



# Newsletter

Volume VI | March-April 2023



Theme: Architecture, Engineering, and Construction

## From the President's Desk

The Architecture, Engineering, and Construction (AEC) industry has undergone a radical transformation in recent years as a result of technological advancements. Building Information Modeling (BIM) and Geographic Information Systems (GIS) have developed as two crucial technologies that are especially important to address the prevalent challenges in the sector.

While the former involves the effective organization of huge volumes of AEC data and rich 3D visualization, the latter enables the simpler study of spatial patterns and correlations on large scales. This combination of spatial and non-spatial information in a single environment is helping drive innovative solutions to overcome sectoral challenges like supply chain delays, shifting regulatory requirements, resource shortages, and rising costs.

The novel concept of Digital Twins has evolved as a result of this ability to display and analyze the data in integrated GIS and BIM environments. Complete physical environments may be modeled digitally, allowing stakeholders to see and assess any planned changes and additions before taking concrete action. Project teams are becoming more effective and productive with the use of cloud-based technologies, IoT, real-time rendering software, and virtual and augmented reality tools. The progress of the AEC sector toward technological integration is opening the floodgates to innovations in design and construction processes. This creates a significant potential for the Geospatial industry as well to engage with companies in the AEC sector and drive intelligent solutions.

At AGI, we are aware and appreciative of the critical role that Geospatial and allied technologies play in sustainable project delivery in the AEC industry. As the voice of the Geospatial industry in India and a thought leader in emerging technologies, AGI dedicates this issue of our newsletter to the theme of Architecture, Engineering, and Construction. Through this newsletter, we aim to shed light on the significant role of Geospatial tools and technologies in the contemporary AEC landscape along with thoughts, best practices, and case studies from the AGI member ecosystem.

We hope this Edition comes across as insightful and enjoyable. Stay tuned for more insights, stories, and analyses from AGI in the coming months.

Enjoy Reading!

**Pramod Kaushik**  
President, AGI



## In this Issue

President's Message

1

*Interview*

**Mr. Pradeep Rathor,**  
Managing Director and  
CEO, AllTerra India

2

*Interview*

**Mr. Sameer Divekar,**  
Executive Vice President,  
CP Kukreja Architects.

4

*Special Feature*

**Geospatial Technologies  
Addressing Key  
Challenges for the AEC  
Industry**

6

*Article*

**Esri India**

8

*Article*

**Hexagon**

10

*Case study*

**Ceinsys**

12

*Product Portfolio*  
**Nebula Cloud**

14

Updates from AGI

16

# When integrated within a project lifecycle, Geospatial sensors and software allow the stakeholders to better plan, design, and manage construction projects.

Maintaining timelines and improving the efficiency of the project is one of the major benefits of using a Geospatial workflow, notes **Mr. Pradeep Rathor, Managing Director and CEO, AllTerra India.**



**About the Organization:** Founded in 2018, AllTerra Solutions LLP India is recognized for Promoting and Curating Solution Specific workflows in building India Infrastructure projects like High-Speed Rail, Metro, Airport Expansion, Seismic Exploration, Highways, Defence & Defence Research, etc. AllTerra India represents Trimble, an Industrial Technology company, and helps users reach new levels by connecting Information, Positioning, and Communication.

**AllTerra is Trimble's globally trademarked brand for distribution partners focusing on delivering Trimble's world-leading technology to surveyors and geospatial professionals. How do you view the confluence of Geospatial with the Architecture, Engineering, and Construction (AEC) sector?**

We, at AllTerra India, view the confluence of geospatial technology with the AEC sector as a promising development that can greatly enhance the efficiency and effectiveness of various aspects of construction and infrastructure projects.

One of the key benefits of Geospatial technologies is that they provide a comprehensive view of the project site, allowing architects, engineers, and construction professionals to make informed decisions throughout the project lifecycle. When integrated within a project life cycle geospatial

sensors and software allow the stakeholders to better plan, design, and manage construction projects by providing them with accurate and up-to-date progress. By using advanced surveying, scanning, and modeling tools, it is now possible to not only create highly accurate 3D models of the project site but also identify potential challenges and opportunities before construction begins.

Maintaining timelines and improving the efficiency of the project is one of the major benefits of using Geospatial workflow which reduces the need for manual processes and increases automation. For example, using drones to conduct inspections can save time and improve safety by reducing the need for workers to enter hazardous or hard-to-reach areas. Furthermore, Geospatial sensors can help improve the safety of construction sites by providing real-time data on various parameters such as vibrations, ground movements, weather conditions, etc. This can help identify potential risks and allow for prompt response in case of an emergency.

Overall, this confluence of geospatial technology within the AEC sector has the potential to revolutionize the way that construction projects are planned, designed, and executed. AllTerra India is leading this fusion where we have successfully implemented and deployed the solution bundles on various landmark construction projects where time, productivity, and accuracy play a pivotal role. We are committed to

helping our clients leverage Geospatial technologies to drive opportunities and growth in the AEC sector through a wide range of solutions, including surveying equipment, 3D scanning, BIM modeling tools, etc. that can be customized to meet the specific need of a project.

**Some of the major challenges faced by surveyors in the pre-construction stage include low productivity and poor workflows in the field, and limited options for collaboration between the field and office. How are your products and solutions helping address these challenges?**

Trimble Geospatial products and solutions are designed to help address the challenges faced by surveyors in the pre-construction stage, specifically related to low productivity, poor workflows, and limited collaboration options. Here are some examples of how Trimble Geospatial products and solutions can help.

- **High-accuracy positioning & data collection:** Trimble offers a range of high-accuracy positioning solutions, such as best-in-class GNSS receivers, high-end Total stations, and laser scanners, which can help improve the accuracy and efficiency of data collection on

the field augmented with Trimble Access field software. This can help improve productivity by reducing the time spent on manual data entry and paper-based workflows.

- **Real-time collaboration:** Trimble Connect is a cloud-based collaboration platform that allows field operatives to share and collaborate data in Realtime with the office. This helps improve collaboration between field and office staff, allowing for better coordination and faster decision-making.
- **Integration with design software:** Trimble solutions (Trimble Tekla) are designed to integrate with a range of design software, such as AutoCAD and Revit. This allows surveyors to easily transfer data between the field and office and ensure that all stakeholders have access to the same information, reducing the risk of errors or any communication gap.

By mitigating the gap between Field and Office the solutions not only create Digital Footprint but also help in creating an ecosystem where all the Stake Holders and Vendors work on a common platform. AllTerra India comes with the expertise of this fusion and we handhold our visionary clients with the Service, Support, and Installation of these Solutions.

**For large-scale construction projects, or projects involving heavy construction equipment, accuracy, and safety are extremely critical yet complicated factors. How can positioning and orientation technology benefit such situations?**

Positioning and orientation technology can play a critical role in large-scale construction projects or projects involving heavy construction equipment by improving accuracy and safety. Trimble offers a range of solutions to help address these challenges, including the following.

- **Machine control systems:** Trimble's machine control systems use positioning and orientation

technology to guide heavy construction equipment, such as excavators and bulldozers, with millimeter-level accuracy. This helps improve safety and reduces the risk of accidents, while also improving efficiency and productivity.

- **Augmented Reality:** Trimble's SiteVision platform uses augmented reality to provide a visual representation of construction plans and designs, overlaid on the real-world environment. This can help improve accuracy by allowing construction crews to visualize the exact location and orientation of the Design. This also helps visualize whether any equipment will clash with existing infrastructure before construction begins, reducing the risk of errors.

**The Scan-to-BIM concept is gaining rapid momentum for AEC projects. How are LiDAR solutions poised to shape Scan-to-BIM in the coming years?**

LiDAR Scanners capture large amounts of data quickly and efficiently, reducing the time and cost required for data collection. It can simultaneously emit multiple laser beams to measure the distance between the sensor and the object, thus realizing the scanning of three-dimensional space. 3D data allows for more precise and detailed BIM models.

LiDAR sensors capture data from a safe distance, reducing the need for workers to enter hazardous or hard-to-reach areas. This can help improve safety on construction sites and reduce the risk of accidents.

Trimble offers a range of BIM software solutions, such as Tekla Structures and SketchUp, that integrate and consume Laser Scanner data for As-Built Analysis and Design to As-Built Deviations. This not only helps streamline the Scan-to-BIM process by enabling the direct transfer of data from the field to the office, reducing the risk of errors or rework but also generates a Digital Footprint towards the Maintenance and retrofit jobs of an asset.

**Given the vulnerability of buildings situated in disaster-prone zones, it becomes important to monitor their performance against vibrations, ground movements, extreme weather conditions, etc. to identify potential failure modes. What role can Geospatial and allied technologies play in this regard?**

Geospatial and allied technologies can play an important role in monitoring the performance of buildings and assets situated in disaster-prone zones, by providing real-time data on various parameters such as vibrations, ground movements, and weather conditions. Here are some ways in which these technologies can help.

- **Structural health monitoring:** Geospatial technologies such as LiDAR and photogrammetry can be used to create detailed 3D models of buildings, which can then be used for structural health monitoring. By comparing data from different time periods, engineers can identify potential failure modes and take corrective action before any failure occurs.
- **Predictive analytics:** Geospatial technologies can also be used to analyze large amounts of data to identify patterns and trends that could indicate potential risks or failure modes. This can help engineers take proactive measures well in time. Geospatial technologies can be integrated with decision support systems to provide real-time information on building performance and potential risks.

Trimble offers a range of Geospatial technologies and solutions that can be used for structural health monitoring and disaster risk reduction. AllTerra India along with Trimble share the vision of making processes simple, taking preventive measures, avoid catastrophic casualties in events of failures well in time.

We at AllTerra India are working towards becoming the go-to Solutions Provider in India complimenting the Trimble vision of Changing the Way the World Works, because it is often said "We cannot Manage what we cannot Measure".



# BIM and GIS allow us to reduce the margins of error and help simulate various possibilities of the kind of built environment we're trying to create.

The confluence of BIM and GIS has potentially changed the way the Architecture, Engineering, and Construction industry functions, notes **Mr. Sameer Divekar, Executive Vice President, CP Kukreja Architects.**



**About the Organization:** Started in 1969 with a vision to redefine architecture and planning in India, CPKA is one of the most revered architectural firms in the country. A multidisciplinary architectural firm based in New Delhi, India, CPKA has a portfolio of 1000+ projects, 200 + employees and has worked with clients from more than 30 countries in the last 50 years of practice. The firm is ranked among the Top 100 architecture firms in the world and the Top 5 in Asia.

**As the head of one of the leading architectural practices in the country, how do you view the confluence of BIM and GIS for solving existing challenges in the AEC industry?**

The confluence of BIM and GIS has potentially changed the way the Architecture, Engineering, and Construction industry functions.

BIM and GIS have inherently helped us with better communication, improved the day-to-day project coordination, and relatively boosted the process of making decisions in a precise manner. The integration of the two has enhanced research and analysis for projects with the help of simulated scenarios that show the impact our structures have on the surrounding environment, all in 3D.

The multidisciplinary nature of our work calls for efficient coordination and hence BIM and GIS in unison help the workflow function more effectively while reducing the chances of delays and errors.

**What are some of the key challenges preventing the wider adoption of BIM and GIS in architecture?**

- **Availability of trained workforce:** Since BIM and GIS need advanced software training, trained resources are not easily available.
- **Higher setting-up time:** BIM and GIS need diverse decisions to be made upfront, and thus, the initial time required to set up the project is higher. Sometimes this may challenge the client's expected timelines.
- **Adapting to the switch:** A lot of professionals aren't adept at or even aware of the latest developments in the field. They tend to prefer the traditional tools of design.
- **User Friendliness:** Using BIM and GIS software is a bit difficult for non-technical personnel as it takes them a while to get used to being efficient with these tools.

- **Expensive Set-up:** GIS and BIM require a considerable initial investment and that might be a challenge for smaller architectural offices. Even training employees in the same ends up being a costly affair.
- **Limited Access:** High-quality GIS data is limited.

**CPKA is considered an expert in master planning projects as well, with projects like East Delhi Hub Karkardooma, Pragati Maidan Redevelopment, Air India Colony Redevelopment, JNU, and more to your credit. How do you leverage GIS and allied spatial tools for such projects?**

GIS and other spatial tools can be highly valuable in master planning projects as they allow for the visualization and analysis of complex spatial data.

We used GIS and allied spatial planning tools to collate data, which assisted us with transportation analysis while designing East Delhi Hub - India's first smart transit-oriented development designed in association with IDOM, Spain. It helped us understand the spatial context through the simulation of various maps, which further helped us conceptualize the ideal planning strategy.

**CPKA also has quite a few transportation hub designs to its credit, including the Gomti Nagar Railway Station Redevelopment, the Airport Delhi Metro, and the Inter State Bus Terminal Anand Vihar. What kind of spatial analysis goes into the design of such transport facilities?**

Spatial analysis has played a vital role in the development of most of our transport facilities. We try to analyze the passenger flow, which involves the avoidance of bottlenecks or points of congestion. While designing the metro/railways systems we try to understand how various lines intersect, the frequency at which the trains/metros pass by and what is the footfall like during peak hours. Since we're dealing with complex mechanical systems in unison, we ensure that our designs have a provision for emergency evacuation procedures, fire safety measures, and crime prevention strategies. All our designs are rooted in sustainability and hence we consider factors like the AQI, noise pollution, clean energy consumption, and a reduced carbon footprint.

**How do you view the concept of GeoDesign – combining Geography and Design for buildings with a focus on natural systems, topography, and landscapes – for city planning? What challenges do architectural practices like yours currently face in implementing GeoDesign principles?**

Approaching city planning with Geo-Design ensures the inclusion of sustainability, liveability, and resilience in our urban environments. Hence as planners, we are aided in visualizing, analyzing, and communicating intricate spatial data that enables us to make better decisions in landscaping and urban planning.

**APPROACHING CITY PLANNING WITH GEO-DESIGN ENSURES THE INCLUSION OF SUSTAINABILITY, LIVEABILITY, AND RESILIENCE IN OUR URBAN ENVIRONMENTS.**

**The COVID-19 crisis has accelerated the need for digitalizing construction practices in the country, more so in areas like data sharing, coordination, and progress monitoring. What technological advancements have you adopted or look forward to adopting in the near future in this regard?**

As architects, we are constantly looking to update our means of communication with our clients. Our field calls for distance learning as we have various teams operating from various locations. This calls for innovative solutions in executing most of our designs. We use augmented and virtual reality tools to show our spatial planning to our clients without really taking them to a site. Artificial intelligence helps us with data analysis.

BIM and GIS allow us to reduce the margins of error and help simulate various possibilities of the kind of built environment we're trying to create. Drones have allowed us to capture an overview of progress on our massive sites on a day-to-day basis. These are just a few of the many tools we have used to constantly update our methods of delivering projects to our clients.



*East Delhi Hub, Kakardooma by CP Kukreja Architects; Source: CPKA and IDOM Spain*



## Special Feature

# Geospatial Technologies Addressing Key Challenges for the AEC Industry

Sakshi Singh

Short for Architecture, Engineering, and Construction, “AEC” refers to the industry that deals with the design, planning, structure, and maintenance of built environments. What drives the industry is the need for mass data, including static and dynamic, historical and current, geometric and semantic. This data is used across planning, design, implementation, and management stages and comprises site maps, project schedules, engineering diagrams, and numerical figures such as cost estimates.

However, this data often gets lost between the many construction or infrastructure development stages. The reason? A lack of consistent mechanisms to help manage it.

Adding to these data gaps is the issue of constrained data flow due to siloed project stages resulting in fragmented inputs across the board. Combined, data gaps and rigidities snowball into bigger issues of miscalculated costs, shoddy planning, subpar planning, and neglected dangers.

## Is Technology the Answer to AEC Challenges?

A study by the EU BIM Task Group suggests that productivity in the construction industry is languishing, ranking above only the oil & gas industry. Productivity in the sector has, in fact, been continuously declining since the 1960s.

Not surprisingly, the study also found a direct correlation between industrial productivity and digital advancement. Although the AEC industry has historically been slower than others to adopt new paradigms like digitalization and capitalize on their advantages, its potential benefits cannot be ignored.

**Computer-Aided Design (CAD)** has ushered in a new era of digitalization of engineering drawings and computer graphics, taking construction documentation to the next level. **BIM solutions** help AEC professionals collaborate online anywhere, anytime, thus reducing errors and enhancing project outcomes. Using BIM, AEC

teams can also mimic energy use to design energy-efficient buildings. IoT and sensors can be used to track and improve a building’s energy efficiency along similar lines.

**Virtual and augmented reality technologies** make it possible to view designs and simulate construction scenarios even before a project commences on site, helping teams spot problems earlier and make better decisions. **Automation and robotics** are helping increase the efficiency at sites, freeing up human workers from monotonous chores so they can work on more difficult occupations. **Drones** are being used to examine structures and track the development of construction projects digitally. **AI and ML** are helping AEC professionals identify possible issues and analyze insights early on to take corrective measures on time.

## Where do Geospatial Technologies Fit In?

Interestingly, Geospatial technology has emerged as a fundamental

technology layer rendering all the above applications (and beyond) possible. “Geospatial technology lays the foundation for planning from the periphery and at the core,” noted **Dr. V. R. Hegde, Executive Director, Pixel Softek**, during the AGI-Christ University GeoBIM Workshop on Geospatial Technologies in Digital Construction. “Digital construction using Geospatial technology translates into making the built environment safer, efficient, and collaborative, ensuring a better outcome at every stage of the asset lifecycle.”

Here are some ways in which Geospatial technologies are accelerating the AEC industry’s digital transformation:

### Contextualizing Projects for Better Planning

The convergence of BIM and GIS has unlocked a better understanding of projects by contextualizing them to real-world settings to improve accuracy and remove discrepancies. Digital twins are making it possible to supervise AEC projects in real-time through accurate replicas of the real world to connected screens. This enables all stakeholders across the value chain to cooperate and solve challenges by looking at the picture of projects, assets, processes, and systems at once.

### A Common Data Environment for Smooth Workflows

One of the key requisites to tackling the aforementioned issues facing the AEC industry is data interoperability. It facilitates digitalization throughout project workflows without having to rely on isolated siloes. Integrated BIM+GIS systems can be leveraged for end-to-end data interoperability and the creation of common data environments for efficiency in people, tools, and process management.

Additionally, GeoBIM can guarantee data consistency from one building stage to the next and stop the loss of important data in between. For instance, the [Building Permit Department of the Ajman Municipality in the UAE](#) was able to digitalize its building permission process using BIM and GIS.

### Localized Simulations for AEC Decisions

Geospatial technologies allow AEC decision-makers to combine geographic and geometric attributes, merge BIM plans and models into spatial mapping layers in GIS, and make localized simulations for better-informed decisions.

“When you plan a building using GeoBIM, you can immediately visualize how it is going to look with the actual skyline, views from surrounding rooftops and levels, giving a precise idea of how your structure will look like in the particular setting,” shared **Mr. Sumit Thapa, Technical Manager, Hexagon** at the AGI-Christ University GeoBIM Workshop. “You can also see how well your planned site is incorporated with the existing landscape of the area, how structures and roads are placed with respect to utilities like high-tension wires, tunnels, and so on, and if any corrective measures need to be taken.”

### Project Implementation and Monitoring

Geospatial technologies and information can help AEC professionals manage otherwise poorly managed operations like supply chain and schedule management, project time control models, on-site coordination, and clash detections much better, thanks to the availability of as-built data. Timely and correct information can be shared in real-time with all stakeholders. Instantaneous data sharing enables far better coordination and decision-making across stages.

### Building and Infrastructure Maintenance

One of the most relevant applications of the BIM-GIS combination is felt in the operation and maintenance phases. Allied with other technologies, GeoBIM can enable full-fledged building management systems, allowing the capture of changes and discussions around them in real-time. Integrated BIM models within a thorough geoinformation system can bring all pertinent architectural, engineering services, spatial, and semantic data onto a single platform for quick action.

### Sustainable Development Practices

Factors such as population increase, climate change, migratory patterns, demographic shifts, and so on, can be accounted for using spatial analysis and location intelligence to understand the relevance, placement, and impact of projects. Scalable GeoBIM platforms can also facilitate compliance checks in line with development regulations, automate the process of obtaining building permits, and make it easier to monitor and assure sustainable urban growth despite the influx of data from many sources.

### What the Future of a Pro-Technology AEC Industry Looks Like?

At this stage, one has to talk about the impediments to the mainstream adoption of BIM+GIS integration in the AEC sector as well. The lack of understanding and acceptance of such an integration in the mainstream is the first, and maybe the most significant, issue that needs to be addressed.

Many in the field are still in doubt because the relatively new concept of GeoBIM is still mostly limited to the early P&D phases of 3D visualization and Detailed Project Reports (DPRs). As a result, they are hesitant to adopt and support the technology throughout its whole lifecycle. The lesser the awareness of GeoBIM’s benefits, the lesser its adoption in the mainstream, and the longer it will take for the AEC industry in India to embrace Geospatial-powered digitalization.

The need of the hour is to talk more about the Geospatial approach and its multiple advantages, and for AEC project authorities, owners, architects, and engineers to focus on its urgent need. Promoting wider adoption of the technology is important, and this must be done with the help of policies and mandates, public-private and business-to-business partnerships, and on-the-ground training.





# Contextualizing Location Intelligence for Smarter Infrastructure

Driven by Capital, Creativity, and Customer (3Cs), Indian Architecture, Engineering, and Construction (AEC) industry has a defining role to play in steering India's '\$5 trillion economy' vision.

But AEC industry is faced with complex challenges. Infrastructure projects are not restricted to construction alone. Landscape, access, utilities, amenities, natural resources, and their impact on the local environment and ecology are integral aspects. Increasingly AEC industry is being tasked to strike the right balance between the economic, social, and environmental factors revolving around infrastructure projects.

As one of the most disaster-prone nations in the world, disaster risk to projects due to natural hazards is considerably high. Infrastructure projects are not just capital intensive with 30% wastage, 40% rework, and significant schedule overruns, the industry also accounts for 39% of energy consumption and is responsible for 19% of GHG emissions.

As digital interventions make their way into the AEC sector, activities can no longer be carried out in isolation. Being myopic to the construction sites alone is no longer tenable. The need for contextual understanding to demystify

the interdependencies and linkages in the infrastructure environs is greater than ever. Geo-enabling the AEC value chain provides builders with better control over their outcomes while ensuring the right balance between social, economic, and environmental aspects.

Integrating GIS with building information management (BIM) facilitates better contextualization of the infrastructure and its environs. Breaking down the data silos and unifying all the information on a common platform by contextualizing location can radically transform AEC workflows, helping builders to deliver projects in a timely and cost-efficient manner, while taking cognizance of the disaster risks and other safeguards.

## One platform for AEC

Esri India's AEC solutions provide firms with a "single point of truth" through one platform for managing the entire AEC lifecycle. Not just improving efficiency and productivity, it also aids in demystifying the complexities and unearthing cost leaks and redundancies. By mapping a common ground, ArcGIS AEC portfolio enables all AEC stakeholders to harness the power of location intelligence for insights that are timely and actionable for smarter decisions.

Supported by intelligent mapping and data capture tools for Geodesign, intuitive visualization for enhanced situational awareness, advanced geospatial analytics for operational intelligence that is actionable, and multi-mode dissemination for sharing and collaboration among stakeholders, ArcGIS AEC solutions foster transparency, efficiency, and cost optimization across the value chain.

## Bringing GIS and BIM Together

With advancements in 3D modeling and simulations, Digital Twins are increasingly assuming greater significance in the AEC workflows. The proliferation of IoT sensors and devices is providing accurate insights for enhanced location awareness and response. Smart applications streaming real-time insights into ArcGIS enable seamless monitoring and administration of the construction processes, facility management, and environmental monitoring.

The power of using BIM data within ArcGIS expands beyond incorporating BIM content from multiple disciplines, sources, and applications into various asset lifecycle workflows. Bringing together environmental, demographic, political, and social data on ArcGIS ensures that due importance is given to these sensitive factors and ensures sustainability and resilience at every stage.



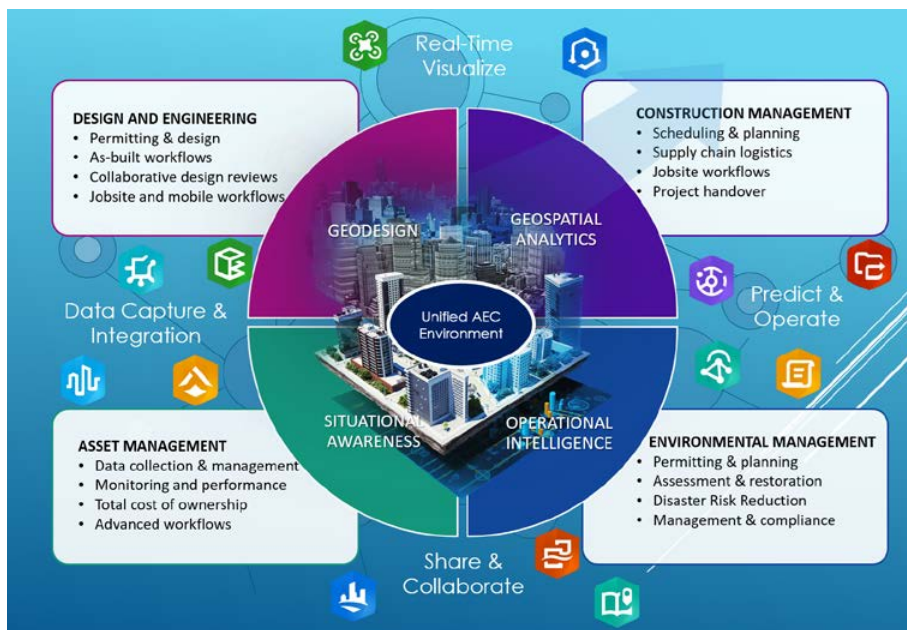


Image Source – Esri India

ArcGIS GeoBIM enables organizations to provide rich geospatial context to architecture, engineering, construction, and facility management projects. By bringing GIS and BIM data together, ArcGIS GeoBIM allows users to incorporate and use data from multiple systems, access project data from a common experience, explore GIS and BIM data side by side, collaborate and share information with stakeholders, and minimize costly data conversions. AEC Project Delivery subscription enables professional service companies to extend internal GIS content and context to resources outside of the organization allowing them to collaborate and share information directly with stakeholders.

### Data Capture and Integration

Site Scan for ArcGIS is a cloud-based drone mapping software designed to revolutionize imagery data collection, processing, and analysis for smaller sites. ArcGIS CityEngine is an advanced 3D modeling software used for creating massive, interactive, and immersive urban environments based on real-world geographic information system (GIS) data with the potential to showcase a fictional city of the past, present, or future. ArcGIS Utility Network provides a comprehensive framework of functionality for the modeling of utility systems such as electric, gas, water, stormwater, wastewater, and telecommunications. It

allows you to build real-world behavior into the network features you model.

### Visualization

ArcGIS GeoPlanner is a web-based planning tool that empowers you to rapidly design city, regional, and landscape-scale scenarios in a collaborative, iterative environment. ArcGIS Urban applies GIS technology to urban planning to streamline plan creation, analyze the impact of plans, visualize current projects, and facilitate public engagement. In addition to helping you design, manage, and measure urban developments. ArcGIS Indoors, as a complete indoor mapping system for smart building management, organizes computer-aided design (CAD), building information modeling (BIM), site scans, and operational datasets into floor-aware indoor maps to support estates, facilities, workplace and maintenance operations, and other various use cases. ArcGIS Insights fuses location analytics with open data science and business intelligence workflows and allows you to perform iterative and exploratory data analysis.

### Share and Collaborate

ArcGIS Hub organizes people, data, and tools through information-driven initiatives for community engagement. With ArcGIS Hub, organizations leverage their existing data and

technology and work together with internal and external stakeholders to track progress, improve outcomes, and create vibrant communities. ArcGIS Experience Builder is a highly configurable solution for building compelling web apps without writing code helps you to choose a template and create an immersive web experience for your audience by unifying web maps, apps, pages, interconnected widgets, and both 2D and 3D data through a flexible drag-and-drop interface. ArcGIS StoryMaps is a story-authoring application that allows you to share your maps in the context of narrative text and other multimedia content.

### Predict and Operate

ArcGIS Workforce is a mobile app solution that uses the power of location to coordinate the field workforce. It integrates work management to reduce reliance on paper and provides everyone with access to the authoritative data they need. ArcGIS GeoEvent Server enables real-time event-based data streams to be integrated as data sources in enterprise GIS and alert personnel when specified conditions occur, all in real-time.

### In Closing

The right data available at the right time in the right hands is critical for the success of infrastructure projects. Comprehensively using BIM information, ArcGIS helps improve decision-making and creates true digital twins for facility design, project delivery, and operations.

While allowing you to build site context with the environment, it provides you with capabilities to sense site change with every phase of development. Designing and visualizing the real world in 3D, ArcGIS, and integrating with IoT sensors helps you optimize infrastructure operation intelligence. Contextualizing a BIM model with local and regional environs ArcGIS AEC portfolio provides efficient design, project management, and improved coordination and collaboration among stakeholders while addressing sustainability and resilience.

# The Value of Data Management in the AEC Industry

Suhas Jadhal, Global Director of Industry Consulting, Hexagon

The Architectural, Engineering, and Construction (AEC) sector remains woefully inefficient when it comes to dealing with the amount of data stakeholders are accumulating in all phases of their operations.

## The Struggle with Data Management

Recent studies indicate that construction firms are generating more data than ever before. Firms are producing an immense amount of assets, including emails, drawings, change orders, punch lists, memos, and more, but this data goes wildly unused. Researchers polled AEC executives in eighty-four countries about project management through five stages of a project lifecycle: bidding, planning, execution, resource management,

and portfolio management. The poll reveals that their collection of data is inaccurate, incomplete, and inconsistent.

The [Economist](#) in 2017 declared that the world's most valuable resource is no longer oil, but data. Just like oil, raw data isn't valuable in and of itself; rather, the value is created when it is gathered quickly, completely, and accurately, and connected to other relevant data to maintain the [Golden Thread of Information](#).

As per the recent [MACE Innovation strategy](#), we will soon see a requirement for a 'golden thread' on all construction projects that will allow owners and occupiers to trace every element of a build from inception, design, and

delivery. By 2026, this will be standard practice in the UK – but to get there we know that many parts of the industry will have to change how they work.

## The Hidden Cost of Non-Data Management

According to [Hexagon AB's](#) internal research, out of a single day on a construction site, approximately 33% of work hours are productively spent for direct construction work, 32% of work hours are wasted, spent idle, or waiting due to a lag in materials or information delivery, and 35% of work hours are spent on materials, tools, and transportation, as well as instruction and personal breaks. The absence of correct data management costs EU firms £62.18 billion per



**90%** of respondents reported they must manually gather status updates from team members



**Less than 25%** of resource managers had access to real-time resource allocation and utilization data when scheduling team members.  
**Less than 15%** had access to online collaboration tools.



**90%** of the cases the new tasks are conveyed **verbally**

Image Source: Hexagon





work-hours  
productively spent  
for direct work



work-hours  
wasted, spent idle  
or waiting due to a  
lag in materials or  
information  
delivery



work-hours spent  
on materials, tools,  
transportation,  
instructions, and  
personal breaks

Image Source: Hexagon

year (Assumption: Europe 5.19 million construction workers employed, X 2080 hours per year multiplied by 0.32 = 3,454,464,000 hours x average construction salary/hr. £18 = £62.18 Billion)

### How to Reduce the Data Gap

Businesses need a data strategy to establish accountability for data that originates or is endemic to particular areas of responsibility. Data management refers to all the functions necessary to collect, control, safeguard, manipulate, and deliver data. Based on research, what is more, concerning is that 30% of the collected data is lost entirely. This is called the Data Gap.

Successful information transfer between the field and office is critical to keeping projects on track. If we can help this data become more available, organized, and accessible, we can dramatically reduce time on

projects, mitigate budget overruns, and make the construction process more environmentally friendly with less waste and fewer carbon emissions. Hexagon is building a future where data is fully and autonomously leveraged so that business, industry, and humanity sustainably thrive. We put “data to work” to enable autonomous, connected ecosystems that boost efficiency, productivity, and quality for our customers.

Hexagon has launched Smart Digital Reality™ to tap the potential of the most dynamic and powerful use of data in history. Smart Digital Reality is Hexagon’s strategic advantage and the greatest source of value creation for our customers, empowering them to put data to work in ways that go far beyond what was ever thought possible. It is digital and data-driven, delivering an experience that is rich and engaging, immersive and real. It is the digital leap

forward that will make all the difference for our customers. Smart Digital Reality is how the real world will intersect with the metaverse, ensuring prosperity, safety, and sustainability for the planet.

For construction projects, Our Smart Digital Reality is defined as two worlds, ONE reality! It is workflow-driven and provides real-time and autonomous digital twins. This is the fusion of the physical world and the digital world—no longer are they two separate realities. This is the state where all data are digitally available, in one place, in real-time, with 360-degree context, providing a complete line-of-sight to every situation in an ever-changing world.

By enabling real-time data capture and analyses and bringing the freedom of autonomy to the digital twin, we transform a twin’s function and utility far beyond a static, single source of truth. Autonomous technologies, like machine learning and AI, enable our customers to create systems that reduce and even eliminate human intervention. This is when data does its greatest work, empowering our customers to work in ways that go far beyond what was ever possible!

Refer to this link for more information on [Construction and project insights | Hexagon](#)



Image Source: Hexagon



# Design and Implementation of an Integrated Digital Project Management Platform for the Visualization of Road Assets

The Government of Maharashtra has formed a Special Purpose Vehicle (SPV) named Maharashtra State Road Development Corporation Ltd. (MSRDC) Tunnels Limited for the execution of the Mumbai-Pune Expressway Missing Link project.

MSRDC is augmenting the capacity of MPEW through the construction of a Viaduct and Tunnel (Missing Link Project) that will not only decongest the traffic flow but also reduce the expressway distance and time. MSRDC has come up with the need for the establishment of an Owner Support Office (OSO) to help them in establishing a necessary organizational framework, procedure & policies, control & tracking mechanisms for successful deployment of the Digital Project Management Platform, and timely completion of the MPEW Missing Link Project. Information Technology (IT) is the backbone of this digital project for setting up of Digital Project Management Platform. This digital platform consists of a 5D Building Information Modelling (BIM) using BIM enabled Common Data Environment (CDE), Enterprise Resource Planning (ERP) System, Business Analytics System (BAS), Geographic Information System (GIS), and Facility Management Services (FMS).

MSRDC appointed Ceinsys Tech Ltd. (CTL) as the 'System Integrator' (SI) for the Supply, Implement, and Support of the Digital Project Management Platform (DPMP) including 5DBIM, ERP, GIS System & Establishment of Owner's Support Office (OSO).

## Project Brief

The Mumbai-Pune Expressway presently has a 6-lane cement concrete pavement with a 2.5 m wide paved shoulder on both sides and a length of 94 km. Heavy traffic and landslides frequently cause congestion in this stretch. Due to the decrease in speed and increase in time of travel in this section & in order to save time, vehicles move at a faster speed on the rest of the expressway, which has resulted in an increased number of accidents.

The project is divided into two packages:

- Package-I** consists of the construction of two tunnels (two tubes of 4 lanes each) of lengths 1.75 km and 8.92 km respectively.
- Package-II** consists of two 8-lane viaducts of lengths 790 m and 650 m respectively with Capacity Augmentation (6-lane to 8-lane) of the existing Expressway.

## Digital Project Management Brief Scope

In order to ensure the implementation of a successful DPMP comprising 5D BIM, ERP, and GIS, Ceinsys carried out:

- Establishing Owner support office.
- IT infrastructure provisioning and maintenance.
- Supply, Implement & Support Digital Project Management System (DPMS).
- Training MSRDC Tunnels Ltd. in resources for use of installed systems.
- Establishing a Helpdesk to handle & resolve project-related queries.

One of the prime motives for establishing this platform is to create a systemized 'Document & Information repository' during various stages of the project lifecycle to establish a datum for all upcoming/future works related to MPEW-ML Project and form a reliable source of information from the backup. It would have been a major uphill task otherwise using traditional information/data/document storage methods and legacy systems. Preservation of information in digital form would also be helpful for quick



retrieval and reference for future developments.

GIS-based Progress Monitoring System development is the crux of the project through which users can view the status of the project, run queries on the spatial database developed, and have all the data in the dynamic reports format thus generated. Developing a GIS-based open-source application integrated with other applications/ components of a digital project management system would provide the visual and geo-tagged information of land, property, utilities, etc. to all the stakeholders at different layers during construction as well as the operation and maintenance stages of the project. The BIM Models made by different contractors can be taken by the OSO and converted into an asset-rich GIS database, in which the required attributes for asset management can be filled in.

In order to maintain a high quality of spatial data and its associated metadata, a minimum set of data requirements was established for any data gathered.

- GIS-based Progress Monitoring System to deliver an open-source system with inbuilt and customized features for viewing, managing & locating features of interest to the project.
- The system is to have spatial as well as non-spatial data to analyze and serve user requirements like displaying the ongoing work status on the internet with thematic maps, and textual as well as graphical reports.
- GIS-based Progress Monitoring System to allow authorities to visualize construction and identify potential spatial/ temporal conflicts at various stages.

### Business Challenges

- Scattered Data from Multiple stakeholders.
- Multiple sources of truth which were complicated to analyze the progress.
- Progress visualization in one frame.
- Absence of Asset information.

### Business Requirements

- All Land Records need to be captured.
- Land parcels to be shown on the GIS application along the alignment.
- Shape files of all 2D drawings to be superimposed on the application as per geo-coordinates.
- Textual data in the form of reports can be extracted from the application.
- Project status using Drone survey in the form of MP4 and UAV generated 2D Maps in TIFF format Point cloud in LAS.
- Spatial Analysis of the data.
- Displaying Thematic Maps along with Legends.
- Upload and View the images and videos attached with spatial data.

### Geospatial Solution for Project Monitoring

In the proposed system, spatial as well as non-spatial data were used to analyze and serve user requirements like displaying the ongoing work status on the internet with thematic maps, and textual as well as graphical reports. There was no chance of losing data using the application. Even old records could be viewed quickly. The application provided the best online communication between internal departments and users.

The web-based solution provided the following key features to users:

- Publishing of the Missing link key plan and other land parcels, and road Map layouts online.
- Tool tip display for features.
- Features to allow end users to click on the individual feature and return a selected set of attributes for features from the database.
- Separate windows for map data and attribute database.
- Simple and easy-to-use built-in tool to simplify the user interface in terms of menu items, etc.
- Thematic Map for displaying work status & legends display.
- Base map layer like Open Street Map, Ortho-photo images taken by drone for location reference, etc.

- Pan, zoom facility on the map.
- User registration facility to register himself to access the application features.
- User Role based access to application features.
- Basic functionality for users like view, a basic search on map, etc.
- Spatial analysis facility like buffer, measure.

### Benefits of the Solution

Implementation of the Digital Project Management system using a GIS web-based application ensured:

- Effective project progress tracking.
- Visualization of Geographical Information and Live data monitoring using Drone photogrammetry.
- Integrated dashboard system to visualize high-level project health.
- Integrated Project Land Acquisition Status with an actual view of the land parcel.
- Integrated drone video along the stretch and actual site photographs can be uploaded in the application for actual status updates and live monitoring of the project.
- Various status reports can be generated.
- 20% saving in time and cost over-run.
- Real-time monitoring.
- Optimize operational efficiencies.
- Single source of truth to avoid duplications.

### Conclusion

The project has been successfully implemented and has gone live for MSRDC officials. Users are able to update the project progress in the GIS application and can visualize the progress over the map. This application enables the user to compare the progress using drone videos which are attached to the respective project alignment sections. Furthermore, users have used these layers for Asset Information Management which shall be available to users with required asset metadata along with the geo-coordinated location of the assets.

# Nebula Cloud Platform.

## Future Ready Digital Workplace for Enterprises

### Nebula Cloud Platform for Engineers, Researchers, and IT Professionals

Nebula Cloud is a digital transformation and remote workforce collaboration platform with hundreds of software listings that make it easy to find, test, buy, deploy, and use software that runs on AWS, Azure, and Google Cloud.

Nebula Cloud Platform provides a simple, powerful, and consistent interface for running complex engineering and IT workloads on clouds, and other resources – advancing engineers, IT professionals, and researchers to focus on core activities and spend less time running complex applications and moving data around.

#### Product Highlights

- **New User Experience (UX):** Seamless integration with Windows and LinuxOS.
- **Flexibility:** Desktop app and web portal.
- **Visualization:** Collaborative 3D remote visualization.
- **Manageability:** Easily add, modify, and remove applications.
- **Secure:** Protected access to HPC resources.
- **Novice to Expert:** No IT skills required.

#### Benefits

- **Fast onboarding for HPC:** Desktop UX lets engineers run jobs on Nebula Cloud without learning or touching the Linux shell.
- **Save time:** Simplify job submission and management thanks to a powerful GUI with smart, simplified interfaces.
- **Be more productive:** Spend more time focused on work and not IT tasks – for example, monitor jobs graphically without having to download huge files.
- **Increase ROI:** Consolidate access to applications and optimize license availability.
- **Reduce errors and improve consistency:** Embed your company's best-practice know-how directly into application definitions used for workloads submission.
- **Option to use existing IT and software resources with BYOL (Bring Your Own Licenses)** on Nebula Cloud.
- **Migration assistance** for moving from on-premises IT to cloud-based computing.

#### Why Nebula Cloud?

For engineers, scientists, and researchers, Access portals provide natural access to HPC with no IT expertise needed to run applications and processes, view progress, manage data, and use 3D remote visualization via web and desktop.

- **Integration with Nebula Cloud Management Platform™** allows optimized provisioning of applications on graphical and computing resources for maximum utilization.
- **Simple, easy-to-use, and application-specific interface** that requires no learning, simplifying management and allowing engineers to focus on their work rather than IT issues.
- **Resource monitoring and accounting:** Integrated with Nebula Cloud Management Console.
- **Collaborate easily from multiple locations** by viewing and editing application data without downloading.
- **Visualize big data files remotely** without file downloads.
- **Be more efficient with easy and accessible data collaboration tools.**



- Optimize resource utilization by consolidating hardware and software centrally.
- Allow engineers to take corrective action without downloading huge results files for running jobs.
- Reduce IT overhead for engineers, information technology professionals, researchers, and academicians – let them focus on their work and not on data movement issues.
- Easily define and set up applications for production workloads.
- Minimize the effort needed to write, modify, and test complex application deployments.
- Scale up and downgrade computing resources based on workload requirements on the fly.

### 3D Modeling, Rendering, and Simulations on Nebula Cloud

#### Capabilities

- 1-Click Application Launch
- Applications and cloud infrastructure can be easily provisioned across departments and regions.
- HPC and GPU instances on Pay as you go and Subscription basis.
- Reduced TCO and Higher ROI.
- Worldwide coverage and Multi-region deployments.
- Easily run CAD, CAM, CAE, GIS, CFD, and all engineering workloads from a single pane of glass.
- Cloud brokerage and multi-cloud management.
- GUI, with simple configurable options and pre-populated software solutions.
- **Inbuilt data transfer capabilities** and tools for easy data movement and migrations activities.
- **Rapid collaboration:** Instantly collaborate on large volumes of data in the comfort of a familiar, interactive application, anywhere and anytime; cooperate with remote colleagues by sharing session views and controls across WAN links.
- **Rich experience:** Adaptive data compression algorithms based on network bandwidth and latency provide a rich experience, even on challenging networks.
- **Run complex algorithms,** models, and simulation workloads with ease with Nebula Cloud Platform.
- **Open architecture:** You can use third-party applications without the need for additional software development and investments.

- **Single Cloud Management Portal** to manage all digital assets across departments and domains on cloud.
- **Resiliency:** Continuity of remote application sessions across network connectivity disruptions.
- **Flexibility:** Access to the same remote session from multiple locations using different client machines: Office access, customer location access, home access, etc.

#### Managing Remote Files and Data

- Manage remote files and data directly from the secure web portal.
- Get real-time access to the cluster's remote file system.
- Easily browse and modify remote files.
- Use standard, familiar file operation tools.
- Automate staging of input and output files.
- Explore huge datasets directly on the server side.
- Access computing and storage resources from any mobile, tablet or PC.
- Collaborate and share resources across teams and team members.

Nebula Cloud Platform is the world's first vendor agnostic, industry agnostic, software and cloud marketplace platform with over 250+ Engineering, Scientific, and IT Software products across 45+ industry categories. It has a vertical focused approach that provides software and cloud solutions to various Small and Big Enterprises, SMEs, MSMEs, Corporates, Universities, Incubators, Startups, Individuals, etc.

Contact:

**Venkata B Ganugula**

Founder & CEO, Nebula Cloud  
[venkata.ganugula@nebulacloud.ai](mailto:venkata.ganugula@nebulacloud.ai)



# Updates from AGI

## Activities, Engagements, and Initiatives Undertaken by AGI Secretariat

### Events and Engagements

- AGI was invited to discuss the roles of industry bodies in the context of the **National Geospatial Policy 2022** under the chairmanship of the GDPDC Chairman, Shri R. S. Sharma.
- AGI supported the Department of Land Resources with industry invitations and participant mobilization in the run-up to the **Bhumi Samvaad 4.0 Conference**.
- AGI was an Ecosystem Partner for the **Umagine Chennai 2023** Technology, Entrepreneurship, and Skills Summit.
- AGI was a Supporting Partner to **Indian Space Association** for their Indian DefSpace Symposium.

### Partnerships



- AGI and the Indian Space Association signed an MoU on Research Collaboration, Knowledge Building & Sharing, Co-Hosting Conferences, etc.
- AGI networked with Belgian industry representatives as part of a Belgian Trade Mission, facilitating B2B networking with its member companies.

### Knowledge Sessions

- AGI conducted a virtual Knowledge Session on the “Role of Geospatial Technologies in Forest Management” with industry and academic experts from the **Indian Institute of Forest Management, Esri India, IIC Technologies, Planet, and Satpalda** on 21 March, the International Day of Forests.
- AGI conducted a virtual Knowledge Session on the “Role of Geospatial ESG in Sustainable Development” with environmental and geospatial experts from the **World Bank, World Wildlife Fund, Hexagon, Ceinsys, and Emitech Infosystems** on 21 April to celebrate World Earth Day.



#### We value your feedback

AGI seeks to explore various avenues to enhance the quantum of interaction between geospatial industry units, academia, government and various other geospatial players. Therefore, we keenly look forward to your feedback and suggestions on various issues that can help meet our objectives. Write to: [sakshi.singh@agiindia.com](mailto:sakshi.singh@agiindia.com)