs, at least 4 goals can easily be met with the application of GIS technologies. These include the goals of Affordable and Clean Energy (Goal 7), Industry, Innovation, and Infrastructure (Goal 9), Responsible Consumption and Production (Goal 12), and Life on Land (Goal 15).

In other words, GIS can play a vital role in ensuring access to affordable, reliable, and sustainable energy for all, building resilient infrastructure, promoting inclusive and sustainable industrialization, fostering innovation, ensuring sustainable consumption and production patterns, and protecting, restoring, and promoting sustainable use of terrestrial ecosystems, combat desertification and halting biodiversity loss. These all are necessary ingredients of a sustainable world, and that way GIS becomes the common enabler.

We are constantly using our natural resources and making a lot of changes to the flora and fauna. Using GIS, we can find out how the natural conditions are changing; how much change is happening in built areas, water bodies, forest areas, etc. This information finds useful applications in land change, deforestation assessments, urbanization, habitat fragmentation, etc. The information obtained from GIS in natural resource management helps to study specific areas and monitoring can be done in and around the area. GIS provides a way of studying the changes taking place in the landscape and managing the environment.

Since you are an expert in mining, how do you think GIS is benefitting the mining industry?

Mapping and monitoring are the most important processes in mining. Without GIS, it will be difficult to implement digital mining technologies leading to Safe, Smart, and Sustainable Mining (3S Mining). I think there is a complete role of GIS in the value chain of mining, starting from locating the mineral deposits, establishing the mine, producing the minerals, and finally eco-restoration of mined-out areas. GIS helps the mining industry professionals to explore and calculate economic potential, manage risk, conduct environmental assessments, and analyze other concerns effectively and accurately.

Now, talking about professionals, do you think we have enough skilled workforce in GIS? What do we need to do in this regard?

India definitely lacks in the availability of a GIS-skilled workforce. To meet the changing needs, GIS needs to get largely adopted in the Indian education system, right from schools. In every sector of our economy be it mining, health, automotive, land management, agriculture, or defence, GIS is playing a big role in achieving efficiency, delivering superior services to the citizens, optimizing resources, and creating a safer world. In India, there is a big scope of GIS and through GIS there can be a complete change in the digital value chain. Such changes will eventually lead to the economic development of the Indian economy.

However, to bring such changes to fruition, you need a skilled workforce. Location is central to everything. Inculcating 'Geographic Thinking' in the minds of children from an early age (grade 6-7) can lead to the development of innovative solutions for combating climate change, economic globalization, biodiversity loss, water quality and quantity, energy, natural hazards, etc. Knowledge of GIS helps students to understand content in a variety of disciplines, not only in geography, but in history, mathematics, language arts, environmental studies, chemistry, biology, civics, and many more. Thankfully, more and more academic institutions are realizing the importance of filling the gap and imbibing GIS to their courses; top institutes like Tier I technical institutions in India are now running courses in Geoinformatics and GIS. That's encouraging.

How is IIT (ISM) Dhanbad contributing to making GIS an important part of academia? How has been your experience with Esri's ArcGIS?

IIT Dhanbad (ISM) has been teaching GIS as part of their course in Geomatics and equipping students of other relevant courses such as Applied Geophysics, and Applied Geology with the knowledge of GIS since long. Esri India has been playing a crucial role in making these initiatives a success. Our experience with Esri India has been wonderful. I joined IIT Dhanbad in 2005 and since 2006, I am using ArcGIS software to help my students of Mine Surveying & Geomatics understand how location intelligence can help them achieve more efficiency in their mining projects.
Till now, more than 40 PG students and 10 Ph.D. students have completed their dissertation works under my tutelage at IIT Dhanbad, where they have used some tools of ArcGIS. They have got excellent results and successfully published their papers.

We will soon also have a Geospatial Centre of Excellence. TEXMiN (The mining Technology hub of IIT (ISM)) and Esri India will be coming together to enhance awareness about GIS in Mining and Earth Sciences disciplines. This center will be very useful for students of non-GIS courses as well for instance, students of applied geophysics, applied geology, environmental studies, etc.

I feel that the tools and applications available in Esri's ArcGIS are unparalleled. They are easy to operate and do analysis with. They allow you to easily add your own APIs and customize them according to your requirement. It has a lot of flexibility. As we can customize the software as per our requirements, its value enhances.

Case Study

Optimal Power Line Route Generation with GIS

India is witnessing a drastic change in the pattern of electricity transmission, mainly due to the shift towards renewables. With these changes in place, the transmission projects are facing the pressure of quicker completions with no compromises on quality. Using GIS, the power utility sector is able to achieve the desired outcomes, while gaining higher ROI in the projects.

Project Summary

A key trend in the power sector today is the revision of the time schedule for the development of transmission projects. Due to the shorter gestation periods of renewable energy projects, the time schedule has been reduced from 36 months to 18 months. This is expected to be reduced further in times to come. Accordingly, power infrastructure companies need to expedite the development of transmission projects to evacuate power from renewable energy projects.

Sterlite Power, which is a leading global developer of power transmission infrastructure with about spanning more than 13,700 circuit kms in India and Brazil, recognized this need. To maintain its track record of commissioning power transmission projects ahead of schedule, addressing the key constraints of time and cost, Sterlite Power collaborated with Esri India to develop a first-of-its-kind integrated GIS Ecosystem for powerline route planning and finalization. The solution that emerged through this collaboration is helping the company not only achieve higher accuracy but also save significant time and cost.

Key Benefits with GIS Integration

- 1-2% Cost Impact
- ~ 23 crores savings for a 1000 km 756 kv line
- 50% lesser time in route finalization (from 60 to 30 days)
- 95%+ accuracy in route generation
- High data confidentiality: Enterprise Grade secure and multi-tenant platform
- 100% reduction in competitive threat
- 100% improvement in reliability of field survey results

What Triggered the Initiative? The Challenges

The process of power line route finalization consists of two stages, namely, route generation and in-field route survey. The manual methods of carrying out these activities, which were earlier followed by Sterlite Power, led to delays and inaccuracy due to information gaps. The major problems that the manual systems caused were as follows:

1. **Delayed Route Generation:** The manual route generation methodology used by Sterlite Power required the survey team to perform an in-field survey and collect relevant data on forests, roads, railways, existing transmission lines, etc. from multiple sources. This was a time-consuming activity. As the desktop route generation process could happen only after this collected data was combed manually, the route generation process was often delayed, leading to huge costs.
2. **Lack of Data Security and Confidentiality:** Sterlite Power bids, designs, constructs, owns and operates power transmission assets across multiple geographies. All bid-related data is highly confidential and the lack of proper access and usage controls posed a major risk to the business. Automated versioning concepts and controls were required to simplify the process for the user and maintain data sanctity.
3. **Poor Connectivity in Remote Areas:** In areas with poor or negligible network coverage, the conventional applications did not work effectively due to a lack of offline-mode support.
4. **Non-Availability of Data:** The manual systems could not provide historical field survey and associated studies data (soil/hydrology, etc.). This affected the bids.

Considering these limitations, Sterlite Power realized the need to have a more robust digital approach to route finalization and survey. In collaboration with Esri India, A huge transformation from the conventional manual survey methodology was brought, and an integrated GIS ecosystem was established. TransAnalyst + CanvasR is a first-of-its-kind integrated GIS ecosystem for route planning and finalization in India.

Solution

The route generation process has been automated via the TransAnalyst Platform and the in-field route survey is executed using the infield CanvasR app.

TransAnalyst helps Sterlite Power to plan multiple route options between two substations in a few minutes by changing the weights of different layers. It reduces 2-3 days' effort for creating any one route option, and also allows modification of the route based on real-time survey feedback. The user can also analyze the BoM/BoQ of different route options by using its CAPEX model where the tool calculates Steel Tonnage, Conductor cost, RoW (Right of Way) cost in terms of land, crop, trees, etc. and identify the best route option for bidding.

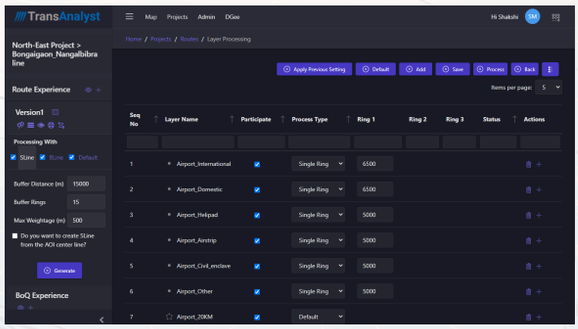


Figure 1: Configure data layers and its weightages

Sterlite Power created a Central GIS Database which acts as an intelligence platform with diverse datasets having 30+ data layers e.g., roads, railways, transmission lines, forests, water bodies, location boundaries, soil data, climate, terrain data, etc. These data layers are consistently updated.

The platform is integrated with a mobility app used to allocate and execute field surveys for transmission routes in a real-time manner for the back office to consume survey data instantly, give feedback to survey teams, adjust the routes where required, and create a fully optimized transmission line route to be consumed in the bid process.

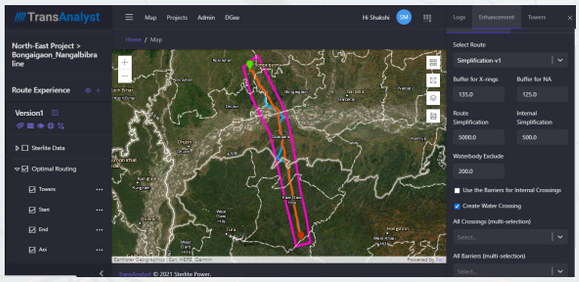


Figure 2: Generate multiple route options

Benefits

Higher ROI, significant savings in time in completion of projects, higher accuracy of data, reduced field visits, and real-time updates – the benefits of the solution have been many.

1. **Improved Data Accuracy:** The routes generated by TransAnalyst are based completely on pre-approved data. This, coupled with a lesser number of iterations,

gives over 95% accuracy in route generation.

2. **Higher Revenue:** The new automated process significantly improves the confidence level in the data and impacts the ROI of the project positively. The company is looking at savings of about INR 23 crores in a 1,000 km project.
3. **Near Real-Time Data Capture:** From survey to route generation and feasibility reporting, automation and digitization have led to in-sync, real-time operation. With CanvasR, the surveyors are now able to provide real-time inputs through mobile apps which get updated in desktop systems in the office in real-time. This reduces the risk of continued visits to the field and thus leads to huge savings in terms of time and cost.

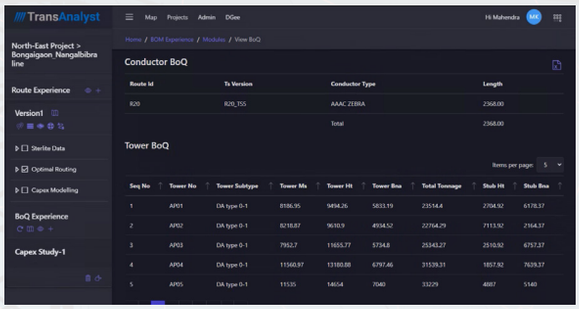


Figure 3: Tower and Conductor BoQ report

4. **Lesser Time Spent in Projects:** The solution for route generation not only delivers an accurate route but also does that in less than one hour for a 200 km route while adhering to all the business rules. Earlier this used to take 3-4 days. The process of data generation also now takes a maximum of 1-2 hours, which used to take 6-8 days earlier. Overall, the integrated GIS ecosystem allows Sterlite Power to save on an average 2-4 months in a project. By reducing the number of survey iterations, the solution is helping it to directly achieve more than 50% time reduction in route finalization.

5. **High Level of Data Security:** TransAnalyst and CanvasR are extensively integrated systems. As a result, data flows seamlessly between the two apps and stays within the ecosystem. This directly eliminates the need to export the data out of this secured ecosystem - ensuring a high level of data security and confidentiality. Moreover, since data stays within a secured ecosystem, team members can access the survey data during any phase of the project. This is unlike the existing industry prevalent system, wherein, access to data is prohibited after a specific tenure.
6. **Offline Work Mode:** In areas with poor or negligible network coverage, the conventional applications do not work effectively due to a lack of offline mode support. With offline-mode support, CanvasR enables data syncing seamlessly and accurately irrespective of the network connectivity. The maps along with the route data are downloaded and saved locally on the surveyor's device. This data is automatically accessed and presented on the app's map screen in case of poor or no network. This facility ensures that the team is able to carry out their work irrespective of the network connectivity status and required information is captured and synced once a reliable network connectivity is established.

Organizational Profile

Sterlite Power is a leading private sector power transmission infrastructure developer and solutions provider with projects covering approximately 13,700 circuit kms of transmission lines across India and Brazil. The company has a portfolio of high-performance power conductors, extra high voltage (EHV) cables, and optical ground wires (OPGW). The company provides bespoke solutions for the upgrade, uprate and fiberization of existing transmission infrastructure projects. It was the sponsor of IndiGrid, India's first power sector InvIT, listed on Bombay Stock Exchange Limited and National Stock Exchange of India Limited. The company was also recognized at The Economic Times Innovation Awards 2020 and is a recipient of awards from the International Project Management Association (IPMA).

"The solution has been helping us gain a significant advantage in winning bids and delivering unmatched outcomes in powerline route finalization projects. With Trans Analyst + CanvasR, the route optimization process takes not more than 3-4 days while providing better accuracy using continuous feed from the field. With these tools in place, we are looking at about 1-2% savings in costs in each project. The reason we chose Esri India as a partner for establishing this GIS ecosystem for powerline route optimization is due to the extensive support the company provides. The availability of resources, flexibility and the in-depth knowledge base are other factors that made the choice easier."

- Trilok Chouhan, AVP, GIS,
Corporate IT, Sterlite Power

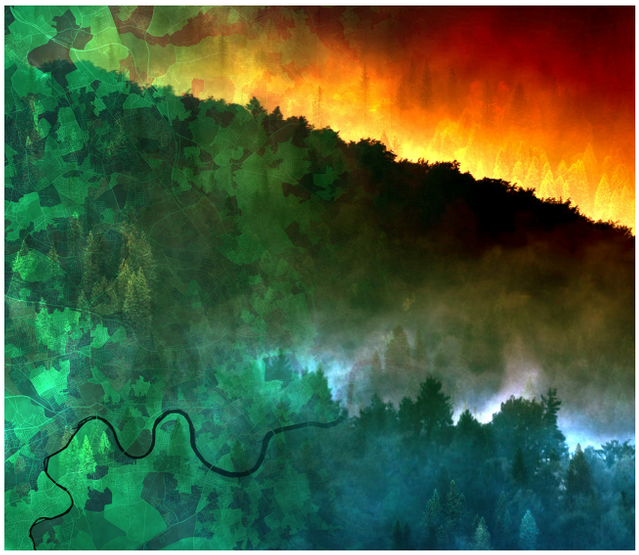
Product Review

Indo ArcGIS: GIS Solutions and Data Products Curated for India

Indo ArcGIS is a unique product, developed by Esri India to solve some of the most pressing social and business challenges the country is facing today. Indo ArcGIS includes 100+ solutions products and applications in the areas of Air Quality Index, Burnt Area Assessment, Carbon Sequestration, Disaster Management, Electric Utility, Forest Fire Management, Forest Incidents, Forest Plantation Management, Jal Jeevan Mission, Land Records Management, Locust Watch, PMGSY, Property Tax Management, Volunteer Registration, Water Connection Management, Water Quality Index, and more. Esri India is also providing 500+ layers of data through the Indian edition of ArcGIS Living Atlas to support these solutions.

Applications of Indo ArcGIS

Forestry



Forest Fire Management

- This Indo ArcGIS Solution is a workflow-based solution integrated with live feeds for preventing and mitigating forest fire spread.
- The solution provides automated and timely fire alerts with precise forest boundaries, leading to prompt action.
- Simple to use dashboards and apps for monitoring and mitigation of fires.

Burnt Area Assessment

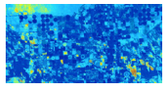
- This Indo ArcGIS Solution enables the forest administration to estimate the burn severity and damage caused by fires for a given area of interest.
- Helps in assessing the spread and impact of the forest fire.
- Aids in identifying forest fire hot spots.

Forest Plantation

- This Indo ArcGIS Solution enables the forest administration to view the status of forest plantations.
- Provides simple-to-use dashboards, web solutions, and mobile apps for all stakeholders for planning and monitoring forest plantations with real-time updates from field teams

Carbon Sequestration

- This Indo ArcGIS Solution enables the forest administration to estimate Carbon Sequestration
- Provides simple-to-use dashboards, web solutions and mobile apps for all stakeholders for performing tree surveys and generating reports.



Urban

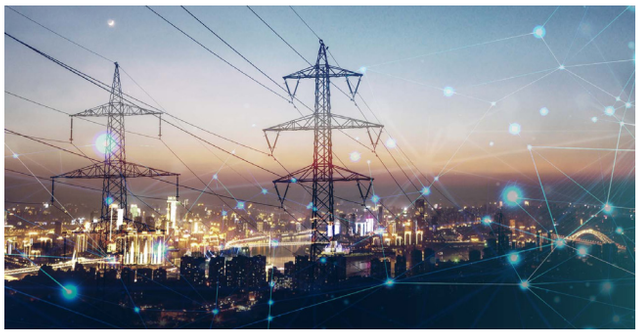
Property Tax Management

- This Indo ArcGIS Solution enables the city administration to easily check and collect authoritative information on all the properties under their jurisdiction.
- Allows authorities to calculate the tax amount based on a specific formula used by the city.
- Provides an interface to the public for calculating tax and incorporating applicable exemptions.
- Aids in generating reports.

24x7 Water Distribution Management

- This Indo ArcGIS Solution provides household maps with existing connections, gaps, and plans for new developments.
- Enables seamless access of information to all stakeholders for planning, operations, monitoring, and DSS.

Utility



Electric Utility Management

- This Indo ArcGIS Solution provides a comprehensive view and status of the distribution network.
- Includes tools to automate the process of data migration to a standardized and scalable data model.
- Enforces data integrity and reduces data entry errors.
- Provides ready-to-use tasks to perform common operations and validation checks, such as how many electrical assets & consumers are connected.
- Enables advanced analysis of your network.

Water Utility Management

- This Indo ArcGIS Solution provides a standardized data model based on Indian aspects.
- Includes tools to automate the process of data migration to the data model.
- Enforces data integrity and reduces data entry errors.
- Provides a comprehensive view and status of the distribution network.
- Includes ready-to-use tasks to perform common operations and validation checks.
- Enables applications based on UN Model.

HLS

Disaster Management

- This Indo ArcGIS Solution provides automated alerts and live feeds for active hazards and possible disasters.
- Helps in locating available resources for efficient disaster response and mitigation.
- Aids in assessing population and area under disaster impact.
- Provides simple-to-use apps for effective decision support in the middle of the crisis.

Volunteer Registration

- This Indo ArcGIS Solution provides an interface to the public for registering as a volunteer in case of disasters with location details.
- Enables disaster managers to check location-wise volunteers' offering status.
- Helps disaster managers to plan action as per the availability of resources.

Land Records Management

- This Indo ArcGIS solution enables the Revenue Department to review the status of the work progress of Khasra Girdawari (Harvest Inspection).
- The solution also enables the department to collect information on all the parcels under their jurisdiction with high accuracy.

Agriculture: Locust Watch

- This Indo ArcGIS Solution can be used to keep a watch and monitor the status of Locust movement.
- Provides real-time situation alerts and acts in an automated/semi-automated way to mitigate the impact and minimize losses.
- Aids in monitoring field force.

And Many More…

- Forestry – Forestry Geo-hub and Working Plans
- Forestry – Wildlife Geo-Hub
- Urban – City Geo-Hub with integrated IUDX
- Urban – Municipal GIS
- Government – Planning & Monitoring Dashboard
- Government – Education Geo-Hub
- Government – Health Geo-Hub
- Natural Resources – Agriculture Geo-Hub
- HLS – Disaster Management and Emergency Response
- Public Safety – Crime Analytics

Indo ArcGIS on Cloud

Indo ArcGIS is now also available on Cloud. This will provide the Indo ArcGIS users with the much needed advaantages of manageability, reliability, scalability, and cost efficiency.

Key Benefits of Indo ArcGIS on Cloud

- Reduction in the total cost of owning a GIS
- Single fixed annual fee
- No hassles of hardware procurement and upgrade
- Best-in-class secured cloud infrastructure from India data center
- Periodical backup and restoration, anti-virus services at no extra cost
- Setup and managed by Esri ArcGIS and Cloud experts
- India base map and data layers as a service included at no extra cost
- Ready to use configured industry solution products at no extra cost
- Accelerated GIS Deployment – ready-to-use

For more details, contact us at:

go.esri.in/indo-arcgis

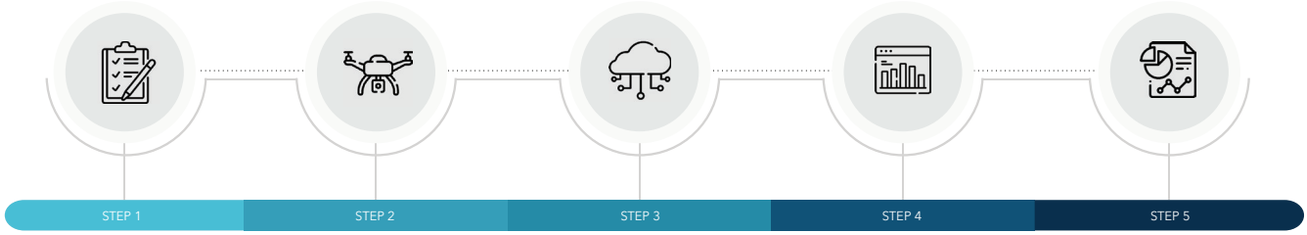
1800-102-1918

info@esri.in

esri India

Site Scan for ArcGIS

A complete drone mapping software fully hosted on India cloud.



Plan	Execute Autonomous Flight	Upload and Process in the India Cloud	Visualize, Analyze & Share	Publish Content and Perform Advanced Analysis

ArcGIS Knowledge

ArcGIS Knowledge is enterprise knowledge graph software that enables users to explore and analyze spatial, nonspatial, unstructured, and structured data to accelerate decision-making.

This is developed to seamlessly connect analysts to the data sources they need and the analytical tools they trust, ArcGIS Knowledge supports collaborative, all-source investigations and sharing of information across the enterprise. Analysts can visualize information through multiple perspectives, like maps, link charts, histograms, and entity cards, to solve spatial and nonspatial problems.

Entities in the model represent real-world objects, concepts, or events such as a harbor, a test plan, or a repair. Relationships in the model express how entities are associated with each other. Different transportation systems and the organizations and people who support them all meet at a harbor in different ways, for example. People, computers, and both physical and network resources are brought together to execute a test plan and assess the quality of the results. Customers, facilities, and supplies are all factors when repairing buildings, appliances, and transmission networks.

Benefits of ArcGIS Knowledge

Data Discovery Analysis: Discover, connect, and contribute to data from a shared graph store to reveal entities and the relationships that connect them. ArcGIS Knowledge makes it easier for multiple independent analysts to contribute data to be easily discovered by other analysts. All information in the graph is connected during the data creation process. With the data connected, analysts can see any data in the context of the whole organization's data.

Turnkey Graph Data Management: ArcGIS Knowledge provides a turnkey graph store that is fully integrated with your existing ArcGIS Pro and ArcGIS Enterprise investment and optimizes storage and retrieval of relationships between entities.

Flexible Deployment: As a user type extension to ArcGIS Enterprise and ArcGIS Pro, ArcGIS Knowledge provides a cost-effective and flexible way to add enterprise knowledge

graph analytics to your existing ArcGIS investment without adding new vendor technology.

Knowledge Graphs

A knowledge graph comprises people, places, or other types of entities and the relationships that connect them in a graph network, allowing users to see data in context and reveal patterns and relationships that may have previously been unknown.

ArcGIS Knowledge enables analysts to create, edit, interrogate, and analyze knowledge graphs to assist in investigations within industries ranging from AEC, Financial Services, Manufacturing, Oil & Gas, and Government.

How is ArcGIS Knowledge Architected?

ArcGIS Knowledge introduces a new Graph Store and ArcGIS Knowledge Server that users access within ArcGIS Pro. ArcGIS Knowledge allows you to create knowledge graphs backed by an ArcGIS Data Store graph store.

ArcGIS Knowledge Licensing

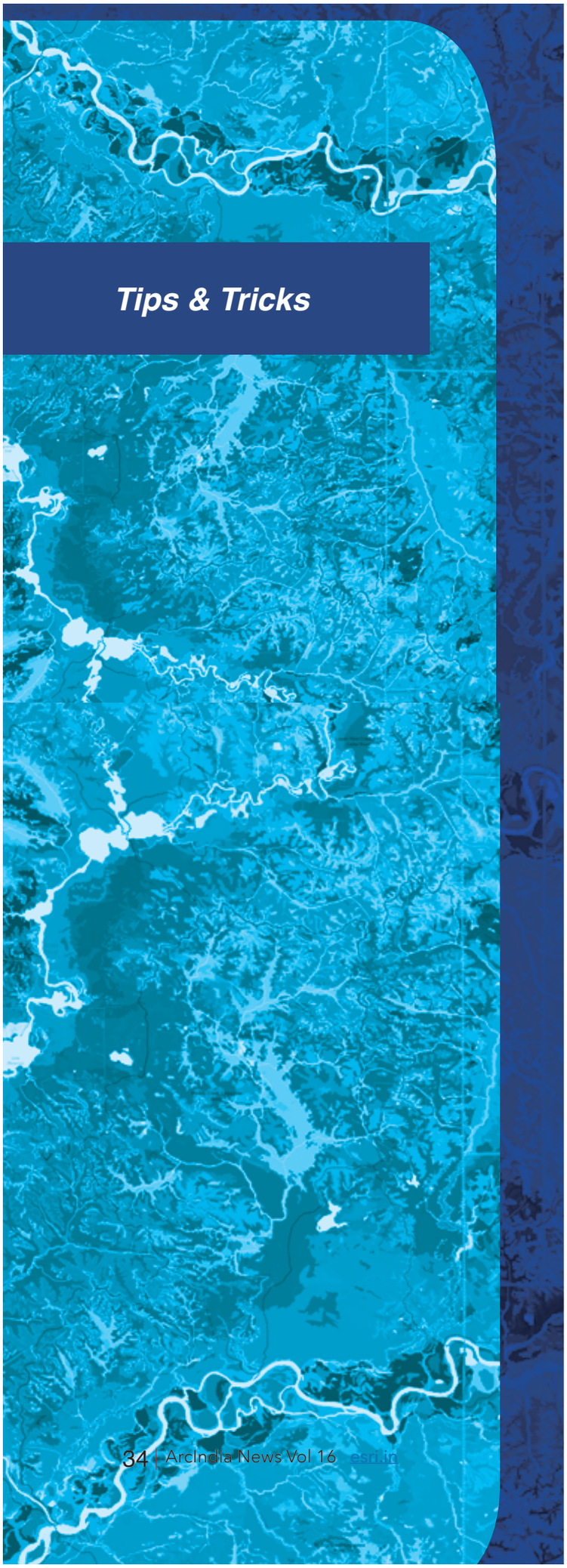
ArcGIS Knowledge is licensed as a user type extension (UTE). Customers require ArcGIS Enterprise 10.9.1, ArcGIS Pro 2.9, and a compatible user type to use. The ArcGIS Knowledge Server requires either an ArcGIS Enterprise Standard or Advanced license Knowledge Server is included with the purchase of the ArcGIS Knowledge user type extension.

License Types Compatible with ArcGIS Knowledge

- Users with view only capabilities do not require the Knowledge User Type Extension.
- Creator user type is required is required for users to create and manage knowledge graphs.
- Editor or above user type is required to contribute to and edit knowledge graphs.

The following user types are compatible with ArcGIS Knowledge:

- Editor
- Field Worker
- Insights Analysts
- Creator - to create and manage knowledge graphs
- GIS Professional Basic
- GIS Professional Standard
- GIS Professional Advanced

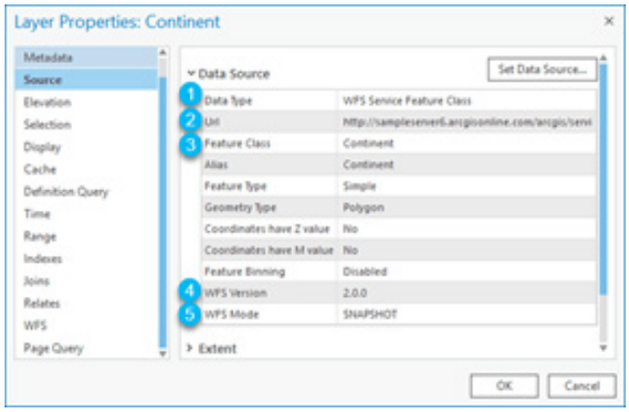


Tips & Tricks

Filter Data WFS in ArcGIS Pro

The Open Geospatial Consortium Web Feature Service (WFS) Interface Standard provides an interface allowing requests for geographical features across the web using platform-independent calls.

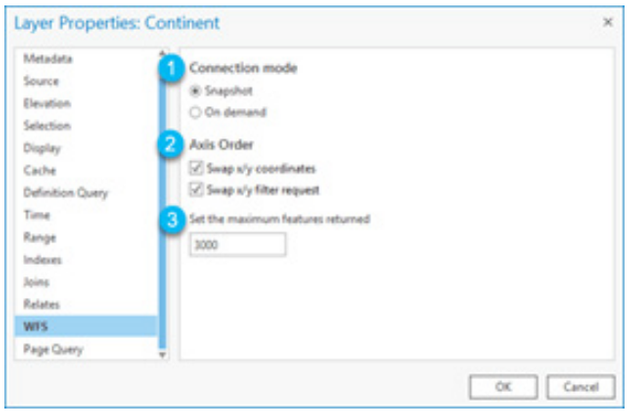
When you add a WFS layer to a map, it gets added with some default layer properties set. These default settings may not be the correct settings for your WFS layer so you may change them. To view or modify these properties, right-click the WFS layer in the Contents pane and click Properties.



Discover the Possibilities

Sometimes it can be helpful to apply a filter to our layers, so that only a subset of data is visualized. For example, we would want to focus on cities with more than 1 million inhabitants in a layer with world cities or focus solely on commercial zones in a layer with parcels. We will specifically look at applying filters to WFS layers.

There are 3 different methods to apply a filter to a WFS layer in ArcGIS Pro, going from the simplest method to a more advanced one. For the latter, it is useful to be aware of the structure of a WFS.



1. Apply definition query to WFS after adding layer

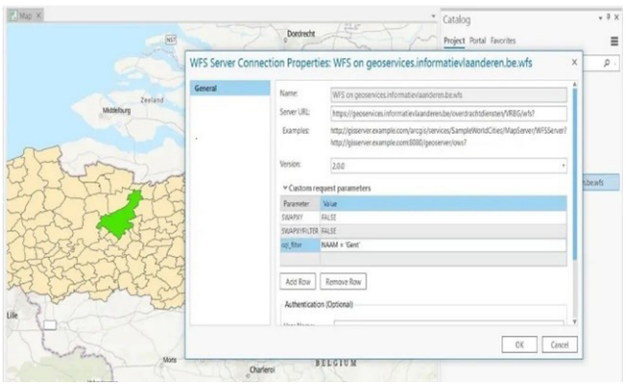
The easiest method is not specific for WFS layers, but can also be applied to your own feature layers. It concerns the addition of a definition query. A definition query contains several clauses that are written in the SQL syntax. Multiple definition queries can be created for one layer, but only one can be active at the exact same time.

To add a definition query on a WFS layer in ArcGIS Pro, you must first add the WFS through Connections to a New WFS Server. The WFS will then be added to the Servers folder in the Catalog pane. Next, choose one of the layers and add it to your folder in ArcGIS Pro. Once the layer is added, right-click it and select Properties. There you will find the Definition Query tab, where you can add multiple definition queries.

Note: However, this first option has the disadvantage that the filter is only applied after the WFS has been added to ArcGIS Pro. If we are working with large datasets, we obviously want the filter to be applied as soon as the connection with the WFS is set up, in order to avoid having to add layers with large amounts of data. Similar to communicating with the WFS via the URL, we can add specific parameters to visualize solely a subset of our data in the WFS.

2. Add CQL filter at WFS connection

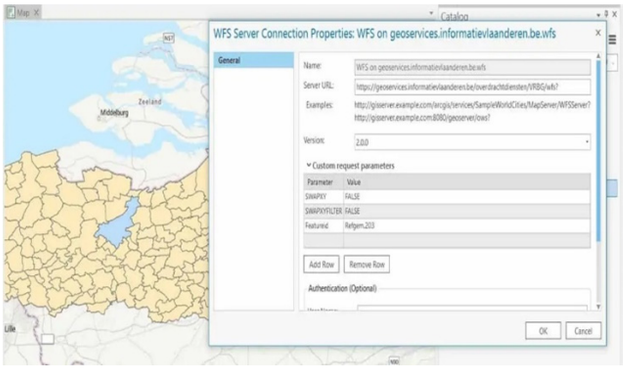
The best specific parameter to add is cql_filter. CQL is the query language specifically created by OGC, and is written in a familiar text-based syntax. When working with the URL of the WFS, this parameter is added at the end of the URL for the WFS, to filter down to the level of parameters in the attribute table. The same can be achieved by adding this parameter to the Custom request parameters when a WFS server connection is established in ArcGIS Pro.



3. Filter on specific Feature ID

The last method is very similar to the previous one. We just add another specific parameter when setting up a WFS connection in ArcGIS Pro. This parameter is FeatureID, the unique ID for each feature in the WFS.

This method is perfect if we are looking for a unique feature and immediately know the ID for this feature. However, this method is more complicated, as it requires an internal search in the WFS for the FeatureID before it can be used.



Limitations

There are some known limitations for the WFS client in ArcGIS Pro:

- WFS with transactions is not yet supported. The layer behaves as a read-only data source.
- Sharing the WFS layer as a web map from ArcGIS Pro is not yet supported.
- An imported .mxd file with WFS layers that were created using the ArcGIS Data Interoperability extension is not supported.
- WFS server connections that are created for version 1.0.0 only support using the snapshot connection mode.
- ArcGIS Desktop-based WFS services at version 10.5 or earlier require using snapshot mode.

Research Paper

Spatial Analysis for Gas Facilities

Mr. Peratla Sujith, Senior Engineer,
Cslt-Software Development, Verizon India

Design Considerations
How does it work?

Several key factors like an increase in gas usage, advanced technologies, pipeline incidents, and new regulatory requirements are triggering gas pipeline companies to transform their traditional gas leak operations to cutting-edge predictive analysis for asset management and risk analysis. For such risk-based asset management, data is foundational which we attain through field observations and knowledge over the assets. So as to create a definitive risk model, historic gas leaks, gas leak inspections and customer data is captured over the years, and this is squashed to derive significant conclusions. This is mainly helpful in correcting field data, focusing on pipeline safety and making necessary mitigation actions.

The current topic is one such foretelling approach to identify gas distribution pipes and customer meters that are at risk. This will have the ability to decide the service areas which are at potential risk by undertaking calculations on notable data. Based on such variety of data, key attributes for gas mains like – pipe age, pipe material, cathodic protection and so on are identified manually. Prioritizing these factors is challenging, but this is vital for identifying risk in that service area.

In addition to the conventional approach, this process leverages in defining weightage to each constraint based on its impact, there by calculating average weightage which is done using Tableau. The initiative has been implemented and tested on a client data with many of these parameters, and the results have been encouraging.

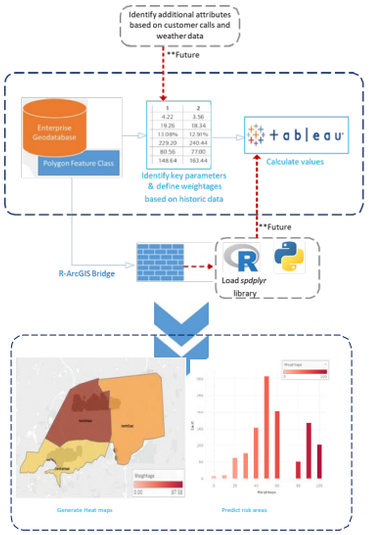


Fig: 1- High-level view of the solution

Once vital parameters are acquired, for each parameter, weightage is defined based on its impact. Later weightage calculations are achieved in Tableau so as to display the output in the attribute panel. This is prepared by creating custom fields in Tableau and then values are derived using the weighted average method. Average weightage is computed for each parameter independently. Such weightage factor is determined for all constants and finally, cumulative weightage for each gas asset is derived by summing up individual weights.

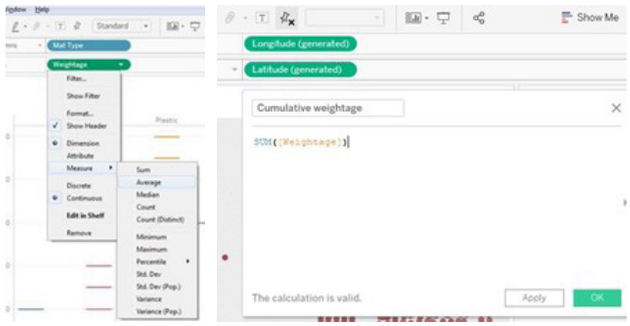


Fig: 2- Weightage calculation in Tableau

To scrutinize the data further, each parameter is mashed against its weightage and counted to rationalize its impact in its survey area. The following histogram shows how pipe material type, pipe coating type, and pipe condition influence the weightage in 'NorthWest' service areas.

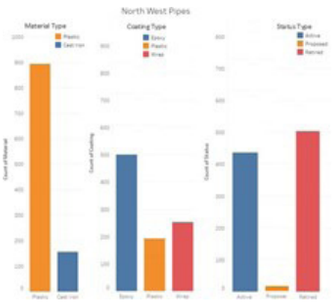


Fig: 3- Gas pipes in showing trends based on material type, coating type and status type

Using the above factors, we are able to detect the service areas that are prone to hazards and the same can be visualized in the map window. Below Figure 4, depicts the 'NorthWest' area as one such hotspot where there is a high probability of getting at risk.

Fig: 4- Map view and graphical view of different survey areas based on weightage (from gas pipes)

Areas that are in safe zones are displayed in different symbology. From the below map view, it is obvious that the 'CentralWest' region is not at high and the same can be visualized as below:

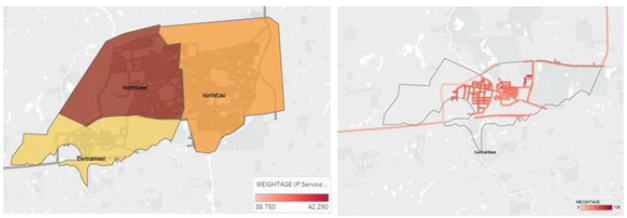


Fig: 5 - Map view of 'CentralWest' region based on weightage

The same output can be passed back to ArcGIS to generate a similar report which will help in identifying other gas facilities linked to those gas mains. A similar forecast is derived by calculating weightage based on customer meters in some service areas. Like before, identifying predominant meter parameters is required for decision making and it is derived from customer calls. Some parameters include - meter last inspected date, meter conditions, meter status, meter last painted to date, and so on are included for calculations. Weightage is derived from the archival data and the Map view show the 'NorthWest' region has more chance of being a danger zone. These weightages were transmitted to derive a histogram and the results are populated as per the below screenshot.

Fig: 6 - Map view and graphical view of different survey areas based on weightage (from meters)

This solution is designed based on gas facilities including gas facilities and customer meters. But apart from this list, climatic conditions (like humidity, temperature), soil conditions (like soil acidity, soil salt levels), third-party excavations and natural disasters etc. are some crucial factors that influence the predictive analysis.

The future capabilities (as indicated in Figure 1) are a lot more, and this will act as a foundation for all the future initiatives. One such leap is to perform all spatial calculations in R tool, since it provides spdplyr library with inbuilt capabilities for statistical computing and plotting output as required.

Key Functionalities Offered

The solution mentioned above can be embedded as a service offering in a variety of applications built on the Esri platform. It can be added as a Geoprocessing tool to support some of the key business operations which would include the following:

1. Asset management can efficiently calculate material costs for all the facilities in highly risky areas and find them quickly on the map.
2. Businesses can determine the service areas that are vulnerable to risks. Heat maps generated from this solution provide business intelligence for better planning.
3. Preventive maintenance operations can be performed based on the results by finding out specific areas geographically on the map.
4. The solution will address safety concerns to customers, by providing insights about the survey areas, gas facilities, and emergency evacuation routes and getting notified accordingly.

Conclusion

With the advent of different visualization techniques and third-party statistical tools, spatial analysis has taken a new leap. The solution connects to a diverse range of data sources to provide a predictive spatial model that will allow users to quickly and easily visualize the output spatially in the map view to take better decisions.

The solution can be expanded further to connect through R libraries and interpret information obtained from historic gas leaks, real-time data from field apps, and web services.

Want to get your research work with ArcGIS published? Share your **Research Paper** for consideration at marketing@esri.in

Partner Showcase

Economic Impact of Geospatial How Our Partners View It

Geospatial technologies are critical for economic growth. Advanced geospatial technologies are constantly empowering governments and private organizations to build a geospatial infrastructure that helps them plan policies and programs, automate operations, improve collaboration with stakeholders, monitor progress and analyse impact.

As per the Geospatial "Artha" Report, India's geospatial economy is growing at a CAGR of 12.8 per cent and is likely to grow to Rs 63,100 crore ($8.5 billion) by 2025. The Indian Government has been depending heavily on the use of GIS in various initiatives and programs and 2021, many new policies and guidelines were introduced, ushering in the much-needed reforms, which have now created a clear path for the growth of India's geospatial industry.

India's Growth Story with Geospatial Technologies

The geospatial industry can create a huge economic impact via employment generation, increased operational efficiencies, improved transparency and resource efficiency, better decision-making and cost savings.

As **Dr. Abhay Kimmatkar, MD, Ceinsys,** rightly points out, "The economy of a country grows with the optimum utilization of its resources. Geospatial technology, with the location advantage it provides, is key to ensuring and measuring the way the resources of a country viz. land, power, water, minerals, etc. are utilized. It helps identify areas of wasteful expenditure, optimised revenue recognition and maximum value realization per unit. For example, geospatial technology is the most important decision support mechanism in understanding the amount of land available, the availability of water in proximity, the type of soil and its characteristics, the weather conditions, etc. Integrating all these varied parameters can help understand the best crop suitable. This, when applied to a large number of land parcels, causes a huge improvement in the agricultural yield. We all are aware how reductions in losses in electricity, water, etc. can make a tremendous impact on the exchequer."

> Geospatial technology, with the location advantage it provides, is key to ensuring and measuring the way the resources of a country viz. land, power, water, minerals, etc. are utilized.
> ***Dr. Abhay Kimmatkar, MD, Ceinsys***

Reiterating the thoughts, **Santanu Chakraborty, VP – Sales, NeoGeoInfo** shares, "Geospatial or GIS solutions accelerate the value creation of the mission-critical projects. This is possible through rapid technological innovations in the fields of data acquisition and processing/modeling techniques that are extremely efficient and independent of human errors.

A simple example is how the ease of data capture using drones or the ability of satellites to produce incredible resolution images has made the land resurvey projects (pending for a long time in India) a reality now. Several state governments and the Survey of India are actively pursuing these projects. Land resurvey projects give accurate land parcel maps which in turn will be used to give property cards (conclusive rights on the land) to the respective owners. These conclusive rights on land will not only improve our ease of doing business index but also enable the people to participate in a thriving economy. Of course, this is easily relatable and simple, but there are engineering and navigational applications (it is estimated that effective and efficient navigational/PoI data improves the GDP by 10 to 13%), whose impact can't be directly relatable, but it's much more significant than my land resurvey example."

> Geospatial or GIS solutions accelerate the value creation of mission-critical projects. This is possible through rapid technological innovations in the fields of data acquisition and processing/modeling techniques.
> ***Santanu Chakraborty, VP – Sales, NeoGeoInfo***

Jake Jacob, Head-GIS, ULTS, adds, "Geospatial analysis is being adopted as a great decision support system in every walk of life. From enabling us to travel faster through shorter routes to saving precious resources like water and power and even saving lives in a pandemic or natural disaster, geospatial is an integral part of every informed decision. In each of these aspects, there is an obvious economic impact since money is after all a translation or an extrapolation of time and material resources. If we can shorten the time spent and reduce the utilisation of resources whether human or material, it will manifest in saving money. Hence, it's time that the government departments adopted this great tool to save precious money which can save the national economy and help it prosper. From tracking traffic to saving people from looming catastrophes, geospatial is enabling the world to move in a faster, more convenient, and safer way. As an industry, Geospatial services generate US$400 billion in revenue per year. However, their total economic contribution is several times higher."

> Geospatial is an integral part of every informed decision. Hence, it's time that the government departments adopted this great tool to save precious money which can save the national economy and help it prosper.
> ***Jake Jacob, Head-GIS, ULTS***

According to **Irfan Choudhry, CEO, Genesis Ray Energy**, "India has long been a leader in using modern geospatial technologies, whether we speak of its remote sensing satellites program that started way back in the 1980s or 2000s when it took steps toward designing a National Spatial Data Infrastructure. Most recently in 2021, India came up with a draft geospatial policy that aims to boost geospatial entrepreneurship for the socio-economic development of India. Already we have been seeing widespread adoption of GIS at the government level for policy formulation in various domains such as land management, utilities, urban development, agriculture, energy, and telecom. In particular, the use of GIS is revolutionizing sustainable development in urban planning, utilities, transport, and land administration for better compliance, and operational transparency."

He further adds, "As India moves towards the target of 450 GW renewable energy by 2030, the quest of finding suitable wind and solar sites using GIS and other geospatial technologies will only grow from here onwards. Similarly, driven by key national mission mode programs, such as Smart Cities Mission, AMRUT, and the Housing for All by 2022 mission, GIS is making a significant impact in the urban development sector. In transport, the recently launched Gati Shakti – the National Master Plan for Multi-modal connectivity - is leading the GIS adoption in the sector, whereas, with schemes such as SVAMITVA, the Ministry of Panchayati Raj is utilizing GIS for land administration to provide rural citizens the right to property documentation."

> The use of GIS is revolutionizing sustainable development in urban planning, utilities, transport, and land administration for better compliance, and operational transparency.
> ***Irfan Choudhry, CEO, Genesis Ray Energy***

Vinay Simha, Founder, SkyServe adds value to the thought by sharing, "India is a land of many cultures, many states with diversity and uniqueness going hand in hand. Due to the expansive population and its needs, geospatial information is one of the best inferencing data sets to address commercial, tactical and strategic needs. For example, we are a price-sensitive nation feeding a billion lives, inflation is a key aspect here, if the government and agencies had a live onion produce dashboard, they can trigger actions before it becomes a big issue. In such case, geospatial data plays a key role."

> Due to the expansive population and its needs, geospatial information is one of the best inferencing data sets to address commercial, tactical and strategic needs.
> ***Vinay Simha, Founder, SkyServe***

Shitanshu Jain, Strategy Consultant - Digital Construction, Capricot Technologies echoes the thoughts by sharing, "India is a diverse country with multitudes of levels - Country, State, District, etc. For a steady and healthy national development, there is a need for a scientific and quantitative analysis of the economic, social, demographic and environmental characteristics among all levels of government across the regions. The application of

GIS technology in economic development plan can ensure the supply of accurate and quantitative information required for decision making."

> The application of GIS technology in economic development plans can ensure the supply of accurate and quantitative information required for decision -making.
> ***Shitanshu Jain, Strategy Consultant - Digital Construction, Capricot Technologies***

Parkshit Das, Director- Geospatial Sales, Emitech Infosystems, presents an interesting view on the subject by saying, "Government and industries rely on GIS for planning, development, analysis and decision making. GIS has evolved to become a technology that can, not only meet industry-specific business needs but can also potentially change the way business decisions are made. Enterprises have integrated other systems like ERP, CRM, and BI with GIS for greater insights into their data and business Decision-making. Today, a lot of organizations are sharing their work and creating billions of maps every day to tell stories and reveal patterns, trends, and relationships about everything. As GIS continues to evolve and integrate technologies such as Big Data, IoT, and Artificial Intelligence, its role is becoming more instrumental than ever in the digital transformation of the country."

> Enterprises have integrated other systems like ERP, CRM, and BI with GIS for greater insights into their data and business decision-making.
> ***Parkshit Das, Director- Geospatial Sales, Emitech Infosystems***

Reiterating the importance of geospatial technologies, **Thiyagarajan Deivasigamani, MD & CEO, Redleaf Technologies shares, "** Geospatial technologies are playing a very vital role in the complete operations of government sector. By using GIS for planning, government departments are able to achieve better efficiency and reduced costs along with many other benefits. GIS brings in acceleration, e.g., planning tasks that used to take a few days to complete earlier, can get completed within a couple of hours using GIS. That's the difference GIS is making. Many operational tasks which were not possible traditionally are also becoming possible with GIS. We are seeing innovative solutions using GIS, for instance, GIS-based solutions that are strengthening the defense capabilities of the country."

> GIS is a cutting-edge technology providing much more intelligent insights than before. So, we are leaping forward not only economically but in several other areas using GIS.
> **Thiyagarajan Deivasigamani,**
> **MD & CEO, Redleaf Technologies**

Conclusion

The viewpoints shared by some of our esteemed partners indicate that geospatial technologies like GIS are vital enablers of India's economic growth. However, a lot remains to be achieved. The adoption rate of geospatial technologies needs to increase to make a credible impact. While sharing success stories is a wonderful way of spreading the word, it is necessary to raise awareness, work towards building a skilled workforce, strengthen the policies and solidify public-private partnerships for more concrete outcomes.

esri India

Esri India Technical Services

Experience the best of Esri technology along with the best of technical expertise.

Email Support

customercare@esri.in

Support Helpdesk

Toll Free: 1800 - 102 - 1918

(9:00 a.m. - 5:30 p.m. IST, Monday-Friday)

Online Support via My Esri*

esri.in/tech-support

* Online support on My Esri portal is enabled for Esri products only. Support for partner products e.g. ENVI and ArcFM is available via email and telephone.

Esri India Technologies Private Limited

(erstwhile Esri India Technologies Limited)

10th Floor, Max Towers, Sector - 16B Noida - 201301, Uttar Pradesh (India)

Toll Free No. 1800-102-1918 | Email: info@esri.in | Web: esri.in

esri India