Three Ways GIS Can Boost the Bottom Line for AEC Teams

Geospatial technology improves workflows, deliverables, insights, decision-making, and customer satisfaction for built and natural environment projects

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There was no time to waste. Potential roof collapse on a widespread portfolio of more than 100 buildings was a real concern. The contractor needed a comprehensive understanding of which roofs were most at risk to triage the danger and head off even more liability.

Normally, such a task would have taken at least six months. But thanks to a powerful technology, the entire survey was done in less than a month with simple, geospatially aware applications and mobile devices used at the project site.

"Speed and efficiency were quite critical," said Jeff Van Etten, head of GIS for Tetra Tech. "Previously, we would have had to use a camera, Ordnance Survey map, and a piece of paper to record everything. Then we'd have to take all that information back to the office, type it up, and map it to understand it. With GIS technology, all the information automatically gets recorded in a single interface."

In general terms, this is known as geographic information system, or GIS, technology. GIS provides a process and a framework for gathering, managing, and analyzing data. Rooted in the science of geography, GIS integrates many types of data. It analyzes spatial location and organizes layers of information into visualizations using maps and 3D scenes. With this unique capability, GIS reveals deeper insights into data, such as patterns, relationships, and situations—helping users make smarter decisions.

GIS provides location intelligence (LI). Location intelligence is achieved through visualization and analysis of geospatial data to empower understanding, insight, decision-making, and prediction. By adding layers of data—such as demographics, traffic, historical conditions, and weather—to a smart map, organizations gain location intelligence as they understand why things happen where they do. As part of a digital transformation, many organizations rely on GIS to create LI.

Today, more than 90 percent of companies say GIS-related technology is crucial to their success. Applications can be found everywhere, from finding optimal locations for retail sites to solving traffic bottlenecks to maintaining and repairing vital infrastructure. More than two-thirds of business executives already use GIS to gain a competitive edge.

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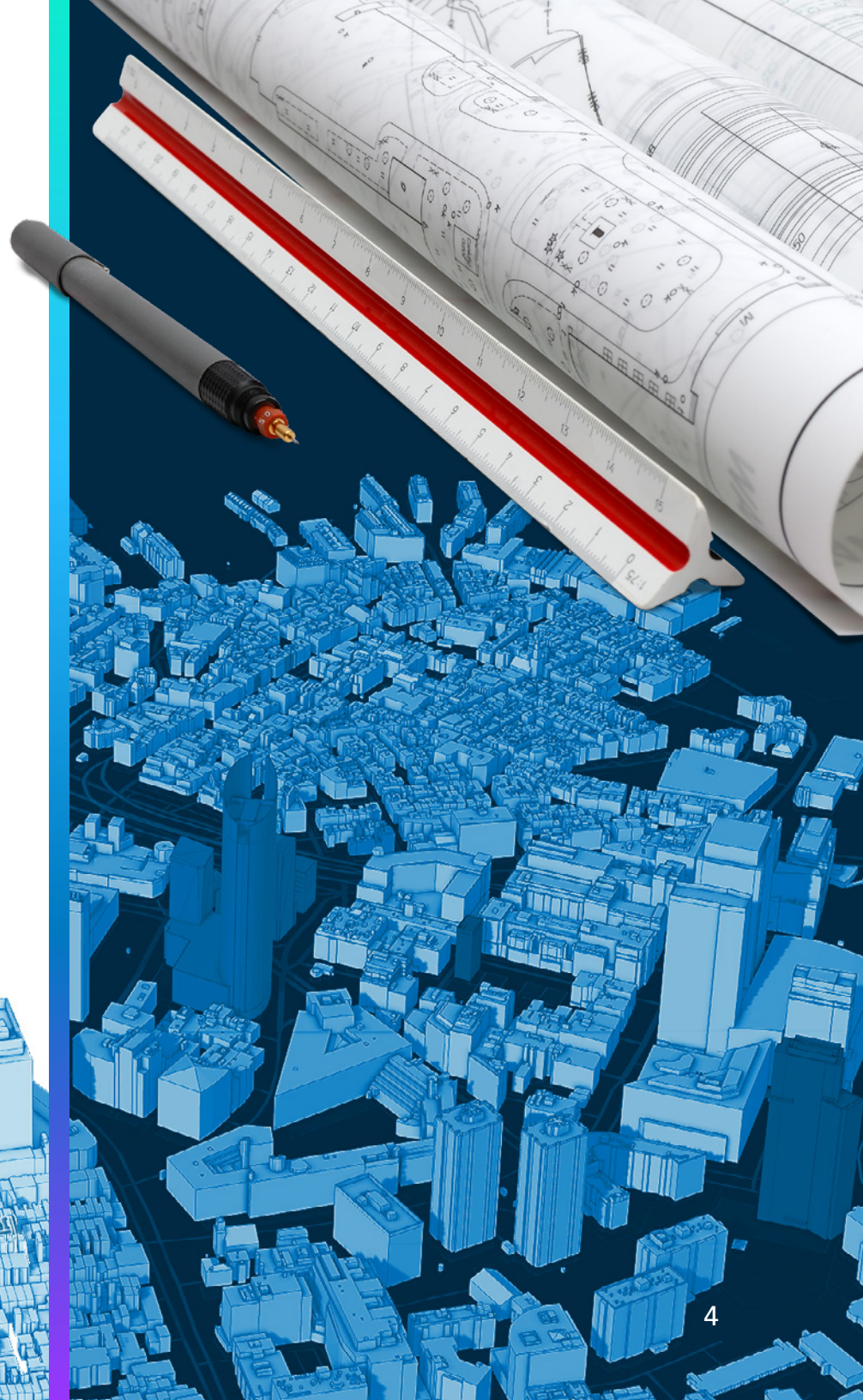
But for the most part, many architecture, engineering, and construction (AEC) firms still fly blind when using this combination of data, technology, and services. Instead, they use old-fashioned paper maps that often get lost and have no ability to share data or provide analysis.

Some AEC companies pull up Google Maps to gain contextual information about a site. But GIS takes that basic mapping to a whole new level with web-based dashboards integrated into the building information modeling (BIM) workflow. This gives users real-time insights into site conditions, geographic context, and historical data for their projects and assets. The combination of location intelligence and services allows AEC firms to better collaborate and offer repeatable solutions.

"Historically, projects were initiated, investigated, designed, and, even in some cases, constructed without any kind of deep or extensive awareness of spatial context," said Stephen Brockwell, Senior Principal Program Manager for ArcGIS GeoBIM. "What has been shown over the last few years is that by integrating awareness about where that project is, what's underneath it, and what other assets are going to be impacted by a project, you can achieve significant efficiency and reduce change orders during the project overall."



AEC firms should follow the lead of other industries that have embraced location intelligence.

Currently, Brockwell said, only a small percentage of AEC firms take full advantage of GIS or LI. But hundreds of thousands of organizations in virtually every field use GIS to make maps to communicate, perform analysis, share information, and solve complex problems around the world.

For example, using GIS, specialty contractor Black & Veatch halved the labor requirement, reduced the average cost per inspection, and improved efficiency. The technology saved more than $180,000, eliminating site revisits and ensuring the public's safety. LandTech Consultants used GIS to turn BIM models into interactive, 3D maps for clients such as those at a sprawling wastewater treatment plant. The plant now uses these 3D models to help technicians know exactly where something like a malfunctioning valve is located. Before, techs wasted untold hours just trying to find such problems.

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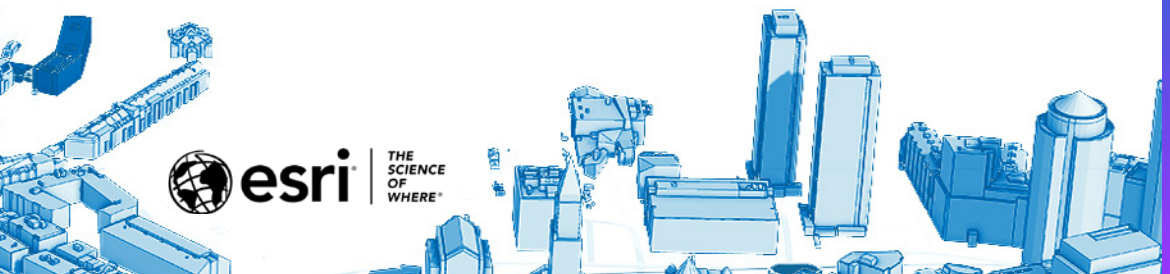
"Imagine being able to take raw, digital BIM information; add the asset information; and tie it all together in the visual aspects of a 3D GIS model and supply it directly to mobile workers on the jobsite in real time," said Zachary Jaffe, GIS analyst for LandTech Consultants. "No more trips to the office or searching through digital files to find the information needed. Just the travel time savings alone can amount to a considerable savings."

Having that kind of powerful, productivity-enhancing technology is more important than ever. Today's contractors face some of the most challenging market conditions in history. Labor shortages, tightening schedules, and growing project complexity make it more and more difficult to maintain already razor-thin margins and stay competitive.

Experts say those pressures are only likely to continue, thanks to ongoing trends. Megaprojects continue to be planned and built in an attempt to keep up with global infrastructure demands. In fact, over the next 10 years, in the US, megaprojects are forecast to explode 600 percent, from about $50 billion to just over $350 billion, according to a report from FMI.



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But even as projects get bigger, a shrinking tax base will likely lead to fewer opportunities. According to *Fortune* magazine: "Lower tax hauls from sales and personal income alone, according to recent projections, could cost state governments anywhere from $106 billion to $125 billion in fiscal year 2021, which began on July 1 in 46 states. 'The overall shortfall, however, could easily reach twice that amount when hits to other sources of state and local funds are factored in,' says Jeffrey Clemens, an associate professor of economics at the University of California, San Diego, who published a working paper on the issue in June with Stan Veuger, an economist at the American Enterprise Institute."

Meanwhile, another report from Deloitte found that as most firms continue to face low profitability and margins—globally, earnings before interest and taxes are just 5.5 percent of sales—they struggle against rising supply constraints and material costs. And all that was before the global pandemic. Experts agree the best hope in this environment is for contractors to embrace technology that increases efficiency, productivity, and margins.

One of the biggest challenges to successful execution and delivery of capital-intensive projects is related to accurate project information, according to the *Construction Disconnected* report from FMI and PlanGrid. That report found that

- AEC professionals spend 35 percent of their time (more than 14 hours per week) on nonproductive activities, including looking for project information, conflict resolution, and dealing with mistakes and rework.
- Nonoptimal activities cost the US construction industry more than $177 billion in labor costs in 2018 alone.
- Poor project data and miscommunication on projects are responsible for 48 percent of all rework in construction in the US, meaning that it accounted for $31.3 billion in 2018 alone.
- Construction workers lose almost two full working days each week solving avoidable issues and searching for project information.
- Seventy-five percent of general contractors and subcontractors provide mobile devices to job site supervisors and project managers, but only 18 percent consistently use apps to provide project data and collaborate.

GIS technology and location intelligence address margin-killing pain points with improved workflows, better collaboration, and strategic partnerships to build smart communities and assets for the future. Adding location to design allows AEC pros to understand projects in context and deliver repeatable solutions.

Three Key Areas Where GIS Can Benefit Contractors

Here are three key areas where AEC contractors can use GIS to deliver LI and how they can improve workflows, deliverables, insights, decision-making, and customer satisfaction.

Field Data Workflows

Many AEC professionals are all but blind when it comes to location awareness and intelligence on a project. Using GIS, workers can audit and validate assets, gain contextual awareness of a site, and become aware of geographic and geologic site characteristics such as the location of utilities and roadways.

"Engineers and mobile workers have always had access to data, whether that be on paper or digital," said Russell Chiles, AEC account manager at Esri. "There's always been drawings, spreadsheets, Gantt charts, punch lists, and maps; and they've been digital for most projects for a decade or more. We're now making this information interconnected, with location acting as the common connector. So if there's going to be any issues, you're going to see all the information immediately, visually, with context."

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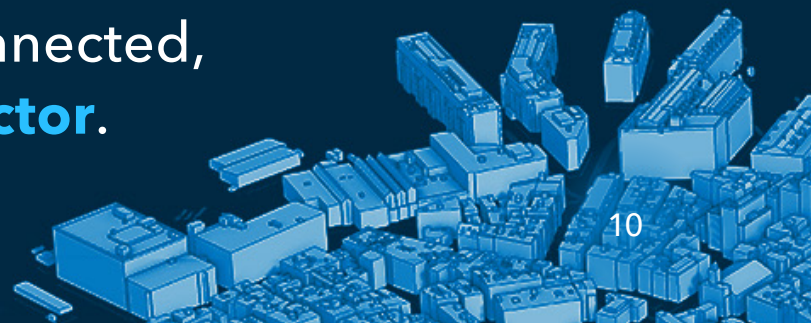
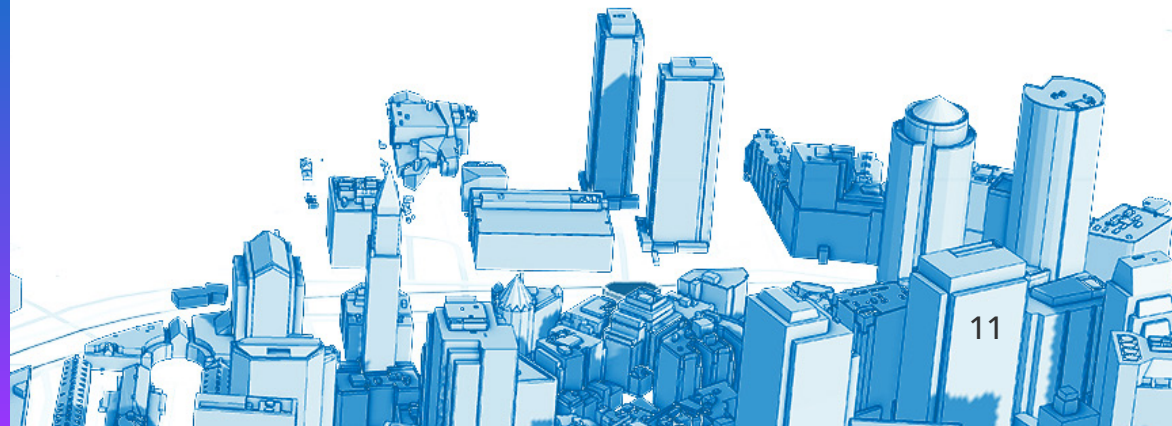


With Esri's GIS solutions, AEC firms can

- Streamline data collection in an intuitive, easy-to-use process.
- Provide project teams with common portals and dashboards to access all the information as part of a connected data environment.
- Help teams, trades, and vendors collaborate and avoid unnecessary bottlenecks or conflicts.
- Give workers the ability to update data in near real time.

"I can take a simple device or mobile phone out in the field, and I can look at an asset or new construction and confirm that, yes, it's there, and it was supposed to be there; or no, it's not there, and it was supposed to be here; or hey, there's something else here that wasn't supposed to be here," Brockwell said. "There are many possibilities once you have the ability to collect reliable, unique information on location for any asset or activity across very large project areas and teams."



Construction Management

Historically, AEC firms are fragmented and federated, with each project managed independently, and no way to coordinate at the level of the whole company other than gross profit. This narrow view causes firms to miss valuable data and insights. "Why not bring in that location data?" Chiles asked. "Why not have additional sources of data to fully inform that project and lower costs? Why are we not using repeatable workflows?"

Location intelligence delivered through GIS answers those questions with the following:

- Risk mitigation through insights and visualization into potential risks, such as underground gas lines or code issues
- Cost reduction through using existing data and intelligence to inform project management strategies
- Increased project velocity through faster access to necessary data that heads off bottlenecks and optimizes resources, assets, and labor

"And once you have this location-aware data built, it supports the entire holistic life cycle. It's a downstream value that just cascades," Chiles said. "We can now reuse this data for maintenance. We can now start planning for rebuild and demolition of this existing asset to replace it or rebuild something new that goes into planning and costing."

Project Delivery

Delivering projects on time and on budget requires having a full picture of the project, including assets and equipment. It also means keeping all stakeholders informed and goals aligned through the project life cycle. "At a very fundamental level, project delivery can be impacted simply by having a better understanding of where your assets are and how prepared you are to go in and execute on that project," Brockwell said. "Beyond that, there are other data insights that can be gained during project delivery by the use of GIS, such as by combining project data with geology and other geospatial context to help meet customer goals and statutory compliance requirements."

Using GIS, AEC professionals can

- Know the location of equipment, personnel, and materials. Having this data is key to bidding as well as constructing. Without GIS, firms don't know when key equipment is available or where it is and thus have no way to efficiently coordinate assets.
- See potential delays or issues before they happen so project teams can develop proactive solutions rather than reacting and reworking.
- Use data to support such operations as rebuilding and demolishing when the time comes.

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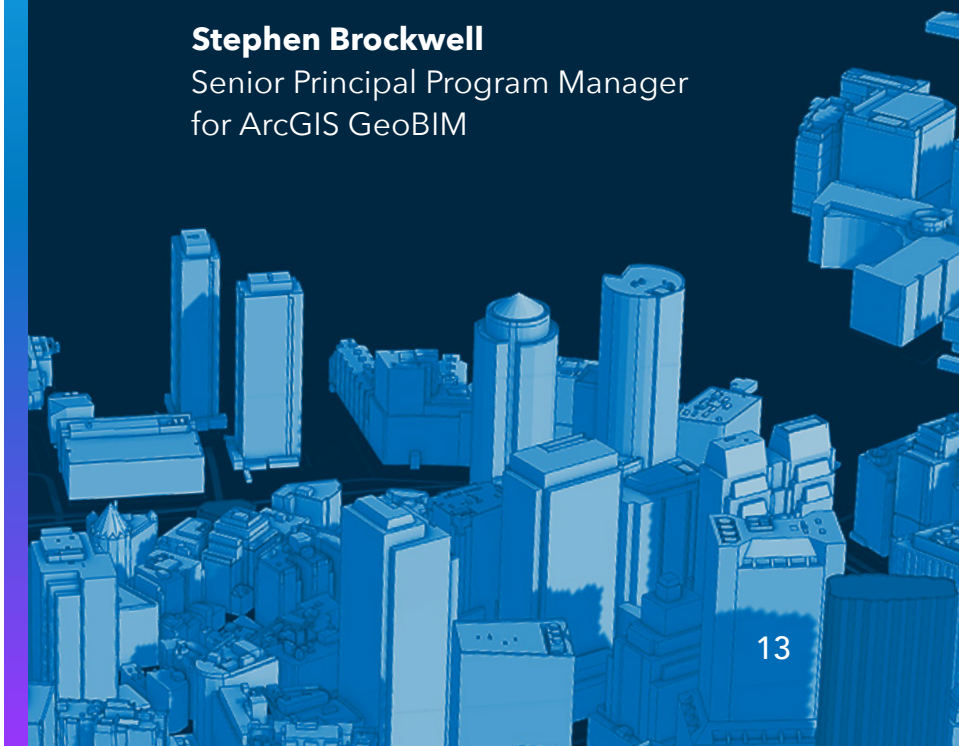

The Power to Make Better Decisions

In short, GIS gives AEC professionals powerful ways to improve field data workflows, construction management, and project delivery. While BIM is continuing to become a standard method of communicating in AEC projects, GIS is proving to be just as valuable. Combining the two with other AEC information-rich methods brings unequaled levels of insight for better project management and delivery. As firms look to stay competitive during these increasingly challenging times, taking advantage of the value that GIS provides is more important than ever.

> "With GIS, everyone has access to the same data, so you can make better decisions and be **more proactive** rather than reactive."

Zachary Jaffe
GIS Analyst, LandTech Consultants

"Everyone is adjusting to reduced revenue streams and looking for ways to stretch budgets," Jaffe said. "What better way to do it than by extending the life of existing digital components and providing real-time asset data in a visual element? Whether it's decision-makers in the boardroom or the person digging a ditch, with GIS, everyone has access to the same data, so you can make better decisions and be more proactive rather than reactive."

Esri, the global market leader in geographic information system (GIS) software, location intelligence, and mapping, helps customers unlock the full potential of data to improve operational and business results. Founded in 1969 in Redlands, California, USA, Esri software is deployed in hundreds of thousands of organizations globally, including Fortune 500 companies, government agencies, nonprofit institutions, and universities. Esri has regional offices, international distributors, and partners providing local support in over 100 countries on six continents. With its pioneering commitment to geospatial technology and analytics, Esri engineers the most innovative solutions that leverage a geographic approach to solving some of the world's most complex problems by placing them in the crucial context of location.

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