

Public Sector; Social Sector; and Travel, Logistics and Transport Infrastructure Practices

Reimagining infrastructure in the United States: How to build better

Infrastructure agencies need to prepare for two very different scenarios—a sharp rise in funding or a precipitous drop.

by Jared Katseff, Shannon Peloquin, Michael Rooney, and Todd Wintner



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US infrastructure agencies have kept the country's trains running, water flowing, and government buildings functioning during the coronavirus crisis. Now that operations are stabilizing, they can reconsider their capital-expenditure plans. What that entails will vary dramatically depending on whether the federal government provides substantial infrastructure funding as part of an economic-stimulus package. If it does, agencies will need to determine how best to spend their share. And if there is no such funding, they will need to prepare to be more efficient with potentially lower budgets.

There is little doubt about the value of investing in good infrastructure. In 2015, the nonpartisan Congressional Budget Office estimated that every dollar spent on infrastructure brought an economic benefit of up to \$2.20.¹ The US Council of Economic Advisers has calculated that \$1 billion of transportation-infrastructure investment supports

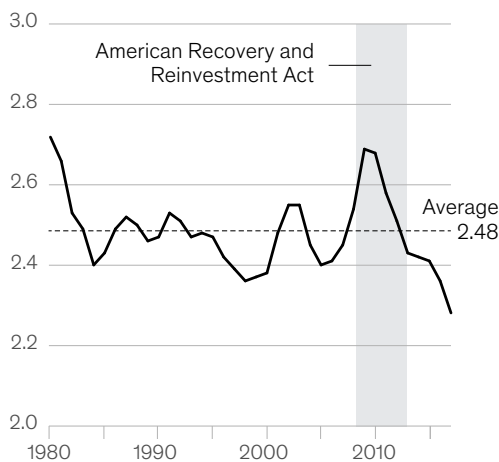
13,000 jobs for a year.² Beyond the numbers, infrastructure is critical to the health and well-being of the country: the United States could not function without the roads, bridges, sewers, clean water, and airports previous generations paid for.

The need for more and better infrastructure is acute. A partial shutdown of the 111-year-old Hudson River rail tunnel in New York, for example, could cost the economy \$16 billion and 33,000 jobs, according to the Regional Plan Association.³ In 2016, the American Society of Civil Engineers estimated that the United States had an unfunded infrastructure gap of more than \$2 trillion (Exhibit 1).⁴ And that figure may now be an underestimate: public-infrastructure federal, state, and local spending was only 2.3 percent of GDP in 2017 (the latest year for which figures are available)—a record low. In 2019, the McKinsey Global Institute (MGI) estimated that fully closing the infrastructure gap could translate into 1.2 percent more jobs across the economy.

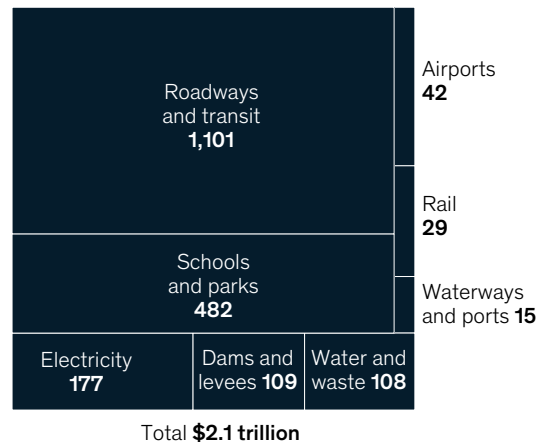
Exhibit 1

Public-infrastructure spending has fallen, and there is a backlog of more than \$2 trillion.

Public spending on water and transportation infrastructure, 1980–2017, % of GDP



Estimated 10-year infrastructure-funding gap by asset type, 2016–25, \$ billion



Source: 2017 Infrastructure Report Card, American Society of Civil Engineers, March 2017, infrastructurereportcard.org; Public spending on transportation and water infrastructure, 1956–2017, US Congressional Budget Office, October 2018, cbo.gov

¹ Estimated impact of the American Recovery and Reinvestment Act on employment and economic output in 2014, Congressional Budget Office, February 20, 2015, cbo.gov.

² "Employment impacts of highway infrastructure investment," US Federal Highway Administration, June 18, 2020, fhwa.dot.gov.

³ Christopher Jones et al., *A preventable crisis: The economic and human costs of a Hudson River rail tunnel shutdown*, Regional Plan Association, February 2019, rpa.org.

⁴ *Failure to Act: Closing the infrastructure investment gap for America's economic future*, American Society of Civil Engineers, 2016, sp360asce.org.

The United States could take advantage of low interest rates and available labor to rebuild and renew the nation's physical assets.

Infrastructure spending was a key part of the 2009 American Recovery and Reinvestment Act (ARRA). The legislation, passed in response to the financial crisis, gave priority to “shovel ready” projects—those that could be completed within three years. While that helped clear out maintenance backlogs (thus improving existing assets and extending their life spans), it did not greatly expand US capital stock or build the kind of projects that could durably strengthen economic competitiveness, as the interstate-highway system, the California State Water Project, and the Washington, DC, Metrorail system did. As Congress considers further infrastructure spending, it should seek to balance the short-term need to maintain employment and activity—the role of shovel-ready projects—with the large-scale ambition to build such transformative projects.

Congress has passed three separate relief packages, totaling more than \$2 trillion, to address the economic consequences of the COVID-19 crisis. Despite significant allocations earmarked for transit agencies, airports, and Amtrak in the Coronavirus Aid, Relief, and Economic Security (CARES) Act,⁵ no funding has been specifically designated for capital projects. As it relates to funding for infrastructure agencies, legislation has focused on maintaining current staffing levels (although some local governments are asking for exemptions to use CARES Act funding for capital needs, despite US Department of the Treasury guidance to the contrary). By contrast, China, the European Union, and Japan have all announced stimulus programs in which infrastructure investment is a key component; like these markets, the United States could take

advantage of low interest rates and available labor to rebuild and renew the nation's physical assets.

Depending on federal action, US infrastructure agencies will face one of two scenarios. In the first, federal stimulus materializes, which would bolster budgets and could unleash a rapid surge of capital deployment. In the second, there is little or no dedicated infrastructure-stimulus spending from the federal government. In that case, capital budgets would come under economic pressure, forcing a reevaluation of priorities.

In this article, we suggest how infrastructure agencies can reimagine their future—whether they get stimulus funding or have to do without. We also set out ways that they could respond in the near term to improve capital allocation in six specific areas: airports, mass transit, roads, water and wastewater, broadband, and publicly owned buildings.

Scenario 1: Federal-stimulus spending bolsters capital budgets

In the first scenario, infrastructure agencies would be expected to put funding to work immediately on projects that both revitalize the local economy and improve service, which often means a focus on routine maintenance and upgrade work. ARRA demonstrated that, given funding, infrastructure agencies can quickly complete many state-of-good-repair projects. That said, there would also be an imperative for agencies to be prepared to invest a portion of stimulus funding in long-range strategic projects.

⁵ Mitchell D. Holzrichter et al., “Summary of CARES Act state and local government relief provisions,” Mayer Brown, April 20, 2020, [mayerbrown.com](https://www.mayerbrown.com).

To get the most out of federal stimulus dollars, agencies should consider balancing projects that provide an immediate economic boost with ones that have transformational impact. To do so, they should consider the following principles:

- ***Be strategic about state-of-good-repair investments.*** With large maintenance backlogs prevalent throughout the United States, reinvesting in existing assets to ensure that they operate at peak performance is one of the quickest strategies for generating economic impact. Existing maintenance and upgrade backlogs can be evaluated against agencies' service mandates to prioritize projects and improve service resiliency.
- ***Prioritize investments that reduce the cost of existing operations.*** Agencies should consider using a portion of stimulus funding for projects that reduce the cost of service delivery. Examples include automating workflows, replacing high-maintenance assets, investing in contactless service operations, and upgrading energy efficiency.
- ***Accelerate transformational investments.*** Large-scale investments in new infrastructure represent the most compelling outcome of a stimulus program and have the greatest potential to enhance competitiveness. However, they also take the longest to construct. Agencies can focus stimulus funds on advancing projects that are in the final stages of development—for example, by finalizing environmental reviews, segmenting work into smaller discrete work packages for early construction, and working with contractors (perhaps through economic incentives) to accelerate delivery.
- ***Capitalize technology investments.*** Digital investments can reduce the total cost of asset ownership and improve user outcomes and experiences; as such, they should be key

components of capital budgets. Digital fare-payment investments, intelligent-transportation systems, predictive-analytics solutions, and workforce-management systems all allow for more flexible operations and higher system capacity without pouring any concrete. Investments such as cloud-based performance-management systems and 5-D building-information models can also make project delivery itself more efficient.

- ***Incorporate decarbonization.*** Stimulus spending on infrastructure could offer an opportunity to improve environmental performance and reduce greenhouse-gas emissions. One way to start is to ensure that agencies measure the pollution and emissions impact of specific projects.

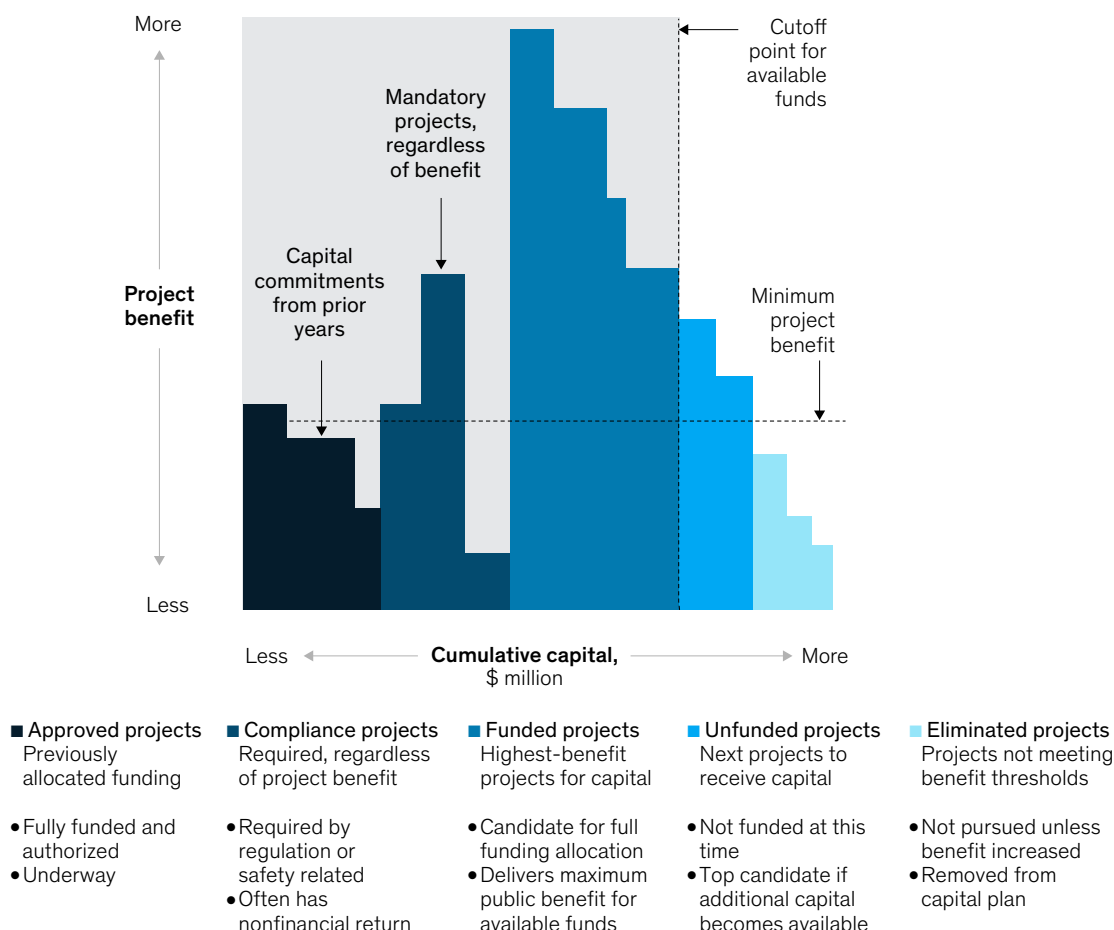
Traditional capital budgets are often crafted through a deliberative and lengthy process. If stimulus funds are to be put to work quickly, that process must be more efficient. One way to allocate funds to their highest and best use as rapidly as possible is to use a capital-portfolio-optimization process in which agencies rank proposed projects based on their estimated benefits. Those with the highest benefits get funded first. Using that process, one major airport reduced its more than \$20 billion capital budget by 40 percent.

Project benefits must be quantifiable and measurable against an agency's stated strategy and time weighted based on when the project will be operational. The time weighting is essential. For two projects with similar outcomes, the public gains more from selecting the project that will finish sooner. Funding is then allocated based on the expected project benefit compared with those of all other available options. The process is iterated at regular intervals to respond to changes in funding or projected project benefits (Exhibit 2). The cutoff point between funded and unfunded discretionary projects depends on how much money is available.

Exhibit 2

The cutoff point between funded and unfunded discretionary projects depends on how much money is available.

Scenario 1: Portfolio optimization with stimulus funding



Source: McKinsey Capital Projects and Infrastructure Practice

Quantifying project benefits can, of course, be challenging. Measures could include operational or service metrics, financial goals, equity aspirations, environmental targets, and user-experience objectives. In the context of recovery from the COVID-19 crisis, agencies may also want to consider metrics around system resiliency (to respond better to future shocks) and economic equity (by creating goals for minority- and women-owned-business participation and removing barriers for small businesses). Vulnerable communities in particular have borne the brunt of both the pandemic and

past environmental discrimination; those same communities could also see some of the highest benefits from modest investments that start to close the investment gap.

Creating that framework increases objectivity in the capital-allocation process and places an agency's overall strategy at the center of decision making. To ensure that the process remains depoliticized, it is important that it be transparent. That can be achieved by publishing the project-benefit calculations, engaging the media, and maintaining

an online portal in which people can track the progress of specific projects and see the capital backlog.

Scenario 2: Capital budgets come under pressure because of poor economic conditions and little or no stimulus funding

If there is little or no federal stimulus, infrastructure agencies may face budget pressure, given the likely downturns in sales taxes and user revenues that are important to their budgets. During the

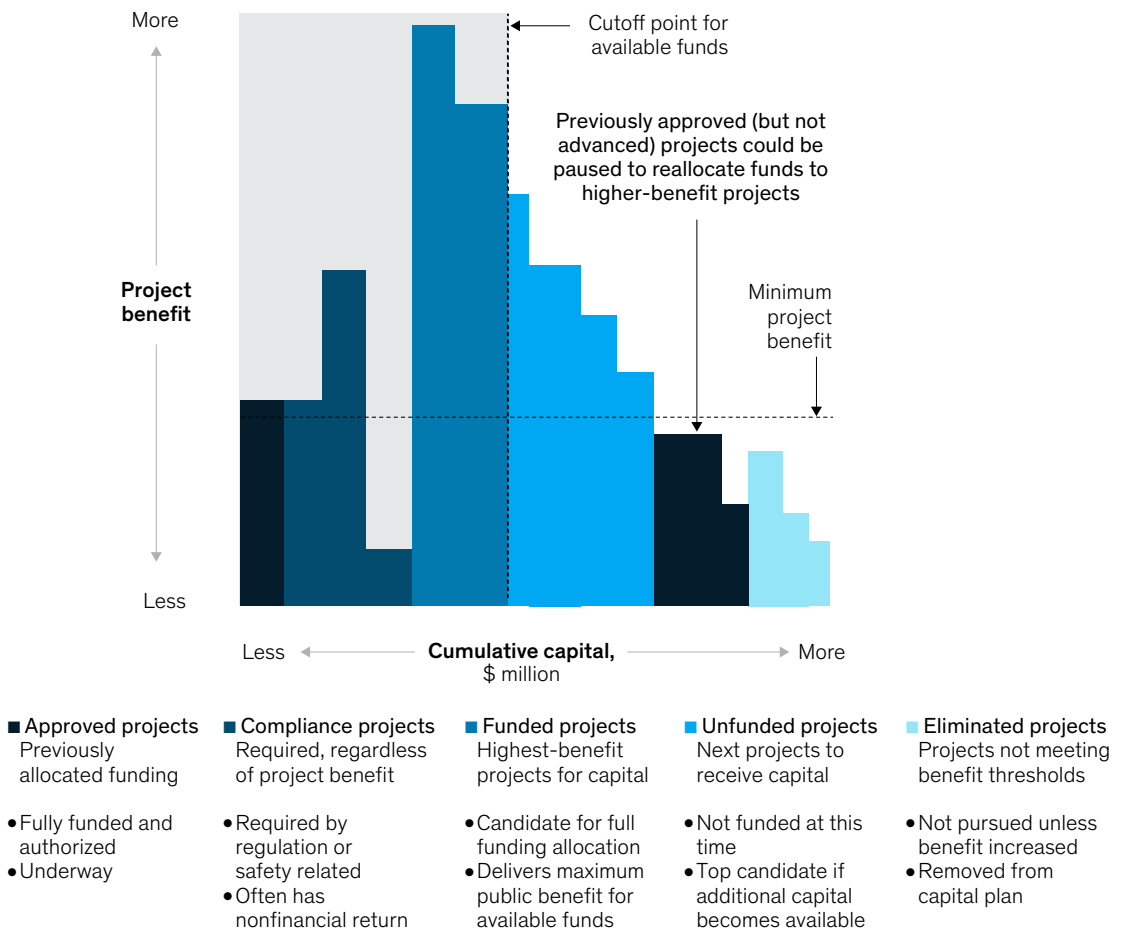
2008 financial crisis, those revenue sources remained depressed for three to four years.⁶ In such circumstances, it is critical to use what capital there is for the greatest benefit (Exhibit 3). Agencies can still use the portfolio-optimization process previously described but would need to modify the capital-allocation strategy and public-benefit criteria. Specifically, they may want to give greater weight to projects that will increase asset resiliency and decrease the total cost of ownership to reduce risk exposure.

According to MGI, spending could be optimized up to 38 percent. Agencies may also choose to delay

Exhibit 3

Giving greater weight to projects that increase asset resiliency reduces risks.

Scenario 2: Portfolio optimization without stimulus funding



Source: McKinsey Capital Projects and Infrastructure Practice

⁶ 2019 State Expenditure Report: Fiscal years 2017–2019, National Association of State Budget Officers, November 2019, nasbo.org.

projects that are not core to operations, eliminate those that may decline in value over the next decade (such as airport parking garages), and take a broader view of what qualifies as a capital project (such as digitization). It may make sense to defer some low-benefit projects that have been approved or even begun early construction and shift that capital to higher-benefit priorities.

Agencies can take steps to reposition capital budgets over the next 12 months to refocus on evolving priorities and improve operational resiliency. To manage current budget constraints and prepare for the next normal, there are four priorities, which are relevant regardless of the type of infrastructure:

- **Enhance the user experience.** Modernize service offerings to attract users back and manage future capacity needs.
- **Transform operations.** Use advanced analytics and flexible models to reduce life-cycle costs and increase asset productivity.
- **Improve delivery.** Take advantage of lower interest rates and accelerate projects to benefit from reduced asset utilization.
- **Consider innovative revenue models.** Look into alternative delivery mechanisms to unlock new revenue streams and consider the use of public-private partnerships to stretch funding.

How to apply these actions will vary, depending on the type of asset and how much it has been affected by the crisis. In the following sections, we describe what actions agencies can take in these four categories for different kinds of infrastructure: airports, mass transit, roads, water and wastewater, broadband, and publicly owned buildings.

Airports

Airports have seen traffic drop by up to 95 percent, and 2019 passenger levels are not expected to return until late 2021 at the earliest. While the \$10 billion in funding from the CARES Act will help, it is

still only an offset; airports will likely have to rethink their capital spending.

Potential actions include the following:

- **Enhance the user experience.** Focus on creating destination terminals that incorporate attractive, high-quality elements. That could mean updating bathrooms, installing noise-dampening measures, and creating localized retail experiences while making queueing efficient and safe.
- **Transform operations.** Invest in smart technologies to streamline maintenance processes, centralize information in operations centers to improve responsiveness, and automate check-in, security, and baggage-handling steps.
- **Improve delivery.** Reevaluate the near-term capital pipeline and accelerate projects to take advantage of reduced passenger loads. For example, Denver International Airport has taken advantage of reduced passenger and flight levels to upgrade its concourses and expedite other construction work. The airport also is reevaluating its master plan, including the timing of parking expansions, roadway upgrades, and construction of a seventh runway.⁷
- **Consider innovative revenue models.** Rethink retail contracts to incentivize performance and capture more value for the public. Examples include seeking ways to increase advertising revenue and negotiating better contracts with concession operators.

Mass transit

With mass-transit-ridership levels dropping by as much as 90 percent in some cities, including Chicago, New York, and San Francisco, and not projected to return to pre-COVID-19 levels for years, fare revenue has plummeted. At the same time, nonfare revenues, such as sales taxes, are also likely to decline because of the economic downturn. The \$25 billion in CARES Act funding was a lifeline

⁷ Jon Murray, "Denver airport accelerates concourse projects by up to \$560 million," *Denver Post*, May 19, 2020, denverpost.com.

The \$25 billion in CARES Act funding was a lifeline to operating budgets but did not affect capital budgets.

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Potential actions include the following:

- **Enhance the user experience.** Use mobile technology to foster a seamless mobility journey and implement improvement projects that create a safer and easier passenger journey. For example, WMATA (Washington Metropolitan Area Transportation Authority) optimized a three-year platform-rebuilding project (upgrading lighting, passenger-information displays, and weather shelters) by accelerating the construction of stations planned for 2021 to this summer.⁸
- **Transform operations.** Deploy digital back-office and workforce-management systems to improve staff efficiency and explore predictive-maintenance systems, driverless vehicles, and energy-efficiency upgrades to lower the cost of operations.
- **Improve delivery.** Accelerate projects to take advantage of reduced passenger loads and lengthened construction-work windows. The City Council of Beverly Hills, citing low traffic levels, recently allowed a full shutdown of Wilshire Boulevard to accelerate the Metro Purple Line Extension project by six months.
- **Consider innovative revenue models.** Monetize shared utility corridors along rights-of-way, redevelop parking lots for alternative uses, and enter joint-development partnerships for urban stations. In Hong Kong, stations are often part of

larger developments that connect and improve the value proposition of three distinct uses (retail, office, and transportation) while generating ongoing revenue for the transit system.

Roads

Departments of transportation (DOTs) are projected to see significant drops in revenue because of reduced gas-tax and toll collections. However, roads are expected to be among the first classes of infrastructure to recover from the pandemic. Not only do Americans want to travel again, but also norms around physical distance may result in a return to automobile use before other forms of transportation.

Potential actions include the following:

- **Enhance the user experience.** Make low-cost roadway modifications, such as sidewalks and bike lanes. DOTs can optimize curb space according to use and time of day to improve system efficiency. Actions include allowing nighttime freight delivery and instituting dynamic park and outdoor dining areas.
- **Transform operations.** Implement advanced analytics and remote monitoring systems to provide targeted predictive-maintenance interventions and manage congestion.
- **Improve delivery.** Accelerate quick-to-repair maintenance projects, such as filling potholes and repaving, to take advantage of a favorable contracting market and lower traffic levels. For example, California DOT (Caltrans) officials moved up a bridge-replacement project in San

⁸ Justin George, "Metro extends summer shutdown to include the Silver Line to take advantage of pandemic slowdown," *Washington Post*, April 23, 2020, [washingtonpost.com](https://www.washingtonpost.com).

San Francisco from July to April to take advantage of the historic drop in traffic. With strong incentives and a collaborative contractor, traffic was disrupted for only eight days.⁹

- **Consider innovative revenue models.** Implement demand-based pricing systems that capture the cost of low-density travel modes, such as congestion pricing and managed lanes.

Water and wastewater

Given the basic need for water and wastewater, those agencies have weathered the pandemic with relative stability. However, there could be more payment default because of the challenging economic conditions and changes in demand patterns from users staying home more. In addition, outside of the biggest water districts, few have invested in innovative processing technologies. There is considerable room for capital improvements that can permanently lower operating costs.

Potential actions include the following:

- **Enhance the user experience.** Use capital to incentivize conservation upgrades that can reduce future demand. California has long had programs to help residents upgrade old appliances with more water-efficient models, avoiding billions of dollars of capacity upgrades.
- **Transform operations.** Install technology that improves systemwide efficiency, such as advanced monitoring systems, “biomimicking” treatment systems, and water-recycling programs that accelerate the shift from gray to green infrastructure.
- **Improve delivery.** Take advantage of the softening construction market to accelerate critical infrastructure improvements. Look for ways to optimize delivery with DOTs and utility companies to share costs and reduce disruptions.

Broadband

Access to broadband is uneven—and a source of present and future economic disadvantage. Almost 163 million Americans do not use internet at broadband speeds (downloads of 25 or more megabits per second) because of financial and coverage limitations.¹⁰ While broadband in the United States is largely the domain of the private sector, governments could take action to expand access.

Potential actions include the following:

- **Enhance the user experience.** Bring broadband to public institutions, including schools, libraries, and police and fire departments, and allow community Wi-Fi access. During the pandemic, many local governments set up Wi-Fi in library parking lots and deployed hot-spot-enabled school buses to provide free internet access.
- **Improve delivery.** Ease barriers to construction, including by streamlining permitting and providing expanded access to public rights-of-way.
- **Consider innovative revenue models.** Offer credit subsidies, tax credits, or equity investments to incentivize private-provider expansion into underserved and rural regions.

Publicly owned buildings

Given the pressures on state and local taxes, operators are facing uncertainty in both how their public facilities will be used and how to pay for upgrades. Moreover, some facilities may need to be reconfigured to adapt to new physical-distancing standards.

Potential actions include the following:

- **Enhance the user experience.** Pursue service digitization to delay future needs for additional physical space. For example, departments of

⁹ Phil Matier, “Speedy contractor finishes SF freeway project early, pockets \$8 million,” *San Francisco Chronicle*, May 10, 2020, [sfchronicle.com](https://www.sfchronicle.com).

¹⁰ *Microsoft On the Issues*, “It’s time for a new approach for mapping broadband data to better serve Americans,” blog entry by John Kahan, April 8, 2019, blogs.microsoft.com.

motor vehicles can reconsider the user journey for obtaining a driver's license or registering a vehicle to enable these processes to be completed online, by mail, or in a library. That could reduce the need to build or upgrade facilities while improving customer satisfaction.

- **Transform operations.** Prioritize lower-cost and quick-to-implement energy-efficiency upgrades, such as window replacements; heating, ventilating, and air-conditioning updates; and plumbing improvements.
- **Improve delivery.** Accelerate ongoing projects to take advantage of construction-market capacity and reduced user levels.

- **Consider innovative revenue models.** Develop new government facilities, with private-sector participation. Real estate is often the most valuable (and undervalued) asset of a city. Chicago has combined library reconstruction with affordable housing in three underserved neighborhoods, addressing two critical needs while maximizing the utilization of city-owned land and lowering overall project costs.

The road to full recovery after the COVID-19 crisis will likely be long and difficult. Whether there is substantial federal infrastructure stimulus or not, US agencies have the chance to reimagine the country's infrastructure for a more resilient and efficient future. This is a critical time that could define America's infrastructure for the next generation.

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