A GOVERNMENT TECHNOLOGY GUIDE

2022 FUTURE OF TRANSPORTATION GUIDE:

Funding, Planning and Transforming the Way We Move

government technology

INTRODUCTION

America's transportation leaders are at a pivotal point in history. After the tremendous upheaval of the pandemic, which has rerouted commutes and freight delivery and decimated public transit ridership, they're ready to look to the future and leverage transportation improvements to help drive economic development. They're eager to embrace data and emerging innovations, such as connected autonomous vehicles, to usher in a new era in smarter mobility and accessible transportation networks. And they're excited to leverage the historic $1.2 trillion Infrastructure Investment and Jobs Act (IIJA) to address long-delayed maintenance to structurally deficient bridges and unsafe roads; implement new IT solutions to enable more efficient transportation systems; and adopt robust technology infrastructures that are agile, dynamic and secure.

Indeed, the IIJA can help usher in a new era of transit innovation and transform backend operations for many agencies, according to transportation officials and industry thought leaders interviewed by the Center for Digital Government. As state and local governments try to maximize IIJA funding and better deploy existing resources to improve local and regional transit systems, they'll need to develop a future-driven, collaborative strategy and harness emerging technologies to accelerate the creation of the transportation of the future. Based on insights and perspectives from industry and public sector transportation experts, here's a comprehensive roadmap for how state and local governments can get moving.

$1.2 trillion

in IIJA funds will help state and local governments improve and maintain roads, bridges and other infrastructure assets, while ushering in **a new era of technology innovation in transit and transportation**.

AN OVERVIEW OF IIJA FUNDING

Funding from the IIJA covers spending for traditional physical infrastructure such as energy, surface transportation, transit and water projects, as well as spending on digital infrastructure to advance broadband connectivity, digital equity and stronger cybersecurity.[1]

The IIJA authorizes $1.2 trillion in infrastructure funds, part of which can be spent on technologies to improve and maintain the condition of assets such as roads, bridges, tunnels, highways and more. The bill also includes $550 billion in new funding that must be spent over the next five years.

Key IIJA appropriations include:[2]

- **$1 billion** for state and local governments to improve cybersecurity
- **$7.5 billion** to build out a national network of electric vehicle chargers
- **$17 billion** for port infrastructure and waterways
- **$25 billion** for airports
- **$50 billion** to boost the country's resilience against climate-related natural disasters
- **$55 billion** to expand access to clean drinking water
- **$65 billion** to expand access to reliable high-speed internet and foster digital equity
- **$65 billion** to upgrade the nation's power infrastructure and invest in clean energy transmission
- **$66 billion** in rail funding
- **$89.9 billion** in public transit funding, including $39 billion to modernize transit systems
- **$110 billion** in additional funding to repair roads and bridges and support major transformational projects

TYPES OF IIJA GRANTS

IIJA funding is split into two categories: formula-based grants and competitive grants.

Formula Funding

State departments of transportation (DOTs) will distribute part of IIJA funding to municipalities based on federal formulas created by Congress. Local, county and municipal governments and other jurisdictions will receive a set amount, but they must apply for these funds. The application and distribution process will vary by state, so municipalities should follow up with their state DOT to gather more information about the timeline and requirements for receiving federal funding.[3]

Competitive Funding

Competitive grants comprise the other share of IIJA funding. Agencies and other eligible government entities must submit applications and compete with one another to receive certain funding. IIJA includes several competitive grant programs, each with their own application and award criteria. These programs include but are not limited to a $5 billion "Megaprojects" program for multimodal regional or multijurisdictional infrastructure projects, a $12.2 billion Bridge Investment Program that will award funding over four years for bridge improvement and safety projects, a $1 billion Rural Surface Transportation Grant Program to improve the safety and reliability of infrastructure in rural communities, and a $900 million Advanced Transportation Technologies and Innovative Mobility Deployment Program that will provide funding for cross-jurisdictional projects that implement and deploy advanced transportation technologies.[4]

With such funding sources, state and local governments now have an opportunity to address some of their most persistent transportation challenges.

CURRENT BARRIERS FOR THE PUBLIC SECTOR

The American Society of Civil Engineers (ASCE) currently gives the nation's infrastructure an overall score of C-.[5] As governments look to improve that low grade and adopt new solutions, they face several entrenched challenges.

LEGACY TECHNOLOGY

Governments continue to grapple with legacy technologies and a fragmented IT ecosystem that make it difficult to gain visibility into the current state of their infrastructure. Most agencies haven't implemented tools to support proactive decision-making, predictive maintenance or connected transit, or maximized their use of technologies like cloud, artificial intelligence (AI), Internet of Things (IoT), and digital twins for more efficient transit operations and management.

Peter Torrellas, president of Connected Communities for Parsons, says IoT and digital twin technologies that provide real-time virtual views of physical objects will be critical.

"Humans get smarter by processing information we can touch and see," Torrellas says. "The same idea applies to transportation infrastructure, whether it be cameras, air quality sensors, traffic monitors or simple things like Bluetooth sniffers that count people or cars passing by. IoT will be absolutely critical to increase data collection, understand usage, make better decisions and improve operations."

He adds that state and local governments can use digital twins to visually connect "the interdependencies among transportation networks, buildings and utilities to our goals for automation, electrification and climate action," which can lead to better decisions, risk analysis, and the ability to better understand and see the impacts of different capital investments before governments proceed with any projects.

LIMITED COLLABORATION ACROSS THE ENTERPRISE

Technology inefficiencies prevent transportation innovation. They also work against the ideal of a collaborative, enterprise approach within state and local government.

Torrellas says there's a "lack of common policies and environments for collecting and sharing data among governments, transportation agencies and academic institutions." This limitation often leads to organizational and data silos. Judging by how the federal government has structured IIJA funding, it's clear leaders in Washington recognize the need for more collaboration across agency silos and even jurisdictional boundaries. This influx of federal funding may finally be the impetus for more state and local agencies to work together on transportation initiatives.

WORKFORCE CHALLENGES

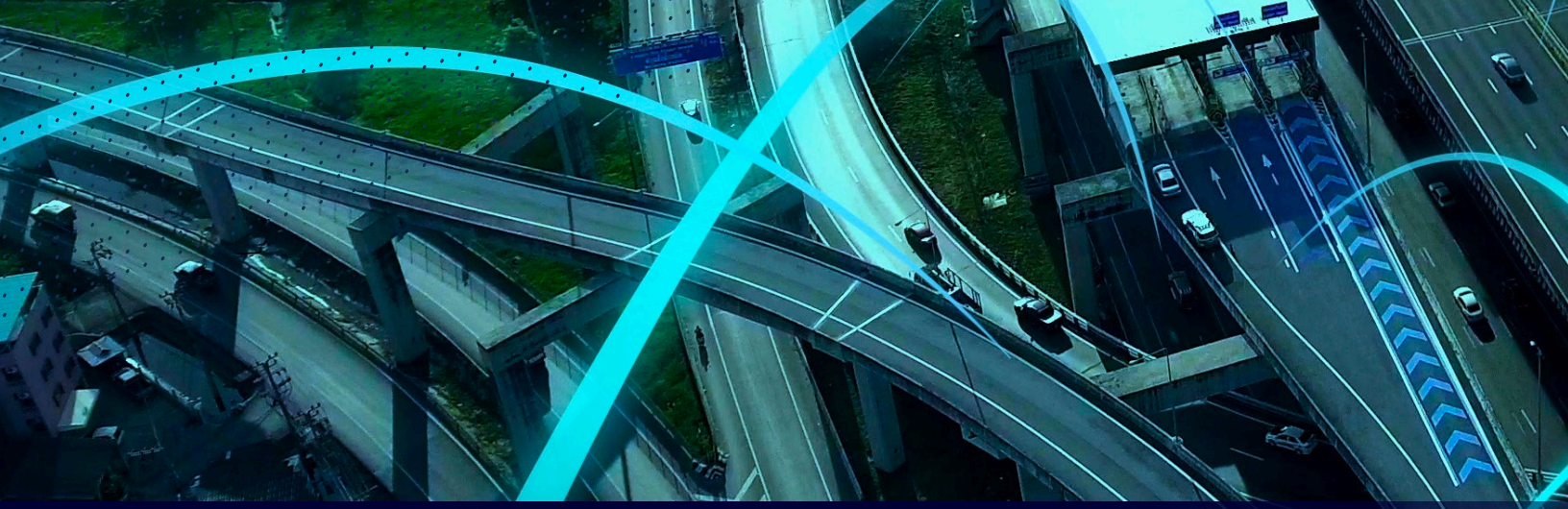
IIJA funding alone won't be enough to solve the nation's transportation's issues, because state and local governments still face serious competition for skilled workers. In a 2021 Center for State and Local Government Excellence (SLGE) survey, 38% of public sector HR professionals said retirement-eligible employees were planning to accelerate their retirement plans, and more than half said their organizations faced challenges filling positions, especially in skilled trades and IT — in part due to competition from the private sector for skilled labor.[6] Separate research indicates state government workforces are projected to decrease by 2% over the next 10 years.[7] The pandemic has only exacerbated these challenges, as the public sector has gained back 53% of the jobs it lost during the crisis, while the private sector has gained back 93%.[8]

Chris Dilley, chief technology officer for government and education at ServiceNow, says as agencies increasingly handle more transit data, they'll need to optimize their business processes and revamp their hiring processes to enable transportation modernization.

"Government agencies also need to be looking at the roles and skill sets they will need on their team. As data becomes such a source of what we do now — and what we do next — we need to understand that data-related roles are really going to be needed in government," Dilley says.

Legacy systems, agency silos and **workforce challenges present entrenched challenges** as governments look to improve the state of the nation's transportation infrastructure.

Bringing more automation to government work and reducing capital expenditure costs by replacing legacy systems with modern technologies may give state and local governments more financial flexibility to hire and retain skilled workers. Embracing hybrid work models, developing pipeline programs with local schools and nonprofit organizations, and upskilling the current workforce can also help state and local governments expand their talent pool. In any case, state and local governments should revisit their workforce strategies as part of their efforts to improve critical infrastructure.



WHY TRANSPORTATION MODERNIZATION NOW?

Several factors are converging to make transportation modernization and innovation a more urgent government priority.

EQUITY

The last two years have brought equity issues to the forefront. During the pandemic, many agencies scaled back transit routes to offset reduced ridership; lower revenue; and a workforce diminished by furloughs, layoffs or employees getting sick.[9] These challenges disproportionately impacted low-income residents, disabled persons and people who live in rural areas, where mobility options were already extremely limited. With federal funding, state and local governments can work to address these disparities.

"Equity is an imperative to eliminate transportation burdens for low-income communities, people with disabilities and other disadvantaged groups," says Geo George, industry strategist and GTM executive at Salesforce. "The key focus is connecting communities and [providing] access to resources and opportunities."

RESILIENCE AND SECURITY

George says strengthening resilience and security are two other driving factors for transportation modernization.

"Recent floods, storms, fires and hurricanes have disrupted the lives of millions and caused hundreds of billions of dollars in damage," he says. "Public officials face the challenge of making highways, bridges, railroads, transit stations, waterways, airports and ports more resilient to climate change and other threats."

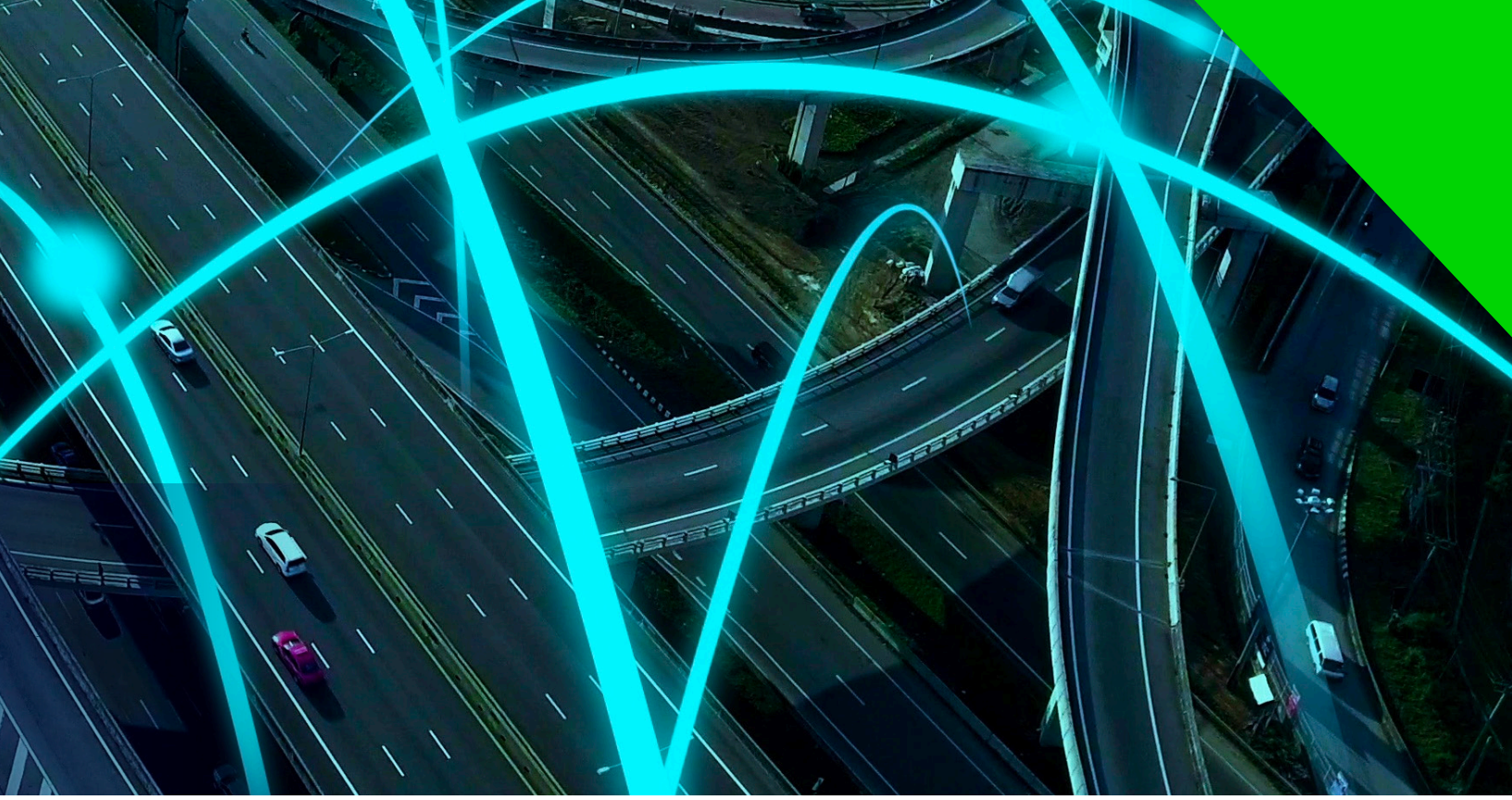
States and localities must also focus on cyber resilience, especially as they integrate new technologies, Torrellas says.

"We really need to close the cyber gap for resiliency and safety reasons," he says. "Just imagine having a million automated vehicles and somebody hacking a car system. As we continue to leverage more data for innovation and automation, the attack surface area will widen. That will create a sense of urgency around cyber."

ENVIRONMENTAL AND ECONOMIC SUSTAINABILITY

State and local governments should also modernize to advance environmental and economic sustainability. Transportation accounts for 27% of greenhouse gas emissions in the U.S.,[10] so making transportation more energy efficient — and putting mechanisms in place to accurately track emissions from these sources — is critical to creating safer, healthier communities.

Deteriorating infrastructure also affects economic growth and development. Businesses and individuals are less likely to move to areas with inadequate transportation options, or crumbling roads and bridges. Municipalities that want to position themselves for growth must make the right infrastructure investments now to stimulate their economies in the future.



SAFETY

Improving safety is one of the most compelling reasons state and local governments should prioritize innovation.

Transportation-related fatalities, which had been on the decline over the past several years, have spiked. 2020 saw the highest increase on record in deaths per mile in the U.S. And the National Highway and Transportation Safety Administration has estimated that 2021 marked the highest level of traffic-related deaths in 16 years.[11]

"Ninety-five percent of transportation fatalities result from routine highway travel," George says. "It will be critical to provide a safe and secure system designed to eliminate transportation-related fatalities and serious injuries."

Daniele Loffreda, senior advisor for industry and solutions marketing with Ciena, says safety is where technology can play a vital role.

"Collisions and accidents are still increasing despite everything departments of transportation have done to try to address that," Loffreda says. "So I expect more technology to be put to work on things like traffic congestion, speed limit enforcement and disaster notifications."

While budget and resource constraints have prevented governments from making expansive infrastructure improvements, it's clear state and local transit agencies must act now to prepare for the future of transportation. They can employ several tactics and strategies to move in this direction.

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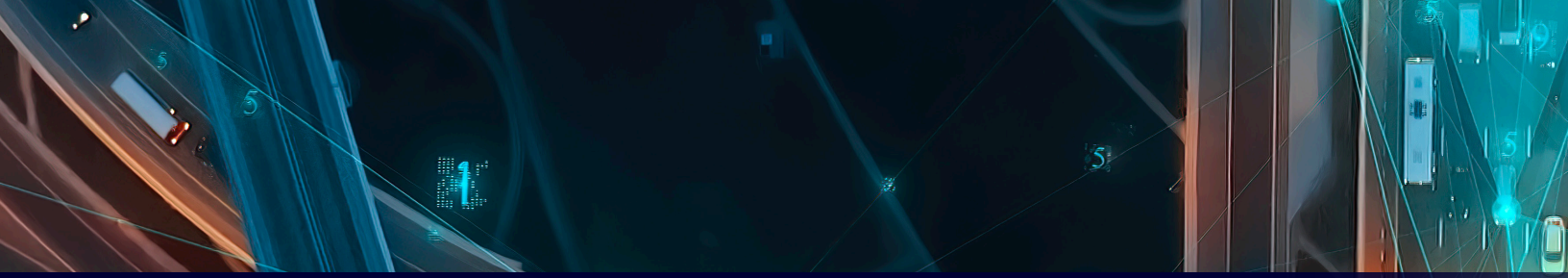

OPPORTUNITIES FOR STATE AND LOCAL GOVERNMENTS

Governments can apply IIJA and their existing funding, technology and workforce resources in several ways to modernize transportation systems and operations.

DATA AND AI-DRIVEN TRANSPORTATION SOLUTIONS

IIJA funding allows agencies to use federal dollars for advanced transportation technologies. For example, the Advanced Transportation Technologies and Innovative Mobility Deployment Program's eligible funding uses include technologies that "improve safety, mobility, efficiency, system performance, intermodal connectivity and infrastructure return on investment." Other grant programs within IIJA include similar language around implementing technology that supports emerging needs, enhances safety and reliability, reduces the environmental impact of surface transportation and paves the way for the "infrastructure of the future."

AI will be a key enabler of the infrastructure of the future. Transportation agencies can deploy federal funding to integrate AI-driven solutions, such as enterprise asset management systems, to manage all the data associated with inspections, repairs and predictive maintenance. AI-enabled autonomous aerial systems and vehicles can reduce the number of human inspectors needed to perform routine work, while also making inspections of complex structures much safer for agencies' existing workforce.

Increased used of data in general will have a transformative impact on transportation networks, says Kristin Hempstead, North American business development manager for data science with Z by HP.

"Collecting, searching and analyzing data for certain outcomes helps you understand current and future issues and needs," Hempstead says. "For instance, the city of Pittsburgh deployed real-time traffic signal controls, which use AI and traffic theory to coordinate the flow of vehicles, cyclists, pedestrians and transit. This tool helped reduce travel times by 25%, wait times at signals by 40% and emissions by 20%."

SMART MOBILITY-AS-A-SERVICE

As municipalities increasingly embrace multi-modal transportation networks, they'll need IoT solutions and other digital technologies to create a more seamless travel experience for residents.[12]

These technologies can support better coordination between rail, buses and other forms of public transportation and give passengers the real-time information they need to plan their trips, says Mark Brewer, group president for transportation solutions at Conduent.

"It's all about the Internet of Things, or IoT, using tools such as cameras, sensors, monitors and data flow to manage congestion — especially during peak travel times. Technology can help control the rate of vehicles entering roadways and highways to keep traffic flowing," Brewer says. "That obviously helps with safety and traffic monitoring. The other thing is smart mobility, providing travelers with an array of options to complete their trips. That includes transit, bicycling and micro-mobility to reduce the number of vehicles on roads and reduce congestion at the same time."

However, all this activity will require lots of data, so agencies will need to retool their IT architecture accordingly. Kevin Tunks, chief architect and national technology advisor at Red Hat, says containers, DevOps, application programming interfaces (APIs) and process automation will be vital to personalize the transportation experience. IT containerization in particular will help agencies create a future-ready transportation technology infrastructure.

"Large legacy systems have been slow to adapt to the changing needs of businesses, consumers and employees," Tunks says. "Containerization breaks down the components

Data, automation and AI will transform transportation.

But governments and their partners must expand 5G, broadband and other advanced IT infrastructure to support that shift.

of systems into smaller and more nimble services or micro-services. These smaller components allow for much faster changes to be made without risking the stability of the overall system. Immutable containerized applications enable the secure management of technologies resting on the network edge. This gives programs like smart cities, emergency management and connected autonomous vehicles the ability to evolve, adapt and innovate at mission speed."

ELECTRIC VEHICLE ADOPTION

As more Americans buy electric vehicles, the country needs an energy infrastructure that will support them. Research shows installing more charging stations in residential areas and adding high-speed charging stations on highways may encourage more residents to buy electric vehicles. IIJA provides funding to incentivize these buildouts, which could lay the groundwork for lower-emission electric school buses, transit buses and even passenger ferries.

5G AND BROADBAND CONNECTIVITY

5G and broadband connectivity will be necessary to support new transit technologies, like vehicle-to-infrastructure communication solutions, that state and local governments will implement in the years ahead. These technologies will also be crucial to promote digital equity.

"Today's technology can maximize the traffic going over fiber," Loffreda says. "This allows more use of fiber along DOT right-of-ways. DOTs can use this extra fiber connectivity to provide broadband access to municipalities and counties. This can extend broadband to remote and underserved communities."

During the pandemic, some municipalities found workarounds for connectivity challenges by deploying mobile hotspots. The state of California, for example, launched a mobile hotspot pilot program in which it outfitted unused transit buses with Wi-Fi technology to extend broadband service to locations that either lacked access or had low-quality access to broadband.

As states move beyond those kinds of immediate responses to the connectivity needs exposed by the pandemic, IIJA funding can allow for broadband buildouts with true long-term impact and help close the digital equity gap in many communities.

DATA-DRIVEN AUTOMATION

As state and local governments implement new transit solutions and intelligent transit systems, they must deal with a growing volume of transit data. When new modes of transit emerge, transit agencies will also need to update their services and fee structures. All of this calls for more automated, efficient transit management.

Tunks says APIs can help transit agencies more easily and securely connect data between systems to deploy legacy business data for smart transportation use cases. AI-driven platforms can also help agencies more easily access data for more proactive decision-making to address their most pressing transportation challenges. This change will allow agencies to "really focus on solving business problems as opposed to solving low-level technology problems," Tunks says.

BEST PRACTICES FOR THE FUTURE OF TRANSPORTATION

As state and local leaders work to determine which transportation investments will be most impactful for their communities, they should keep the following best practices in mind:

◆ TAKE AN ENTERPRISE APPROACH

Governments should avoid organizational and information silos as they develop their prioritization strategy for transportation projects and technology implementation. Greater enterprise-wide collaboration and partnerships between key stakeholders — including IT leaders, DOT officials and other public sector partners — will help ensure state and local governments prioritize the projects that align with allowable uses for federal funding and address the diverse needs of different constituent groups, such as low-income and rural residents.

◆ BUILD YOUR DATA INFRASTRUCTURE

Data will be the fuel that powers modern transportation and infrastructure management technologies, so state and local agencies must improve their data management practices and onboard AI- and cloud-based solutions for superior data collection and analysis.

Additionally, many agencies may already have systems and data they can deploy in new ways to advance their transportation priorities. They should start by devising a plan for how to make better use of existing assets to drive transit and infrastructure improvements.

◆ LEVERAGE PUBLIC-PRIVATE PARTNERSHIPS

Partnerships can increase cost efficiencies for transportation agencies and accelerate infrastructure improvements. State and local governments can leverage federal funding for joint development projects or to enact innovative procurement models for major capital projects.[15]

The state of Nebraska, for example, has advanced a bill that would implement a public-private contracting method for transportation projects in which a private contracting company would finance the project and the state would make periodic payments.[16] Kansas City, Missouri, has collaborated with several major telecommunications providers to install free public Wi-Fi and interactive kiosks to reduce traffic congestion and encourage more pedestrian foot traffic in its downtown business corridor. The city contributed $3.7 million to the $16 million project, with its private partners covering the remaining costs in exchange for exclusive access to usage data from the kiosks.[17]

Partnerships between public sector organizations can also be valuable. The state of North Dakota, for instance, has worked with North Dakota State University to create an incubator called Grand Farm. The state plans to push this project forward even more with IIJA funding.

“We have a large agricultural industry here,” says Bill Panos, director of the North Dakota DOT. “It’s a very significant part of our GDP. Grand Farm is an incubator for new technology, so we’re having them work with some of the suppliers of large agricultural equipment to develop autonomous mowers because we mow green spaces and along the side of highways. If we can come up with a suitable, deployable automated mowing technology to mow with less people and create better safety on the highways for our workers, that would be a win-win-win.”

◆ REVAMP PROCUREMENT PROCESSES

Adopting modern transportation infrastructure may also mean state and local agencies need to embrace modern procurement processes. California,

for example, has taken a collaborative approach to procurement with multi-vendor MSAs to help smaller municipalities and DOTs more easily vet vendors and adopt new transit technologies.

"We can do some of that at the state level and take the burden off to provide options so that some of these local agencies and local governments can see what's possible, since they just don't have the time or resources to do that work themselves," says Lori Pepper, the California deputy secretary for innovative mobility solutions. "We're looking at how we can be more enterprise-focused — not dictate what people should do."

◆ ADOPT A SECURITY-FIRST APPROACH

Operation technologies and information technologies are converging, so transportation agencies will need to automate backend operations, increase their data and endpoint visibility, improve life-cycle management and develop a comprehensive cybersecurity plan to safeguard intelligent transportation systems.

"Many intelligent transportation devices are not necessarily monitored 24/7," Loffredo says. "That's a physical security vulnerability. There are also network vulnerabilities because those devices don't necessarily have strong passwords. They're certainly not updated or patched as often as they need to be. It's the same with the network devices, routers and servers along the roadside. Agencies should constantly upgrade, patch and replace those devices."

As state and local governments modernize their infrastructure, they should invest in advanced transportation solutions with integrated security and monitoring capabilities. To maximize their cybersecurity posture, governments should also create new security policies and governance frameworks for these technologies.

CONCLUSION

America's transportation infrastructure is long overdue for improvement. But with competing government priorities and limited financial resources, many states and localities haven't been able to focus on this critical area.

IIJA represents the largest and most comprehensive infrastructure investment in American history. State and local governments can seize this opportunity to modernize transportation for decades to come. Beyond surface transportation and physical infrastructure projects, governments can invest in the technology infrastructure they need to harness transit data, reimagine transportation systems, and drive proactive maintenance and repairs.

In doing so, they will make their communities healthier, safer and better places to live. There's no investment more worthwhile than that for state and local governments.

ENDNOTES

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