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Infrastructure Plan Offers Historic Opportunity to Future-proof Critical Systems

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Modern IT and Business Processes Can Help State and Local Governments Build Back Better

Crumbling bridges and leaky levees. Buckling roadways. Unsafe water pipes. Inadequate public transit. The list of U.S. infrastructure failings is both broad and deep. In its 2021 report card, the American Society of Civil Engineers (ASCE) graded the nation's infrastructure a C-, up from a D for the first time in 20 years. ASCE's analysis, conducted every four years, reveals incremental gains in some infrastructure categories but notes that the nation's long-term investment gap continues to grow. The United States is paying about half of its infrastructure bill, and the total investment gap has grown from $2.1 trillion over 10 years to nearly $2.59 trillion over 10 years, ASCE says.[1]

Local government leaders face staggering infrastructure requirements that local tax revenues cannot fulfill. Nearly a quarter of cities experienced fewer infrastructure upgrades over the past year, as investments paused or were put off during the worst of the pandemic, according to the State of the Cities report from the National League of Cities (NLC). Ninety-one percent of local government officials responding to the State of the Cities survey indicated that insufficient funding was a primary factor affecting infrastructure decisions.

In 2021, infrastructure is the No. 1 priority among mayors, NLC found.[2] Many are calling for increased federal investment. Economic stimulus funding via the American Rescue Plan Act helped some jurisdictions, as money could be spent on water and broadband infrastructure. Some cities, such as Bozeman, Mont., were able to move up water and sewer projects by several years because of the funds.[3]

Infrastructure Plan Offers Vision to Build Back Better From COVID-19 Pandemic

Of course, the nation's needs go well beyond water and broadband. Fortunately, infrastructure is a bipartisan issue. Republicans and Democrats at all levels of government agree that infrastructure across the country is in grave disrepair and must be addressed.

President Biden's infrastructure proposal, the American Jobs Plan, was built on the premise that the nation can rebuild its infrastructure and recover from the economic crisis brought about by the COVID-19 pandemic – to build back better. The plan acknowledged that public domestic investment as a share of the economy has fallen by more than 40 percent since the 1960s and sought to invest $2 trillion over 10 years.[4]

Since the introduction of the American Jobs Plan, the White House and congressional leaders agreed upon the compromise Bipartisan Infrastructure Framework. The White House said the framework would provide:[5]

- Millions of new jobs
- The largest investment in public transit in U.S. history
- The largest dedicated bridge investment since the construction of the interstate highway system
- The largest Federal investment in passenger rail since the creation of Amtrak
- Historic investments in clean drinking water and waste water infrastructure; clean energy transmission; and resilient physical and natural systems

The infrastructure framework has the potential to foster workforce and economic development; improve citizen safety; reduce taxpayer costs; bolster resilience to increasingly severe floods, wildfires, hurricanes, and other climate risks; and correct historical inequalities in infrastructure investment.

Image courtesy of Shutterstock.

Following the framework agreement, Senate negotiators agreed on the scope of a final infrastructure bill and lawmakers put the plan into legislation. As the bill has been passed and signed by the President, state and local governments can evaluate their infrastructure deficiencies and improvement plans to identify existing projects that could be accelerated and projects that were shelved due to funding shortfalls.

Digitization Will Speed and Improve Infrastructure Project Execution

The infrastructure plan provides momentum for digital transformation on a broad scale, continuing a trend jump-started by the COVID-19 pandemic. The pandemic brought about an abrupt shift to cloud computing and paperless processes in public and private sector architecture, engineering, and construction operations. Executives who resisted digital tools were converted, and many traditional processes were digitized virtually overnight in order to keep projects going and workers employed.

Digitizing engineering and construction workflows enables seamless collaboration across teams and organizations, and 3D modeling results in more accurate planning, fewer miscalculations, and fewer cost and time overruns. And the benefits of digitization extend beyond the design and build phases. Whether it's a road, bridge, tunnel, or building, digital management brings a lifetime of efficiency, because problems can be identified and resolved quickly and at less cost than with traditional methods.

Digital tools help state and local governments and their infrastructure contractors design and build more sustainably as well. For example, when record rainfall flooded Berrendo Creek in Roswell, N.M., in 2013, it submerged a 50-year-old steel highway bridge. To withstand future weather events, a new design was required. Using building information modeling (BIM), engineers redesigned the bridge with 3D technology that allowed them to adjust input values, such as geometry and elevation, for a stronger structure.[7]

BIM is an intelligent, 3D model-based process that encompasses technology, standards, skills development, and project management. It has evolved into an information methodology for the design, build, and management of construction projects.

> "The disinvestment in infrastructure that has been going on – frankly for a lifetime – is catching up to us. … Now is the time to be bold. There are trillions at stake in economic productivity over the next 20 years."
>
> – **Pete Buttigieg**
> Secretary of Transportation
> at the 2021 Report Card for
> America's Infrastructure
> Solutions Summit[6]

Historically, collaboration on construction projects has been hampered by siloed information, easily disrupted supply chains, and low productivity. BIM, by design, is a collaborative platform that leverages cloud computing to create seamless workflows across organizations and geographies.

In 2009, Wisconsin became the first state to require BIM for all public projects over $5 million. Some state agencies, such as transportation departments, have adopted BIM standards; some Federal agencies, such as the General Services Administration and the U.S. Army Corps of Engineers, have done so as well.[8] Momentum is growing because of the efficiencies that BIM can provide; the infrastructure plan provides further opportunity to embrace BIM.

Building Information Modeling Supplies a Single Source of Truth

The old way of infrastructure design and development is a tedious process. As soon as one parameter changes, each dependency must be recalculated across siloed architecture, engineering, and construction systems. Manual errors and higher costs can result. Typically, 10 percent to 15 percent of construction budgets are set aside for change orders, which can amount to millions of dollars on large public infrastructure projects.

With the right tools, however, changes can be quickly calculated and information shared across all public and private sector organizations working on a project.

BIM, for example, captures every data point about an infrastructure project and its interdependencies in a cloud-based platform shared across architecture, engineering, and construction. This single source of truth, available everywhere and at any time, results in fewer errors and better project outcomes. It brings a new level of connection, efficiency, and workflow integration to even the largest teams and the most complex infrastructure projects.

In addition, BIM delivers 3D models that help external stakeholders visualize projects. The 3D models can be uploaded to virtual reality headsets, and viewers can "walk around" the infrastructure. This immersive experience helps stakeholders understand what the final asset will look like and how changes will affect design and construction. This "real world" visualization enables a common understanding and streamlines project approvals.

Modern Infrastructure Development Requires GIS Integration

In addition to intelligent, model-based technology, state and local governments also need tools that integrate with geographic information system (GIS) software to provide a near real-time picture of current infrastructure and the ability to visualize future projects, as well as events such as severe weather that affect infrastructure operation.

In traditional design and construction projects, design data lives in a computer-assisted design program. It doesn't extend to the jurisdiction's GIS application. Integration is essential so jurisdictions can respond promptly to problems. For example, when a water main fails, officials rely on the GIS application to pinpoint the problem area and inform affected businesses and residents. But when crews are working with outdated information, they can't accurately identify the location of the problem or notify the right people. What appears on their computer screens is not what's in the ground. Integration of GIS data with design programs solves this problem, saving time and money.

> "Models bring understanding and transparency to projects, especially these large-scale projects. It's enormous, the difference. We know where the problems are, and we can address them right away. … I don't think it's a question of 'if' we should use BIM, or even what value does it bring? To me, that's not even a question anymore."
>
> — **Lennart Andersson**
> Director of virtual design, construction and operations for The LiRo Group, builder of the East Side Access Project connecting Grand Central Station in Manhattan with Queens and Long Island City[9]

New Mexico DOT Digitizes for Efficiency, Cost Savings

The COVID-19 pandemic pushed state DOTs past their wariness of remote working, accelerating their move to digital management of construction and maintenance projects.

"COVID-19 forced them out of their comfort zone," said Priscilla Benavides, a technical support engineer at the New Mexico Department of Transportation (NMDOT). "They were able to get everybody who could work from home set up and tied into the servers." As a result, connected teams are designing and modeling in 3D with increased efficiency.

Digitization has direct impacts on taxpayers. Paper, for example, is a typical line item in infrastructure construction. Jesus Sandoval, construction liaison engineer at NMDOT, previously budgeted $9,000 per construction project for paper. "We used to bring pallets of plan sets to distribute to project offices, engineers, and contractors," he said. "That's a lot of money for just one project."[10]

Horry County Builds Five Schools in 21 Months, Sustainably

Revved up by a 3.7 percent growth rate in the Myrtle Beach metro area – the second fastest in the United States – Horry County, S.C., is projecting a half a million residents by 2040 and, consequently, an urgent need for more schools, hospitals, and public facilities. Autodesk tools enabled the county and its private-sector partners to build five new schools in 21 months and set a green standard. By using renewable energy sources on campus, each school generates more energy than it consumes.

"We were able to evaluate sustainable land development scenarios using the current tools available in AutoCAD® and Civil 3D®," said Charles D'Errico, IT systems analyst for engineering and design firm Thomas & Hutton. "The tools allowed us to quickly make design changes and evaluate their impact on the project."

Using AutoCAD® as the common design platform allowed Thomas & Hutton to share files and collaborate seamlessly with other contractors. AutoCAD®, Autodesk's "software to design anything," created precise 2D drawings and 3D models. Civil 3D supported building information modeling (BIM) for the civil engineering design and construction documentation. It enabled quick generation of plans for submittal to local agencies, which shaved about six months off of the schedule.

"Our teams are typically small," D'Errico said. "The software is efficient, and it helps us be more efficient."[11]

Autodesk Solutions Help State and Local Governments Realize the Promise of the Infrastructure Plan

Autodesk, a global leader in design and make software for architecture, engineering, construction, can help state and local governments realize the promise of the infrastructure plan. Autodesk tools help government agencies and their infrastructure contractors work more quickly, effectively, and sustainably throughout the project lifecycle.

Autodesk provides intelligent, model-based technology via cloud-based solutions that are easy to deploy and use. Autodesk technology integrates workflows and data across the project lifecycle, from planning to maintenance. The result is infrastructure delivered faster, with less cost, and with greater sustainability. Because Autodesk integrates with GIS software, public sector organizations are able to operate infrastructure more efficiently today and plan for the future.

Key Autodesk technology solutions for state and local infrastructure initiatives are Autodesk Construction Cloud and Autodesk Architecture, Engineering & Construction Collection.

Autodesk Construction Cloud Can Transform Infrastructure Development

Autodesk Construction Cloud (ACC) is a portfolio of easy-to-use tools that reduce time and increase clarity across the project lifecycle, from design to operation. When combined, the ACC tools can digitally transform infrastructure development.

At the design phase, ACC enables architects, engineers, and project teams to collaborate regardless of location, role on the project, or stage of the project. It simplifies design development and reduces information loss at project handover.

Next, ACC helps project leaders get set up for success before breaking ground. With Autodesk Construction Cloud solutions, preconstruction teams can execute design intent, bid competitively, mitigate financial risks, and remain profitable by streamlining coordination, model conditioning, quantification, bid management, and qualification.

Key Autodesk Construction Cloud products:

AUTODESK® **BUILD**
Comprehensive field and project management software that delivers a connected set of tools for builders. **Learn More**

AUTODESK® **TAKEOFF**
Integrated 2D and 3D construction takeoff software that generates accurate 2D takeoffs and automated quantities from 3D models. **Learn More**

AUTODESK® **BIM COLLABORATE**
Cloud-based design and coordination software that connects architecture, engineering, and construction teams to enable design and delivery of high-quality constructible models on a single platform. **Learn More**

DLT A TECH DATA COMPANY

AUTODESK Master Government Aggregator

At the build phase, ACC removes silos between project teams. By connecting the office and the field across work phases and turning project data into actionable intelligence with machine learning, ACC removes uncertainty and improves control over project outcomes.

When the project becomes operational, ACC connects teams with BIM asset data created during design and construction. With all project teams working in a common data platform, owners gain visibility into project status, changes, and problems.

Key Architecture, Engineering & Construction Collection products:

Revit®
Plan, design, construct, and manage buildings with multidisciplinary BIM software

Civil 3D®
Civil engineering design and construction documentation software

AutoCAD®
Software for 2D and 3D CAD. Includes AutoCAD and specialized toolsets

InfraWorks®
Civil infrastructure conceptual design and analysis software with GIS integration

Navisworks® Manage
Clash detection and advanced coordination, 5D analysis, and simulation software

Autodesk® Docs
Project management in a cloud-based, common data environment

Image courtesy of Shutterstock.

Improved visibility across the project lifecycle saves time and money and results in fewer project delays.

Architecture, Engineering & Construction Collection

The Architecture, Engineering & Construction (AEC) Collection provides designers, engineers, and contractors a set of BIM and CAD tools supported by a cloud-based common data environment that facilitates project delivery from early-stage design to construction. The collection enables teams to accelerate design processes and improve quality with integrated workflows for document management, conceptual design, modeling, coordination, and documentation. Benefits include:

Improved operational efficiency.
Task automation reduces design time and improves handoff with streamlined data exchange

More sustainable projects.
Tools enable delivery of high-quality building and infrastructure projects that exceed performance requirements

Reduced risk.
Tools facilitate stakeholder buy-in and improve project predictability, while reducing errors and rework

Autodesk and DLT Partner to Help Agencies Solve 21st-century Infrastructure Challenges

Autodesk and DLT partner to help state and local governments access the 21st-century technology solutions they need to solve their 21st-century infrastructure challenges.

As Autodesk's first master government aggregator, DLT has worked in the public sector for 25 years alongside Autodesk authorized resellers to provide comprehensive solutions, product expertise, and procurement services.

To learn more, please visit **www.govdesignhub.com** or contact us at **autodesk@dlt.com**.

Virginia DOT Pilots Digital Tools for ROI Over 500 Percent

The importance of ease of use cannot be underestimated. It should take no more than three to four clicks to get to any piece of information, according to Dakota Clifford, a civil engineer with the Virginia Department of Transportation (VDOT). "If it takes a thousand pages of a training manual to learn how to use something, you've already lost the battle," he said.

When implementing new technology, VDOT tests users with varying levels of tech savvy to make sure it works for everyone. Pilot deployments are also essential. VDOT deployed its pilot program for tablet-based inspections in 50 projects. The digital tools saved nearly four hours per week, making an easy case for wider adoption. Efficiencies generated a conservative estimated ROI of 584 percent, Clifford said.[12]

Endnotes

1 American Society of Civil Engineers 2021 Report Card for America's Infrastructure
2 National League of Cities State of the Cities 2021
3 Cities Say Infrastructure Is Top Priority in 2021
4 Fact Sheet: The American Jobs Plan
5 Fact Sheet: President Biden Announces Support for the Bipartisan Infrastructure Framework
6 2021 Report Card for America's Infrastructure Solutions Summit
7 A New Road
8 Governments Can Help Fix Construction Woes With Global BIM
9 Connected BIM Helps LiRo Tunnel Through a Major Project Underneath New York's Grand Central Station
10 Digital Transformation in Government? 4 DOT Best Practices Show It's Possible
11 Building Green: Site Development Is Driving the Future of Building Design
12 Digital Transformation in Government? 4 DOT Best Practices Show It's Possible

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