



## Transportation Infrastructure and COVID-19

### A moment that matters

The COVID-19 pandemic has caused sharp drops in employment and economic growth and triggered widespread disruption of the economy. This has created unprecedented demand- and supply-side disruptions with serious impacts to households, businesses, and state and local governments.

Affected on most fronts, state and local government agencies are facing huge revenue shortfalls, economic slowdown,

overstretched health systems, and a concerned workforce.

For the transportation sector, key revenue sources (e.g. the gas tax, sales taxes and user fees) are at serious risk with the American Association of State Highway and Transportation Officials (AASHTO) projecting a 30% decline in transportation revenue nationwide.<sup>1</sup> Today, many agencies face a daunting financial future that threatens not just their current

operations and capital projects, but their long-term viability.

As state and local governments explore solutions, focusing on short-term relief as well as the steps that will set up for long-term success is critical. This white paper explores the implications of COVID-19 on transportation infrastructure and provides insights for decision-makers to take positive action in this critical moment in history, by considering the following:

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<sup>1</sup> <https://www.usatoday.com/story/news/politics/2020/05/04/coronavirus-transportation-officials-urge-federal-aid-roads-bridges/3005467001/>

- Economic impacts from COVID-19 and the effects on state and local transportation
- An opportunity to address mounting maintenance backlogs, optimize technology, and protect the workforce
- Prioritizing project portfolios to ensure limited funds are optimized to produce the maximum societal benefit.

## Workforce disruption

All economies rely on the exchange of goods and services, and transportation is a vital component of this exchange. Transportation industry workers build the infrastructure and operate services that enable markets to thrive, but the workforce disruption caused by COVID-19 has not been evenly distributed. The transportation sector includes more than 13 million workers – or nearly 10% of the country’s workforce.<sup>2</sup> Many of these workers build, operate, and maintain the public transportation infrastructure that plays a major role in the economy. Commuters logged almost 10 billion transit trips in 2019 alone, with lower-income populations even more reliant on public transit to access essential services.<sup>3</sup> The current state affects the transportation sector in two distinct ways:

1. **Direct Impacts**, including exposure for frontline transit workers, reductions in transit service and the resulting lost wages for employees, and lost work-time for construction efforts paused or slowed by social distancing requirements or efforts deemed non-essential. As of late April, more than 2,500 employees from New York’s MTA had tested positive for COVID-19.<sup>4</sup>

2. **Indirect Impacts**, including service degradation for workers relying on transit to access their jobs, supply chain impacts such as reduced sales of fuel, equipment and maintenance services for both individual households and fleets.

The combined impact leads to a negative feedback loop, one that impairs workers’ livelihoods and threatens one of the most imperative sectors in the economy.

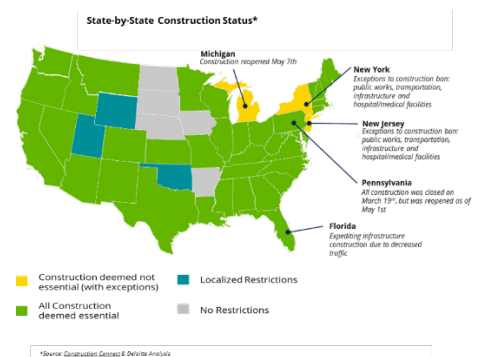
## Infrastructure at a standstill

Although construction has been deemed an essential industry in most states—and some capital projects have pushed forward with additional precautions—many projects are being delayed or put on hold indefinitely due to projected budget shortfalls. In North Carolina, for example, a steep decline in revenue has pushed the NC Department of Transportation below its statutorily mandated cash floor. The department is no longer permitted to enter into new contracts, and it was forced to postpone more than 100 projects valued at \$2.2 billion.<sup>5</sup>

“We need revenue to begin putting people back to work across North Carolina,” said NCDOT Secretary Eric Boyette.<sup>6</sup> This has implications beyond construction. As staff follow social distancing orders, future project planning and design activities have slowed down considerably. Inspections and maintenance also have come to a grinding halt; an issue that already was subject to delays due to staffing shortages.<sup>7</sup>

For infrastructure projects that have continued with new safety precautions, it is likely that the pace of construction will

slow down. Social distancing requirements limit the physical interaction necessary for many construction activities, resulting in reduced worker efficiency, which will affect the schedule and ultimately the cost of projects. State and local governments should be prepared for change orders resulting from additional resources and related costs for the increased project timelines.



## Declining taxes and user fees

Along with hospitality and tourism, the transportation sector has been one of the primary industries to bear the brunt of the COVID-19 pandemic and associated economic shock. Personal travel patterns have shifted dramatically in response to public health guidance and shelter-in-place orders issued by state governments across the country. Every metro area in the country has experienced a decline in traffic of at least 53% since the beginning of March, with cities in coastal California and the Northeast corridor experiencing declines of more than 75%.<sup>8</sup> Apple Maps data show that transit demand is down 73% from the beginning of the year<sup>9</sup> and major transit agencies are reeling—New York City subway ridership is down 92 percent.<sup>10</sup>

<sup>2</sup> <https://www.bts.gov/transportation-economic-trends/tet-2018-chapter-4-employment>

<sup>3</sup> <https://www.apta.com/news-publications/public-transportation-facts/>

<sup>4</sup> <https://www.theguardian.com/world/2020/apr/20/us-bus-drivers-lack-life-saving-basic-protections-transit-worker-deaths-coronavirus>

<sup>5</sup> <https://www.usatoday.com/story/news/politics/2020/05/04/coronavirus-transportation-officials-urge-federal-aid-roads-bridges/3005467001/>

<sup>6</sup> <http://goldsborodailynews.com/blog/2020/05/04/revenue-decline-due-to-covid-19-depletes-ncdot-cash-reserves/>

<sup>7</sup> [https://s3.amazonaws.com/PCRN/docs/Strengthening\\_Skills\\_Training\\_and\\_Career\\_Pathways\\_Across\\_Transportation\\_Industry\\_Data\\_Report.pdf](https://s3.amazonaws.com/PCRN/docs/Strengthening_Skills_Training_and_Career_Pathways_Across_Transportation_Industry_Data_Report.pdf)

<sup>8</sup> <https://www.brookings.edu/research/coronavirus-has-shown-us-a-world-without-traffic-can-we-sustain-it>

<sup>9</sup> <https://www.apple.com/covid19/mobility>

<sup>10</sup> <https://brooklyneagle.com/articles/2020/04/08/new-york-city-subway-ridership-down-92-percent-due-to-coronavirus/>

**Change in Public Transit Demand, Nationally (Feb 15 – May 1, 2020)**

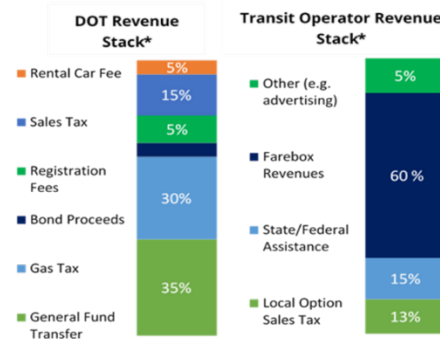


Combined with the decline in consumer spending and overall economic activity, state and local transportation agencies and transit operators have come under immense financial pressure. Departments of transportation responsible for funding and financing major capital projects, such as highway or rail construction, face a steep drop in both fuel tax revenues, vehicle and registration fees, and toll revenues. Transfers from general funds are likely to decline as well. In past recessions, sales taxes have provided a relatively stable revenue source for states.<sup>11</sup> This is not the case today, with consumer spending limited by social distancing and shelter-in-place orders. The US Commerce Department reported that retail sales declined by 16.4% from March to April, the largest monthly decline on record.<sup>12</sup>

With such a severe impact to their tax revenues, the ability for state and local governments to meet their bond obligations has come into doubt.

Meanwhile, transit agencies are largely dependent on local sales taxes and farebox recoveries to subsidize their system operations and maintenance.

While the federal government has allocated \$25 billion in emergency aid to help cover operational losses, the next six months present an enormous financial challenge as transit agencies struggle to attract riders back onto buses and subways and continue to implement much needed capital projects.<sup>13</sup> Furthermore, state transportation agencies received no federal support and according to AASHTO they are “forecasting a significant reduction in state transportation revenues that will challenge their ability to maintain and operate our transportation system in a way that can support the COVID-19 response.”<sup>14</sup>



Note: Generalized view of DOT and Transit Agency revenue sources  
 Figure 1: Illustrative Revenue Stack (Source: Deloitte Analysis)

Leaders of transit agencies and departments of transportation alike will have to find creative solutions to the economic and public health challenges posed by COVID-19. The American Association of State Highway and Transportation Officials (AASHTO) projects a 30% decline in transportation revenue nationwide.<sup>15</sup> However, there may be opportunities for transportation officials to manage finances and operations during this period of disruption, while also preparing their organizations to adapt and

become more resilient for the longer term.

**An opportunity to address usually difficult projects**

Critical transportation infrastructure operations and maintenance are essential services in many places that must continue during the COVID-19 pandemic. Across the US, the transit systems have a \$98 billion maintenance backlog<sup>16</sup> and the national highway system has a further \$826 billion backlog of highway and bridge capital needs.<sup>17</sup> Transportation agencies are struggling with limited funds coupled with a declining workforce that is now hampered by social distancing restrictions.<sup>18</sup> An opportunity exists for agencies to address these critical needs resulting from our aging infrastructure, to improve safety and modernize the workforce.

Under normal operations, traffic control for transportation projects adds cost and limits schedule. Currently projects on normally high-traffic bridges or highways can be performed more efficiently with significantly less disruption than previously experienced. A deck replacement project for a Bay Area California bridge normally traversed by a quarter of a million cars a day was expected to cause hours-long backups. Instead, with traffic flow reduced by 40 to 60 percent, the project was accelerated and completed in half the estimated time, with only a 10-minute detour for drivers.<sup>19</sup> Florida’s Department of Transportation is accelerating \$2.1 billion in critical transportation infrastructure projects to take advantage of decreased traffic.<sup>20</sup>

<sup>11</sup> <https://taxfoundation.org/income-taxes-are-more-volatile-than-sales-taxes-during-recession/>  
<sup>12</sup> <https://www.washingtonpost.com/business/2020/05/15/retail-sales-april-coronavirus/>  
<sup>13</sup> <https://www.reuters.com/article/us-health-coronavirus-transit/trump-administration-awards-25-billion-in-emergency-transit-funding-idUSKBN21K2JW>

<sup>14</sup> <https://aashtojournal.org/2020/04/24/state-dots-feeling-the-budgetary-impact-of-covid-19/>  
<sup>15</sup> <https://www.usatoday.com/story/news/politics/2020/05/04/coronavirus-transportation-officials-urge-federal-aid-roads-bridges/3005467001/>  
<sup>16</sup> <https://www.transit.dot.gov/TAM>  
<sup>17</sup> <https://www.infrastructurereportcard.org/roads/funding-future-need/>

<sup>18</sup> <https://www.infrastructurereportcard.org/roads/funding-future-need/>  
<sup>19</sup> <https://www.theatlantic.com/politics/archive/2020/05/coronavirus-pandemic-infrastructure-week/611125/>  
<sup>20</sup> <https://www.roadbridges.com/florida-dot-accelerates-21b-critical-work-during-covid-19>

Road congestion cost the US economy \$87 billion in lost productivity in 2018.<sup>21</sup> The potential for decreased congestion in the future and decreased construction time in the present, makes performing projects during this time financially and economically advantageous.

## Safe and socially-distanced operations

The economic impacts of COVID-19 and the mandate for social distancing to help safeguard worker safety has disrupted normal operations for all transit organizations, but critical transportation operations and maintenance must continue.

Public transit systems are vital for urban economies when recovery from the pandemic begins. As shelter in place restrictions begin to lift, passenger and worker safety remains the top priority. The New York City Metropolitan Transportation Authority has paused overnight service to allow time for stations and trains to be disinfected.<sup>22</sup> There is potential to decrease risk by mandating increased distancing between passengers, which would in turn decrease capacity and require modified timetables that account for increased loading time. Even after social distancing guidelines are lifted, transit agencies may not see ridership return to its previous levels for months or even years. Social distancing has forced many organizations to adapt to working remotely, potentially decreasing the number of commuters permanently and altering attitudes toward public transit for many Americans.<sup>23</sup> To accurately and successfully account for these changes, organizations can rely on robust data analytics, predictive modeling, and optimization tools. For example, agent-based modeling can be used to better

inform transit schedules, optimize based on new travel behaviors and ultimately ensure critical service provision for communities who need it most.

Inspecting and maintaining transportation infrastructure also must continue to ensure public safety. For pedestrian overpasses, bridges, and structures that run over difficult terrain, an aerial work platform or rope access has traditionally been required for in-person inspections. The use of innovative technologies, such as drones, sensors, and Internet of Things (IoT), can reduce personal safety risk to inspectors by letting them perform inspections remotely or distanced from other people and away from traffic. Even after the pandemic ends and social distancing is no longer required, remote inspections should continue to benefit transit agencies and the traveling public.

## Cost savings associated with drone inspection are estimated to be around 40%

Cost savings associated with drone inspection are estimated to be around 40%—even before accounting for the advantages of having a digital inspection file that easily can be revisited.<sup>24</sup>

## Workforce Modernization

The transportation workforce should utilize technology to continue operations now and improve efficiency in the future. Many transportation agencies have not traditionally supported widespread, remote work; however, social distancing has created a demand for technology and IT professionals to be able to support this.

Roles across transportation agencies have been reevaluated for the potential to work remotely and while many jobs will return to in-person, now that the ability to work remotely has been established, many workers may push to increase their job flexibility.<sup>25</sup> The skills and technology used to enable these workers during the pandemic can support increased remote work in the future.

Increasingly, robust data analytics are required to inform investment decisions and policy recommendations by accurately assessing conditions and simulating impacts from future infrastructure projects and policy changes. One potential solution is a digital twin, a model of a complex, large-scale, multi-modal transportation system. Systems engineering and agent-based modeling approaches can be leveraged to conduct scenario-based modeling in a more agile fashion, adapting to new modes (such as introduction of scooters) and unplanned disruptions to demand, and provide insights to evolving land use changes, infrastructure needs, and improved demand management practices. This can enable agencies to take proactive steps to mitigate and exploit opportunities and reduce the risks associated with investments in mobility. In a recent FHWA report, the San Diego Association of Governments (SANDAG) cited sketch planning tools like Deloitte's FutureScape™ platform as having the "highest potential for future application" in transportation scenario planning.<sup>26</sup>

<sup>21</sup> <https://www.weforum.org/agenda/2019/03/traffic-congestion-cost-the-us-economy-nearly-87-billion-in-2018/>

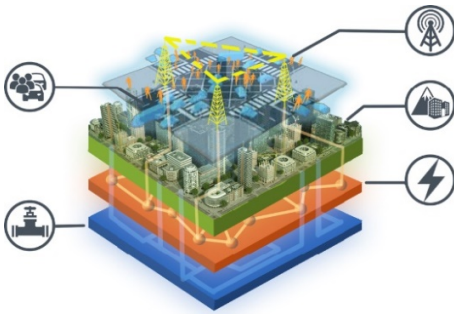
<sup>22</sup> <https://www.nytimes.com/2020/05/03/nyregion/mta-subway-coronavirus.html>

<sup>23</sup> <https://www.governing.com/community/Social-Distancing-Could-Have-Permanent-Impact-on-Public-Transit.html>

<sup>24</sup> <https://www.dot.state.mn.us/research/reports/2018/201826.pdf>

<sup>25</sup> <https://www.nytimes.com/2020/05/12/nyregion/coronavirus-work-from-home.html>

<sup>26</sup> [https://www.fhwa.dot.gov/planning/tmip/publications/other\\_reports/emat\\_beta/index.cfm#toc24473484](https://www.fhwa.dot.gov/planning/tmip/publications/other_reports/emat_beta/index.cfm#toc24473484)



Developing a technologically-savvy talent pool could help to modernize the workforce, creating jobs while implementing disruptive technologies that can transform the transportation industry as it emerges from the pandemic. This process could include:

- Transportation sector evolution to more virtual work
- Workforce modernization around tech savvy innovations like drones, IoT, automation and predictive analytics
- Training or employing more data scientists to support the current engineering workforce.

### Risk of Department of Transportation grants and loans being left “on hold”

The COVID-19 crisis has had a negative impact on states, forcing them to use rainy-day funds and implement cost saving measures.<sup>27</sup> Many capital projects are being cancelled or postponed due to budgetary constraints. A concerning consequence of the COVID-19 crisis is that federal support and funding could be allocated to projects that are no longer feasible or delayed, immobilizing a scarce resource that could be deployed elsewhere to help address other US infrastructure challenges.

With federal support capped by MAP-21<sup>28</sup>, transportation agencies have to

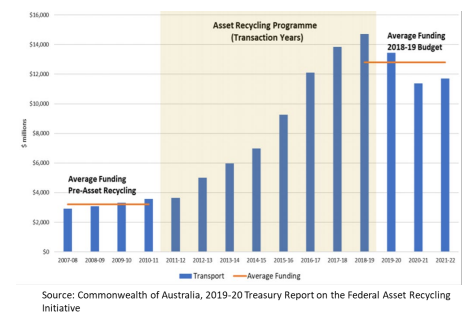
contribute a significant share of the project’s costs. Their traditional funding sources are being adversely affected and transportation agencies may struggle to match federal contributions. The impact may not be limited to state projects, but also have cascading effects on federally-funded developments that could stall due to state liquidity challenges. Federal credit programs, such as Transportation Infrastructure Finance and Innovation Act (TIFIA), could potentially see an increase in loan delinquencies along with a rapidly shrinking origination pipeline for new loans.

There are several levers at the federal level that could be considered to assist state and local agencies, such as the possibility to reallocate federal funding to projects that are likely to move forward or amending federal incentives to reflect the funding issues faced by states. Examples include reducing or aligning TIFIA interest rates to prevailing market rates, expanding the use of Private Activity Bonds (PABS), offering federal matching, grants or tax incentives to stimulate private investment.

### Private capital for public good

The country needs investment to rejuvenate decaying infrastructure – but this also could provide a much-needed source of funds to address critical deficits and stimulate the economy. State and local transportation agencies should consider evaluating their portfolios in a more strategic and innovative way. By leveraging private capital for public good—utilizing public private partnerships, asset recycling, evaluating underutilized facilities, sought after right-of-way access or renegotiating lease arrangements—transportation agencies could alleviate economic pressures and help stimulate recovery. For example, in 2014 the Australian government established an asset recycling initiative

that leverages long-term lease arrangements on its port facilities and electricity transmission network. The resulting benefit was more than \$35 billion invested in their critical infrastructure, including rail, transit, roads, tunnels and hospitals. Asset recycling allowed the Australian government to increase transportation infrastructure to \$14.7 billion in 2018 – fivefold the budget allocation from 2008-09.<sup>29</sup>



Due to pressing economic needs, Australia’s government was able to quickly gain public support and heavily de-risk contracts through federal guarantees, allowing for fast tracking and unprecedented economic returns.

### Project prioritization needs to be re-examined

The environment created by the COVID-19 virus may require a change in the way transportation agencies are developing their infrastructure programs. New revenue and funding baseline forecasts should be developed to account for shortfalls related to COVID-19 (reduced ridership, declining taxes, etc.) and these forecasts need to flow through the planning and budget process including STIP and TIP. Without clearly updating the programs, capital may be earmarked to the sub-optimal projects and will be difficult to reallocate, which could result in a negative economic surplus. The last 20 years have seen three major economic declines—the dot-com bubble, the

<sup>27</sup> <https://www.ncsl.org/research/fiscal-policy/state-fiscal-responses-to-covid-19.aspx>

<sup>28</sup> <https://www.fhwa.dot.gov/map21/fedshare.cfm>

<sup>29</sup> <https://treasury.gov.au/sites/default/files/2019-03/360985-Infrastructure-Partnerships-Australia.pdf>

financial crisis, and now the COVID-19 public health emergency—and transportation agencies should leverage lessons learned to forecast what the future may entail, for example which project had the most optimal economic results after previous downturns.

This understanding of the potential revenue impacts can set the groundwork to update state capital programs within the new paradigm. Costs could increase, as social distancing rules could limit the on-site workforce and increase the need for multiple shifts. Projects that did not make economic sense before could become feasible with the decrease in prevailing interest rates. Funding made available for a specific project that has been stalled may be reallocated to another state initiative or accelerate the development of another capital project.

### Focus on economic benefits

With the significant increase in unemployment across the country<sup>30</sup>, infrastructure investments may represent a path to restart the economy and benefit society more broadly. State and local departments of transportation could widen the aperture to assign greater weighting to ancillary benefits a project brings to citizens and prioritize public spending to support vulnerable local economies, provide valuable employment opportunities, and support the US workforce in times of stress.

The current environment could be the catalyst to break silos within the government and adopt a holistic perspective that includes deeper integration of economic considerations and benefits into programmatic planning. A transportation project may not offer direct financial benefits, but could unlock broadband connections to a community, enable job creation or retention, or improve connectivity, amenity or other factors resulting in net increases to local tax collections.

Transportation agencies could benefit from increasing the importance of broader economic considerations in their approach to program development. Increased dialogue with other agencies could influence some of the prioritization factors to reflect a state-wide agenda to support economic recovery. Traditional key performance indicators (KPIs), such as average daily traffic, may not capture the entirety of a project's outcomes. Transportation agencies should consider alternative performance measures and evaluate demand based on a systematic and networked approach, where the focus is shifted from car counts to population needs and behaviors.

Finally, uncertainty does not imply an economic depression, but rather could be used to explore alternative ways of deploying capital to circumvent stalled projects and keep programs moving forward.

COVID-19 could be the catalyst for departments of transportation to reflect upon long-established prioritization criteria and challenge the status quo to adapt to the new environment

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<sup>30</sup> <https://data.bls.gov/timeseries/LNS14000000>

## Conclusion

With much of the country sheltering in place, the transportation sector has been particularly affected by the pandemic, and even as public health rules begin to lift, commuting and travel patterns are unlikely to return to their pre-COVID-19 levels. Given the vital role that transportation plays in the American economy, it is imperative that public sector leaders identify and implement creative solutions to maintain the health of the transportation sector.

Infrastructure has long been the common enterprise that Americans turn to in times of crisis. Previous generations built the Hoover Dam and the interstate highway system in the midst of the Great Depression and Cold War, respectively. Looking back on the Federal-Aid Highway Act of 1956, President Dwight Eisenhower wrote: “More than any single action by the government since the end of the war, this one would change the face of America ... Its impact on the American economy—the jobs it would produce in manufacturing and construction, the rural areas it would open up—was beyond calculation.”<sup>31</sup>

Almost 65 years later, in the depths of this latest crisis, there is an opportunity to lay the foundation for renewed growth and prosperity for future generations.

Even absent major new federal funding, there is room for government leaders to make a big difference in the continued construction, operations, and maintenance of critical transportation infrastructure. From new technology applications to creative financing solutions, the private sector stands ready to work with public officials to help preserve the vital business of transportation. Now is the time to act on the various opportunities to:

- Identify the near-term issues resulting from the complexity of the economic impacts of COVID-19 and address the prioritization for funding of projects
- Embrace public-private partnerships, expand public activity bonds, adjust federal matching programs, and identify opportunities for asset recycling

- Evaluate the strategic advantages for long-term modifications to infrastructure O&M through the adaptation of disruptive technologies to reduce costs and increase safety
- Seize moment to address maintenance backlog, upgrade technology, help modernize the workforce and create jobs



<sup>31</sup> <https://www.fhwa.dot.gov/interstate/quotable.cfm>

## Let's talk

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