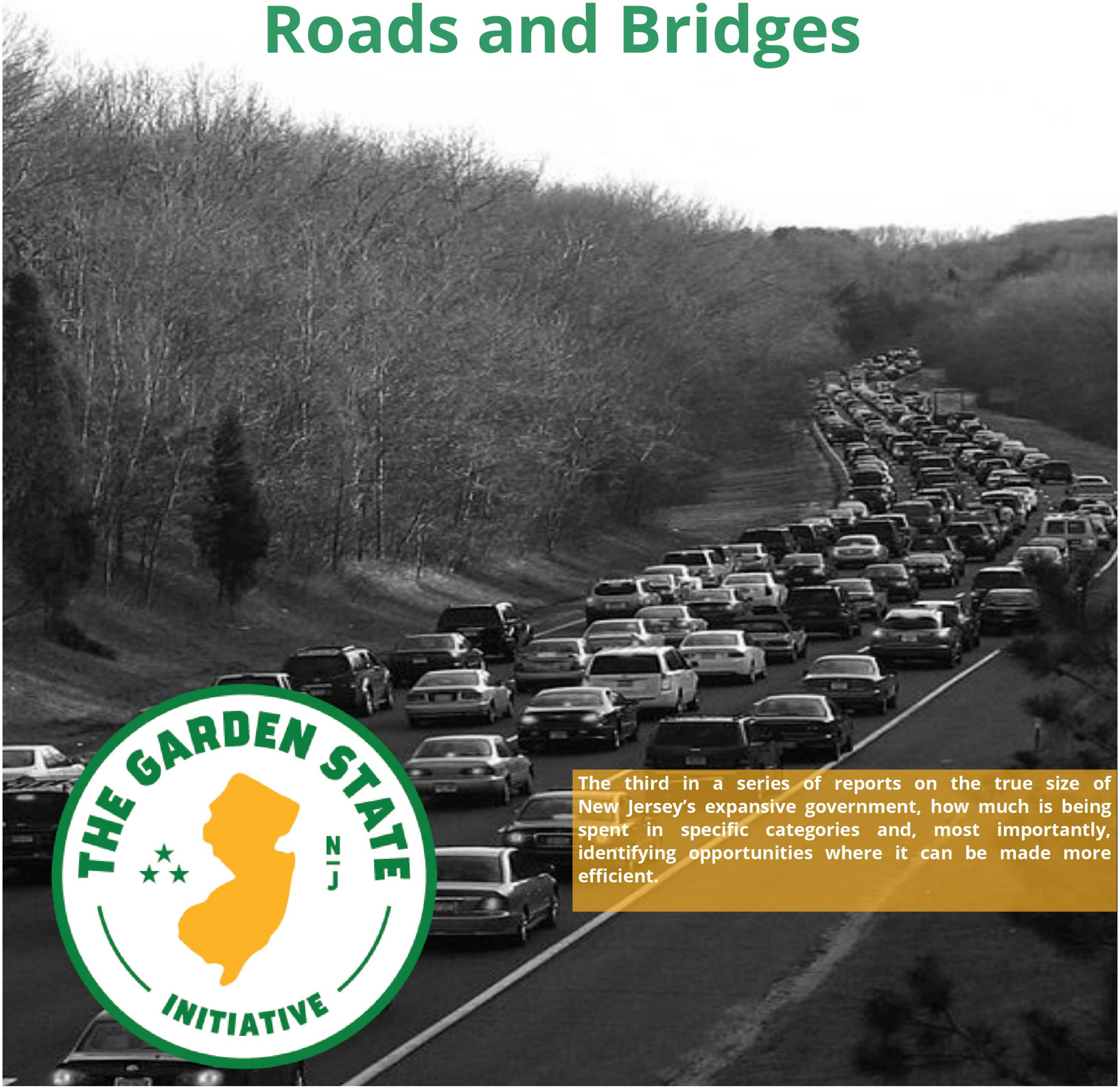
Adding It All Up:

The Path to Saving $2 Billion on the Cost of New Jersey's Roads and Bridges



The third in a series of reports on the true size of New Jersey's expansive government, how much is being spent in specific categories and, most importantly, identifying opportunities where it can be made more efficient.

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Our Mission

The Garden State Initiative is a 501(c)3 nonprofit organization dedicated to strengthening New Jersey by providing an alternative voice and commonsense policy solutions in the state -- solutions that promote new investment, the growth of jobs, the creation of economic opportunities, and innovation to the benefit of all New Jerseyans.

GardenStateInitiative.org

Research and analysis conducted by PEL Analytics

Authors

Henry Amoroso is the Executive Chair of PEL Analytics, an attorney, professor, and CEO with decades of experience navigating the most complex problems in the business, government, and non-profit sectors. He is Chair of the Department of Economics and Legal Studies at Seton Hall University and Executive Director of HJA Strategies.

Adam Szumski is a Senior Analyst at PEL Analytics, specializing in financial projections, statistical analysis and policy research. Adam also has project management and complex data systems implementation experience, having managed these projects for cities and counties across the United States.

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Executive Summary

Despite having infrastructure that is rated D+ by the American Society of Civil Engineers, New Jersey has among the most expensive road and bridge networks in the country, and, according to many ways of calculating it, *the* most expensive. As we identified in *Adding it All Up: An Impartial Look at NJ's $117 Billion Government*, transportation and infrastructure spending constitutes 10 percent of the State's spending, or over $11.5 billion annually and is near the top for spending on actual services to the public.

In order to establish a meaningful transportation spending savings target, we factored out the foundational issues that set New Jersey apart from our peers—specifically our density and the overall "costs of doing business". After making these major adjustments, New Jersey still far outspends its peer states on core transportation services per state-controlled lane mile. If New Jersey spent on par with the second best among the peer group, Delaware, taxpayers would save $1.5 billion; spending on par with the leader, Pennsylvania, would save $2 billion or 20% annually.

If New Jersey just spent the same amount per lane mile as our closest seven peer states, we would save **$1.3 billion**. Even if New Jersey just spent on par with the next highest-spending state, Massachusetts, we would still save almost half a billion dollars.

Core Transportation Costs Variance Compared to New Jersey, 2017 (Thousands of dollars with Price Parity)		
State	Variance Per Lane mile	Total Variance
Massachusetts	-41.75	-481,065
Maryland	-121.74	-1,402,651
New York	-92.70	-1,067,995
Peer Average	-115.62	-1,332,048
Connecticut	-127.11	-1,464,485
Rhode Island	-121.30	-1,397,514
Delaware	-131.08	-1,510,254
Pennsylvania	-173.62	-2,000,370

Establishing a "Peer Group": First by creating a group of seven of our closest peers--Massachusetts, Maryland, New York, Connecticut, Rhode Island, Delaware, and Pennsylvania--and adjusting for the total costs of goods and services in those states relative to New Jersey, we have confidence in our ability to compare our costs across an even playing field.

"Cost of doing business" differential among the peer states: We then take the two data sets together to calculate the average cost per lane mile and account for the strong price and density differentials in the states in order to not punish New Jersey for underlying economic and structural realities--namely, the cost of doing business and the fact that it is one of the most urbanized and road-dense states in the country. After accounting for regional price differences, **New Jersey spends over $238,000 per state-controlled lane mile, the highest among the states analyzed**. The next expensive state, Massachusetts, spends nearly $197,000 per lane mile.

This report estimates New Jersey has the outside potential to save $2 billion annually using statewide data, adjusted for differences between states, and leveraging best practices in a variety of transportation work categories including:

1. De-layering and consolidation of services (Massachusetts)
2. Private Public Partnerships (P3s) (Illinois, Indiana, and Pennsylvania)
3. Modernized project planning, budgeting, and scoring (Virginia)

So why does road and bridge management and maintenance cost so much in New Jersey and what can we do about it?

Best Practices to Improve New Jersey's Performance

1. De-layering and consolidation of services (Massachusetts)

Out of the states that have had major consolidations in the past several years, Massachusetts is by far the best comparison. Massachusetts has seen savings from the consolidation and there has been no reported decline in quality or responsiveness. The savings largely derive from reductions in employee benefit costs (all employees were merged into the state's cheaper and far larger Group Insurance Commission), lower borrowing costs, administration function consolidation, and operational efficiencies. Since inception in November 2009 and up to FY15 the Commonwealth reports the reform has saved over $525 million.

2. Private Public Partnerships (P3s) in Illinois, Indiana, and Pennsylvania

Public Private Partnerships, commonly referred to as P3s, are one of the most common ways for infrastructure to be financed built, operated, and maintained throughout the world--although they are comparatively rare in the United States. While relatively new in the United States, there are over 200 documented P3 projects and more than 30 states with P3 enabling legislation. Just last year, New Jersey significantly augmented the ability for more governments to do more kinds of P3s and now is a critical time to understand best (and worst) practices, as regulations are drafted, and early projects take place. The Chicago parking meter and Indiana Toll Road P3s are often pointed to as examples of what not do with P3s, but we have been able to take the lessons learned from those cases and create highly successful P3s that provide clear taxpayer protections. A great example is Pennsylvania's $1 billion Rapid Bridge Replacement Program, which competitively selected a private firm to replace over 550 structurally deficient bridges and maintain them for decades. The P3 is nearly ten years ahead of schedule of what a traditional public project delivery system would have allowed for and the projected annual maintenance cost for each bridge is $10,000—40 percent less than if Pennsylvania's Department of Transportation remained responsible for maintenance.

3. Modernized project planning, budgeting, and scoring (Virginia)

Established in 2014, Smart Scale is the Commonwealth of Virginia's digital transportation project selection and planning platform, which helps to allocate approximately $800 million in transportation funding to be used generally throughout the Commonwealth. Smart Scale's data inputs are premised off of two essential axes. The first separates the Commonwealth into four distinct geographic categories: dense metropolitan areas, mid-sized cities, exurban areas, and rural areas like Appalachia and the southeastern Atlantic coasts (D). The second axis looks at six considerations: Congestion Mitigation, Economic Development, Accessibility, Safety, Environmental Quality, and Land Use. Local and regional governments are able to pick the projects they feel are most important and run them through the Smart Scale system. Then, each part of the state weighs the six considerations differently according to the realities of their geography; e.g., dense areas like the Washington, DC suburbs prioritize congestion mitigation while Appalachia more heavily favors economic development. By creating a totally data-driven framework and allowing anyone to easily see how and why a given project is selected for funding, the state can far more easily defend its funding decisions, as well as prioritize a very limited pool of funds towards both state and local priorities.

Maximizing New Jersey's Transportation Investments

$16 Billion of transportation spending was authorized in 2016 to fund NJ's Transportation Trust Fund (TTF) for 8 years through the 23-cent increase in New Jersey's Gas Tax. In 2018, the current Administration increased our gas tax another 4.3 cents to ensure that funding source remained stable.

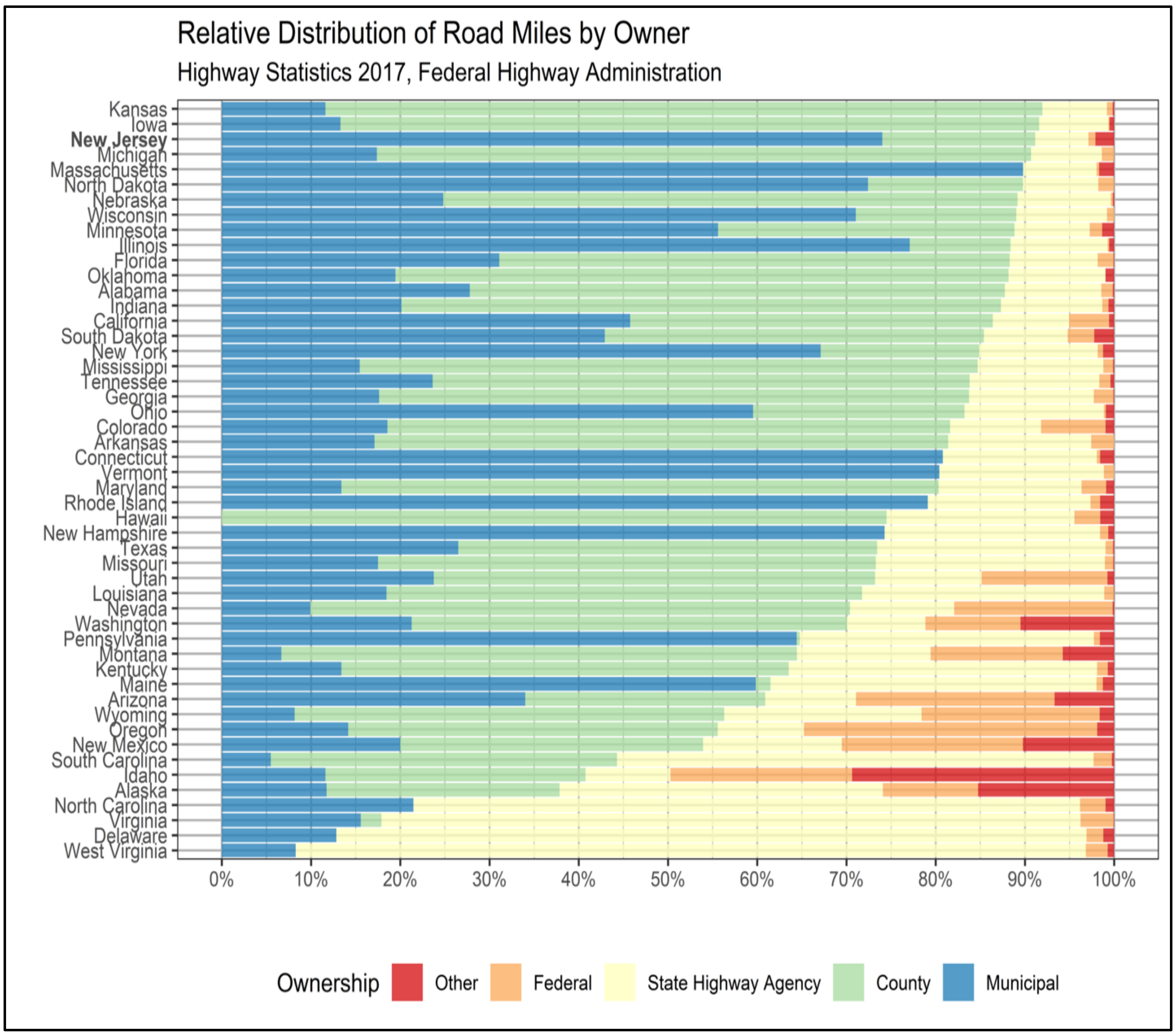
New Jersey now has the opportunity to lead the nation in improving our infrastructure at a more competitive cost structure by leveraging the knowledge and experiences of what's already been proven in other states.

What are we waiting for?

Context: New Jersey's Redundant Layers of Government

When we look across the country, we see that small states like Delaware and large, diverse states like North Carolina and Virginia have very limited local roads, while Pennsylvania has almost no county roads--there's no fundamental reason particular to New Jersey any of those models can't be true in New Jersey, it's just the way we've been doing things.

Indeed, New Jersey ranks third among states when considering states with the largest proportion of the state's road inventory under the ownership of county and local municipal governments. According to the *Highway Statistics 2017* data aggregated by the United States Department of Transportation's Federal Highway Administration, 74 percent of all New Jersey road miles are owned by its municipal governments and another 17 percent fall under county jurisdiction. Kansas, Iowa, New Jersey and Michigan are the only states whose combined county-municipal road inventory exceeds 90 percent of the respective state's entire road inventory.



New Jersey Road Miles by Owner		
Owner	Miles	Percent (%)
Municipal	28,790	74.0
County	6,662	17.1
State Highway Agency	2,321	6.0
Other[1]	814	2.1
Federal	308	0.8
Total	**38,895**	**100.0**

As with most aspects of New Jersey government, a variety of functions are performed by a variety of levels of government, with local, county, state, local authority, state authority, and bi-state authorities all managing and performing aspects of road and bridge construction, maintenance, and management. This distribution comes from a principal of *limited* government: devolution. Roads traveled mostly by residents of a town are managed by that town, while roads traveled to get from one town to another are managed by the county, and roads traveled to get from one county to another are managed by the State, and so on. As with so many aspects of local control, the accepted goal is to allow the most frequent users of roads to have the most say in those roads. As a historical reference, traffic signals used to be maintained by the State, but, due to budget pressure and sub-par performance, that responsibility has shifted to lower levels of government. The idea is that when a pothole appears on Main Street, a resident can go to the mayor, rather than a bureaucrat in Trenton, to get it fixed quickly.

But this system creates an enormous amount of redundancy and heretofore it has been undefined how much, if any, a performance boost local control really offers. As an example, when a section of the Turnpike needs replacing, it doesn't matter if it is in Salem County or Bergen County: the Turnpike is responsible for fixing it and it fixes the part in Bergen County just like it would in Salem County, with the same equipment, basic design, engineering, labor contracts, and so forth.

The question: how much inefficiency do these layers create and, if better performance can be demonstrated, is it "worth it"?

Establishing a "Peer Group"

First by creating a group of seven of our closest peers-- Massachusetts, Maryland, New York, Connecticut, Rhode Island, Delaware, and Pennsylvania--and adjusting for the total costs of goods and services in those states relative to New Jersey, we have confidence in our ability to compare our costs across an even playing field. Our financial data analysis is limited to core bridge and road transportation services as collected in a uniform way by the Federal Highway Administration: capital outlays, maintenance, administration, research, and planning; the cost of debt and highway patrol were excluded.

The best data source for evaluating cost differentials among different states comes from the Federal Highway Administration. While mileage data is collected for all levels of roads--e.g., municipal, county, state, federal and other-- 2017 spending data is only available for "State-

[1] The "Other" category includes the major toll roads, as well as other state-affiliated agency roads.

controlled highways". In this case, that includes both State roads and State-related roads, like the New Jersey Turnpike, Atlantic City Expressway, and the Garden State Parkway.

According to these data, New Jersey apportioned $3.2 billion on "core" transportation services, with the majority ($2.3 billion) in capital outlay. Only New York and Pennsylvania spent more on capital outlay in 2017 among the peer states.

Core Transportation Appropriations by State, 2017				
State	Capital Outlay	Maintenance	Admin Research & Planning	Total
New Jersey	2,301,582	736,431	180,258	3,218,271
Massachusetts	1,756,843	325,635	281,549	2,364,027
Maryland	1,451,730	405,612	113,189	1,970,531
New York	4,018,762	1,623,208	479,742	6,121,712
Connecticut	938,453	235,590	84,961	1,259,004
Rhode Island	187,377	114,471	61,377	363,225
Delaware	508,042	467,828	307,948	1,283,818
Pennsylvania	3,356,765	1,730,214	551,539	5,638,518

Of course, these states vary considerably with the amount of state-controlled highways for which they are responsible. The following table combines state- controlled road miles by a lanes-per-road mile ratio[2] to calculate an estimated state- controlled lane miles.

Estimated State-Controlled Lane Miles by State			
State	Total Miles	Ratio	Est. Lane Miles
New Jersey	3,135	3.67	11,521
Massachusetts	3,645	3.18	11,588
Maryland	5,447	2.87	15,634
New York	16,478	2.54	41,921
Connecticut	4,058	2.64	10,723
Rhode Island	1,195	2.60	3,108
Delaware	5,503	2.19	12,064
Pennsylvania	41,656	2.22	92,513

The data is clear that, in general and in relative terms, New Jersey far exceeds other states with respect to how much it costs to run, maintain, and build its highways. The most significant driver is the "cost of doing business" in New Jersey relative to other states is much greater for every kind of project or product—not just roads; the labor and land is more expensive here and, unlike peers like New York and Pennsylvania, we don't have a significant amount of rural and low-density areas with their correspondingly lower costs. This, by definition, has a strong effect on *statewide* averages. Indeed, New Jersey is 3-times as dense as New York and 4-times as dense as Pennsylvania, which, again, is a good proxy for corresponding increases in the price of land and labor. Moreover, the median household income is 34 percent higher in New Jersey and the median home value in New Jersey is about twice that of Pennsylvania. So, it is more sensible to compare the counties in the Philadelphia and New York suburbs to New Jersey's data, rather than those states as a whole. "Noise" in the state-by-state cost comparison data

[2] Ratio derived using Table HM-81, Highway Statistics 2017

surely comes from the fact that 35 of Pennsylvania's 67 counties have a lower population density than even Cape May County, New Jersey's least dense.

Thus, before comparing state appropriations per lane mile, we must first account for this "cost of doing business" differential among the peer states. The United States Department of Commerce's Bureau of Economic Analysis publishes Regional Price Parity figures for states and metropolitan statistical areas (MSAs) that allow for comparisons between regional cost of living variations, with the national average cost of goods and services set at 100. As opposed to using the general state figures, we developed a methodology of weighting each MSA figure by the number of bridges in that metro area to account for the relative distribution of transportation infrastructure between metro areas.[3] This matters because approximately 70 percent of all New Jersey bridges are within the New York-Newark-Jersey City metro area. Conversely, a plurality (33 percent) of New York bridges are in rural non-metro areas, while only 26 percent are in the New York-Newark-Jersey City metro area. **The results of this analysis suggest that baseline transportation-related costs after accounting for density and the general costs of doing business could be as much as 17 percent higher in New Jersey than the national average, with Maryland coming second at 7.9 percent above national average.**

We then take the two data sets together to calculate the average cost per lane mile and account for the strong price and density differentials in the states in order to not punish New Jersey for underlying economic and structural realities--namely, the cost of doing business and the fact that it is one of the most urbanized and road-dense states in the country. After accounting for regional price differences, **New Jersey spends over $238,000 per state-controlled lane mile, the highest among the states analyzed**. The next expensive state, Massachusetts, spends nearly $197,000 per lane mile.

Core Transportation Appropriations per Estimated Lane Mile by State, 2017 (Thousands of dollars)			
State	Weight	Core Per Lane Mile (Unweighted)	Core Per Lane Mile (Weighted)
New Jersey	117.11	279.33	238.51
Massachusetts	103.68	204.01	196.76
Maryland	107.94	126.04	116.77
New York	100.15	146.03	145.82
Connecticut	105.39	117.41	111.40
Rhode Island	99.70	116.86	117.22
Delaware	99.06	106.42	107.43
Pennsylvania	93.93	60.95	64.89

What does this variance mean if we back out of the per-lane mile figures to the big picture once again? Below, we calculate the difference between New Jersey and each peer state per lane mile and then multiple this amount by the 11,521 lane miles under New Jersey state control.

[3] See the Methodology Section for details.

So, if New Jersey just spent the same amount per lane mile as its closest peers—Rhode Island, Delaware, Maryland, Connecticut, Massachusetts, New York, and Pennsylvania--it would save $1.3 billion. If New Jersey spent on par with the next highest-spending state, Massachusetts, we would still save $481 million. Spending on par with the second best, Delaware, would save $1.5 billion and on par with the best, Pennsylvania, would save $2 billion.

Core Transportation Costs Variance Compared to New Jersey, 2017 (Thousands of dollars with Price Parity)		
State	**Variance Per Lane mile**	**Total Variance**
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By leveraging the Best Practices already in operation in the peer group states, New Jersey has the opportunity to save significantly and drive improved performance by following the high performing states: transportation consolidation, public private partnerships (a critical initiative after new enabling legislation was recently passed by the legislature and signed by the Governor), and technologically advanced and transparent project planning and funding mechanisms.

Transportation Functional Consolidation

After years of effort, the Massachusetts Department of Transportation was consolidated by Chapter 25 of the Acts of 2009 ("An Act Modernizing the Transportation Systems of the Commonwealth of Massachusetts"). It merged a significant number of agencies with a very broad array of transportation functions (far more than has been contemplated in New Jersey or Pennsylvania): Executive Office of Transportation and Public Works, Massachusetts Turnpike Authority, Massachusetts Highway Department, Registry of Motor Vehicles, Massachusetts Aeronautics Commission, and the Tobin Bridge. In addition, the consolidated department added the Massachusetts Bay Transportation Authority and the Regional Transit Authorities to its oversight and assumed responsibility of the many bridges and parkways of the Department of Conservation and Recreation.

Massachusetts has seen savings from the consolidation and there has been no reported decline in quality or responsiveness. The savings largely derive from reductions in employee benefit costs: all employees were merged into the state's cheaper and far larger Group Insurance Commission (saving approximately ~$30 to $40 million annually), lower borrowing costs, administration function consolidation (saving ~$2 million annually), and operational efficiencies.

Since inception and up to FY15 the Commonwealth reports the reform has saved over $525 million. Initial projections placed lifetime savings at $6.5 billion, but a realistic savings target seems to be closer to $2 billion--still very impressive. Many of the headwinds against savings by the consolidation came from a reported need to staff up to manage the Commonwealth's Accelerated Bridge Replacement project, as well as federal stimulus projects. That being said, since those staff are funded either through the capital budget (313 staff through bridge associated bond issues) or the federal stimulus (72 staff), the agency was still able to achieve a net reduction of 416 staff as of the early 2010s.

More than fifteen years ago in 2003, New Jersey combined the Garden State Parkway and the New Jersey Turnpike to create the agency still in existence today. Overcoming inertia and several false starts, this consolidation is still held up as a case study for other states to follow, savings tens of millions of dollars and achieving operational efficiencies. Many of the problems often held up as insurmountable road blocks--primarily surrounding debt-- were overcome. New Jersey can be a leader in consolidation of duplicative services once again. While the Turnpike and Parkway consolidation merged two state entities *horizontally*, there is also a great deal of consolidation potential *vertically* between state, county, municipal, and authority government. The FY 2020 budget includes $10 million for the Department of Community Affairs to study, and ultimately, implement shared services - including some aspects of municipal road maintenance.

Pennsylvania has often thought of combining its turnpike with its Department of Transportation, and, when interviewing officials in the Pennsylvania Department of Transportation for this study, the main concern he had was the differences in how they do things. But when we drilled down, the differences were mostly on account of past practice and inertia than any true difference in approach: different pay scales (for the same types of workers), different labor contracts (for the same types of projects), and different amounts of debts (for the same type of bonds[4]). Once again, New Jersey was able to overcome these concerns in the Garden State Parkway and the Turnpike; there is no clear difference between a similar merger between the NJDOT and Turnpike.

Out of the states that have had major consolidations in the past several years, Massachusetts is by far the best comparison. It has far closer levels of spending than the other states--mostly southern--that have consolidated and, most importantly, costs and density are much, much closer than Texas and Florida. In fact, it has even more municipally owned roads than New Jersey. Consolidated states like North Carolina and Virginia primarily use the state agencies to maintain and make capital improvements to local roads. In many ways, consolidation is a "no brainer" --especially horizontally, i.e., between state agencies. The missions and needs are so similar that redundancies--from planning staff to professional services contracts to equipment--could certainly be eliminated. As the Massachusetts case shows--as well as New Jersey's successful efforts in the early 2000s--it is possible and worthwhile.

[4] Although New Jersey Turnpike bonds are "revenue" bonds, as opposed to general obligation bonds, meaning toll revenues are pledged towards bond repayment.

Best (And Worst) P3 Case Studies

Public Private Partnerships, commonly referred to as P3s, are one of the most common ways for infrastructure to be financed, built, operated, and maintained throughout the world--although they are relatively rare in the United States. All P3s are complex and exist on a spectrum--from an outright sale of an asset, to a long-term lease, to a simple management contract--but they always involve some degree of either financial or operational risk transfer to a private party. While relatively new in the United States, there are over 200 documented P3 projects and more than 30 states with P3 enabling legislation. Just last year, New Jersey significantly augmented the ability for more governments to do more kinds of P3s and now is a critical time to understand best (and worst) practices, as regulations are drafted and early projects take place.

Australia is a world leader in P3s, both in their own country and as financers and consultants advising P3s in countries around the world, including the United States. In Australia, the use of P3s is strictly limited to deals with a value in excess of A$50 million, primarily to mediate the impact of higher transaction costs common to the complexities of P3s; British Columbia, Canada actually *required* P3s for projects exceeding C$50 million, though this practice was discontinued in 2017. Alberta's ASAP I project, which built 18 new schools in Edmonton and Calgary had a total project cost of C$630 million with C$100 million in savings. In New South Wales, Australia's largest state, P3s constitute 10 percent of overall projects, where they experience average cost overruns of 1 percent as opposed to 15 percent for traditional public projects. P3 projects were completed 3.4 percent ahead of time versus traditional public projects, which were completed an average of 23.5 percent behind schedule.

One of the reasons P3s are much more common in other parts of the world is that most state and local governments in the United States fund most of their infrastructure projects through tax exempt bonds--meaning the interest bondholders receive is not taxed--which tend to be significantly cheaper sources of capital than either equity or taxable debt; this type of capital is not as common outside of the United States. But, as federal, state, and local governments either reach statutory debt limits or the limits of their constituents' debt tolerances, P3s have become an attractive financing option. In some cases, commonly through a type of P3 called a "concession", the private partner pays the government partner a significant up-front (or smaller ongoing) payment in exchange for revenue related to the asset (such as tolls or parking meters) or simply the right to have the public sector to continue to use it after the P3 (known as "availability").

P3 Deep Dive: Chicago Parking Meters and Indiana Toll Road

This concession type of P3 is the root of their bad reputation in the United States, largely thanks to two major P3s in the Chicago area: the Chicago parking meters deal and the Indiana Toll Road concession. In the Chicago parking meter deal, the P3 was driven far more by a need to plug a general city budget gap than any crucial infrastructure need (selling your house to pay your credit card debt). In 2008, this now famously bad deal leased Chicago's parking meters to a consortium of banks and sovereign wealth funds for 75 years in exchange for $1.15 billion. In exchange for the payment, the private partner was guaranteed a certain amount of revenue every year. Since the existing revenue stream was not enough to support the payment, this caused drastic increases in both rates and the area parking meters were placed in service, moving ever further away from the downtown and into the neighborhoods. One of the most painful features of the deal is that city events like street and cultural festivals, which typically eliminate the availability of parking that day, mean the City has to pay the private partner a "true up payment" for the lost revenue for that day--about $20 million in 2017. Perhaps the saddest news is that, as of 2017, the private partner has made $927 million and will have completely paid themselves back by 2021, meaning they have 62 years of parking meter revenue with no real associated payments--none of which will go to the City.

In Indiana, while the concession payment in exchange for a 75-year lease was $4 billion, the vast majority of it was simply redeployed to other critical infrastructure projects around the state such as new bridges over the Ohio River and the major Indianapolis interstate (selling your house to buy another house). But the price of this $4 billion up-front payment was a 72 percent toll hike, then 8 percent, then 2 percent annually. The negative effect was so great on both toll road use and public feeling that the state had to step in and subsidize tolls. More than that, it turned out that the upfront payment was about $2 billion more than the project could have supported, a problem which was only magnified by how much the project was leveraged--20 percent equity to 80 percent debt--meaning there were a lot of expensive bonds to repay before anything else. In order to make the state-mandated improvements that were a requirement of the deal--e.g., 1000 new centerline road miles, electronic tolling, and 600 bridge replacements--the private partner took on $1 billion in *more* debt. Just 8 years into the 75-year lease, the private partner filed for bankruptcy.

Despite the bankruptcy, the Indiana Toll Road P3 was a good deal for the state. Unlike Chicago, the lease structure in many ways proved to be a saving grace. Because the state still owned the toll road, it did not become an asset for restructuring in the bankruptcy--only the lease itself did--and there was no claim on the $4 billion upfront payment, which the state got to use as it had planned. There was no clear disruption or decline in service during the bankruptcy; part of this was thanks to the continued diligence of the public sector P3-monitoring body, the Indiana Toll Road Oversight Board. Since all the financing was from private sources, only the banks and investors took a haircut--including $400 million in project equity. And, since the availability payment structure was not used--in which the government pays an amount simply for the use of its former asset--it did not have to continue to make payments that did not reflect performance.

The *financial* failure of the Indiana Toll Road P3 was not hard to predict. The revenues simply weren't there, so it is odd that some of the most sophisticated investors went ahead with the deal anyway, which was clearly over leveraged (an added data point is that the winning bidder offered *$1 billion* more than the nearest competitor). Macquarie, the Australian bank that was one of the private partner's leads and one of the largest P3 firms in the world, has over $100 billion in assets under management. While the success of a given project is of course important, Macquarie makes most of its money from management fees, and, as an investment bank, the deals themselves. So, the more assets it has under management and the bigger deals it does mean far more for its investors than profits. Thus, Macquarie is almost magically incentivized to make "bad deals."

The lessons of the Chicago parking meters and the Indiana Toll Road cases can be summarized simply: the government needs to shift as much risk as it can to the private sector and that means a very sophisticated operation--as well as one that likely isn't desperate for a quick infusion of funds. Even some of the traditional red flags for P3s, such as over-leveraged deals, do not need to be catastrophic, as the Indiana case shows. Here we can also see the wisdom of Australia and Canada, where certain transaction side thresholds must be met in order to justify the transaction costs, and the designation of specific, professionalized government entities to carry out P3s. Canada has an excellent P3 explorer, where the public and professionals can explore, in detail, the over 284 active P3 projects that come to a $130 billion value.

Deep Dive: Pennsylvania's Rapid Bridge Replacement

One of the key differences between the Chicago and Indiana cases is that, for Chicago, the P3 was essentially a means to leverage an asset to make money. For Indiana, the P3 was a way to better project delivery and generate funds, as well as free up time, for other transportation projects.

The Commonwealth of Pennsylvania has 15,950 more bridges than New Jersey, covering an area more than 5-times as large and more geographically diverse. One commonality, however, is that New Jersey and Pennsylvania both rank near the bottom of the American Society of Civil Engineers' bridge condition ranking, achieving the grade of D+. Managing and maintaining existing bridges, let alone building new ones, proved a challenge for the Pennsylvania Department of Transportation (PennDOT), which is one of the most centralized transportation management agencies in the United States.

Under Governor Tom Corbett in 2012, Pennsylvania passed Act 88, which established a modernized P3 process for transportation projects. One of the first, and still by far the largest and most complex, is the Rapid Bridge Replacement project, covering 558 bridges all over the state at a cost of nearly $1 billion. A lengthy competitive procurement process began in December 2013 to find private partner, to lead design, construction and maintenance, which ultimately finished in March 2015; 90 percent of the bid vetting was related to cost. The procurement process itself was managed with from a P3 Office within PennDOT and four internationally experienced consultants: KPMG (accountants), CDM Smith and Lochner (engineering), PFM (public finance), and Allen & Overy. The successful bidder--ultimately Plenary Walsh Keystone Partners, a consortium of Chicago and Australia-based firms--would be responsible for design, construction, finance, and maintenance of the bridges for 25 years--known as a "DBFM" contract--after a 42-month construction period. PennDOT would continue to provide snowplowing, debris removal, and incident first response.

One of the critical jobs of the P3 Office and its consultants was to design the procurement itself, which in large part depend upon the universe of bridges that would be part of the program. In the most basic terms, the 558 bridges had an average project cost of $2.1 million and an age greater than 50 years. PennDOT chose bridges that were similar in size, that had minimal changes to existing alignment, and could maintain the existing profile. In addition, bridges that had clear utility, environmental, right of way, rail, or water issues were excluded, allowing for the achievement of a significant economy of scale on design and construction. While the project used precast components to save on costs and time, it was so massive that it actually strained the precast concrete industry. The contractor actually had to get additional firms certified to provide the beams.

The P3 agreement incentivizes quick construction timeframes and penalizes the contractors for bridges that are not open within the contractual timeframe. In order to prevent moving too quickly to get the bridge open--and thus free up payment--PennDOT's construction quality assurance team carefully inspects each bridge before payment can begin. In order to speed up the project, 87 of the bridges were designated as Early Completion Bridges, which require PennDOT to get necessary environmental approvals, acquiring right-of-way, and completing utility relocations. The remaining 471 bridges make the private partner responsible for gaining environmental approvals and utility. Despite these steps, utility relocation delays and weather issues created some delays, as well as trout season. Even though PennDOT selected bridges that avoided the most serious of these issues, they could not be avoided entirely. As of June 2019, 547 of the 558 bridges have been built. While this is behind the P3's schedule of completion by December 2017, it is well ahead of the 2023 or 2027 date PennDOT estimated the project could have been completed using the traditional model. All in all, the private partner used 500 subcontractors from around Pennsylvania to complete the project on time and as close to budget as possible.

Not only is the private partner responsible for building the bridges, it also has to maintain them for 25-years at a cost of roughly $60 million annually, while the Commonwealth continues to own them. In addition, the annual average maintenance cost of each bridge is somewhere between $10,000 and $16,000. As some were concerned that the maintenance timeframe, given that it could incentivize the private partner to make bridges that would "give out" after their maintenance responsibility ended but before the bridges' 100-year useful life, careful consideration was given to the design of each bridge and the maintenance protocol. In addition, these maintenance costs are fixed regardless of issues that might arise for the Commonwealth, so a great amount of risk is taken away from the state while predictability is increased.

Although the $1.12 billion project was privately financed, it was "publicly" funded. The Commonwealth's Pennsylvania Economic Development Finance Authority issued $722 million in private activity bonds, which are similar to traditional tax-exempt bonds, though with slightly higher interest rates since they are not usually back-stopped by a public guarantee. Still, the 4.1 percent interest rate the bonds achieved, which are set to amortize in 17-years on average, are well-within the normal range for the public sector. This also represents the largest private activity bond issuance in the history of the federal program, which began in 1968. Private activity bonds basically allow a public sector issuer to support public purpose projects that benefit a private party, such as charter schools, stadiums, and other infrastructure projects;

there are 27 approved uses in all. The federal government caps the amount of private activity bonds that can be issued in a given year are capped in order to limit their use to projects that clearly meet the qualifications and intention of the program. The remaining amount of funding came from other PennDOT sources, along with $60 million in equity from Plenary and Walsh. While this mode of funding is somewhat more expensive than a traditional government infrastructure package, it is considerably cheaper than other P3s that make use of extensive infusion of equity and debt from Wall Street and international investors. Notably, the average cost of the bridge under the P3 model dropped from the estimated $2.1 million to $1.6 million--although delays and other issues caused a $43 million (or 3.8 percent) increase in costs. Plenary Walsh, the private partner, was bonded for project completion. The project uses the availability payment model, since none of the bridges provide their own revenue stream. After PennDOT provided a one-time mobilization payment, the Commonwealth provides six milestone payments as bridges are built and come online. Throughout the lifespan of agreement, continued availability payments are tied to performance metrics, namely the number of bridges that are constructed, open to traffic, and accepted by PennDOT staff and outside professionals (who make up the bulk of the P3 review team).

The Rapid Bridge Replacement project demonstrates the potential of a P3 that is much more about enhancing project delivery and de-risking than identifying a convoluted way to monetize an asset. And, while streamlined management did play a role, the success of the project relates far more to the achievement of massive economies of scale for very local, and often small, projects. Although there are cost savings on this project--at least so far--they are not eye popping. But what the project clearly achieved was a markedly faster way to deal with one of the state's most significant infrastructure problems. PennDOT staff, rightly, did need to be devoted to the project, but its limited staff and resources could be reallocated to those projects that *require* intense attention and government funding.

Picking the Projects

As home to some of the fastest growing cities and counties in the United States, as well as some of the most remote and under-resourced rural areas east of the Mississippi, the Commonwealth of Virginia has had to carefully re-tool how it prioritizes its limited statewide transportation dollars. Historically, like many states, Virginia's funds were allocated largely according to metrics that relied more on the strength of that region's state representatives than the strength of the underlying project. Perhaps most infamously, northern Virginia's Washington, DC suburbs are among the most congested and sprawling anywhere in America. Traffic and congestion is a continuous problem, as are less than adequate public transportation options, which has led the Commonwealth to introduce some of the first-in-the-nation Express Lanes, where drivers can opt to pay a higher toll to use dedicated highway lanes. The cost of the toll rises and falls relative to demand and, on May 14th, 2019, for example, the toll on Interstate 66 to Washington, DC reached $46.75. But it's not just the Washington, DC Metropolitan Area: The Hampton Roads are comprising Norfolk, Newport News, and Virginia Beach is home to nearly 2 million people and some of the most complicated infrastructure in the Commonwealth—including several tunnels and bridges throughout the Chesapeake Bay, the James River and other associated waterways. Finally, the Appalachian region in the southwestern corner of the Commonwealth depends on transportation infrastructure to connect it to the broader economy and provide routes for the regions resources and businesses to access urban markets.

In 2014 after having passed both of the Commonwealth's legislative houses unanimously, then-Governor Terry McAuliffe signed House Bill 2 into law, which provided the legislative basis for Virginia's Smart Scale transportation project selection tool. While county and city governments in Virginia manage their own transportation dollars, Smart Scale helps to allocated approximately $800 million in transportation funding to be used generally throughout the Commonwealth. Smart Scale is premised off of two essential axes. The first axis separates the Commonwealth into four distinct categories: dense metropolitan areas like Hampton Roads and Northern Virginia (A), mid-sized cities and metropolitan areas like Richmond (B), exurban areas (C), and rural areas like Appalachia and the southeastern Atlantic coasts (D). The second axis looks at six considerations: Congestion Mitigation, Economic Development, Accessibility, Safety, Environmental Quality, and Land Use.

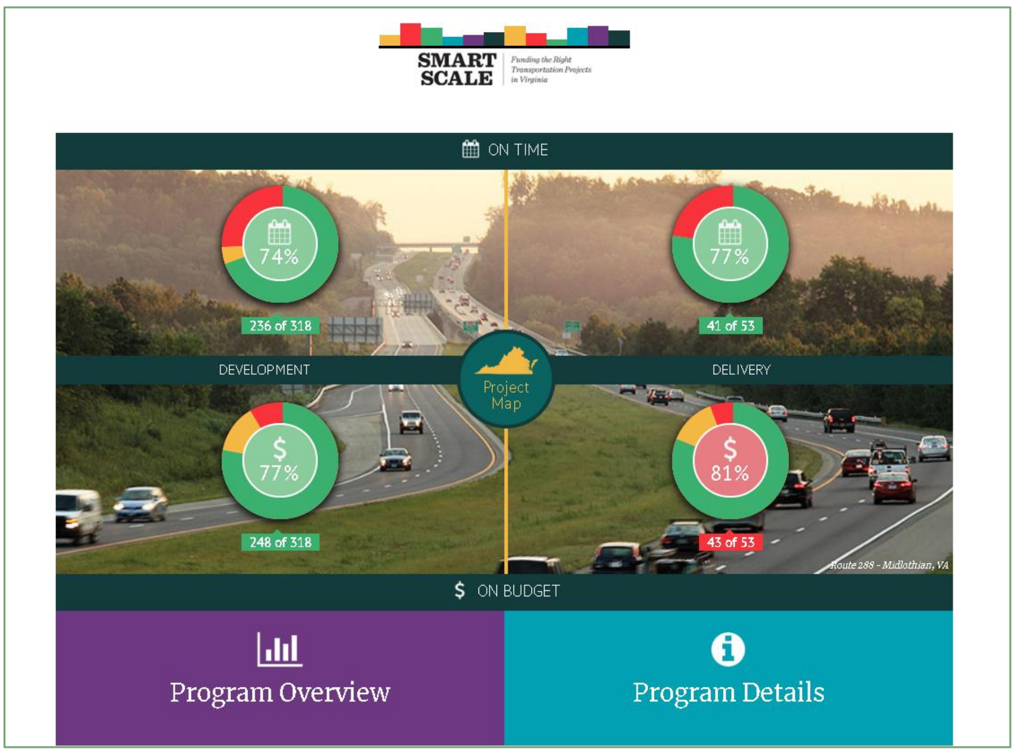
Factor	Congestion Mitigation	Economic Development	Accessibility	Safety	Environmental Quality	Land Use
A	45	5	15	5	10	20
B	15	20	25	20	10	20
C	15	25	25	25	10	
D	10	35	15	30	10	

As you can see from the table, congestion mitigation is profoundly prioritized in the high-density Hampton Roads and Northern Virginia Areas (Category A), while economic development is prioritized in rural areas (Category D). So long as they are in keeping with the statewide multimodal long-range transportation plan, Vtrans, the projects themselves can be highway improvements such as widening, operational improvements, access management, intelligent transportation systems, transit and rail capacity expansion, and transportation demand management, including park and ride facilities, or meet safety needs.

While the projects are assessed according to the above metrics, local communities, transit, and planning organizations are responsible for providing the data and the project description itself to the Commonwealth via an online portal, SMART Portal. The most important information is the project scope and description, as well as the cost estimate. Without the scope, the Commonwealth cannot effectively run the Smart Scale platform. Depending on the scale of the project, if costs come in significantly higher on a percentage basis than what was anticipated by the applying entity, they will have to begin the Smart Scale scoring project from the beginning.

Smart Scale ultimately leaves the statewide transportation entity, the Commonwealth Transportation Board, with discretion over projects, but requires that the Board defend and document any changes from what Smart Scale recommends. Smart Scale's detractors are, unsurprisingly, those projects and areas that don't happen to receive an allocation for a given year. One of the reasons, however, that otherwise solid projects that would seem to score highly on the Smart Scale methodology are left out is due to a process of normalization among similar projects. A small controversy erupted this year as several important Northern Virginia congestion relief projects did not receive any Smart Scale funding, while a transit project adjacent to the Amazon HQ2 campus did. Because of the normalization process, where like projects are measured against each other, a "mega" project in the Hampton Roads region that provides congestion relief drove down the scores of otherwise strong congestion relief project applications in Northern Virginia. While the scale of the Hampton Roads project is unusual, some perceive this as a zero-sum flaw in the Smart Scale methodology.

One of the other key features of the Smart Scale platform is its transparency and ease of access for the general public through an online Dashboard. The website makes very clear the methodology used to evaluate projects, and, once they're underway, if they're meeting budget and timing projections. Users can also toggle what they see by geography, project type, agency in charge, and timing.



Smart Scale Dashboard Landing Page

Drilling down into individual projects is also easy. Ordinarily, disputes over project funding like the Hampton Roads/Northern Virginia example from earlier can be hard to evaluate. Smart Scale creates a readily available "paper trail" for analysis, as each project's evaluation is available to the public in the form of a Score Card:

SMART SCALE
Funding the Right Transportation Projects in Virginia

VDOT · DRPT · Office of INTERMODAL Planning and Investment

PROJECT SCORECARD

For more information on how to read a scorecard, click here.

Route 7 (Route 9 to Dulles Greenway)

Project Id: 3592

Safety and Operational improvements eastbound on Route 7 between Route 9 and the Dulles Greenway (Toll Road).

Submitting Entity:	Loudoun County
Preliminary Engineering:	Not Started
Right of Way:	Not Started
Construction:	Not Started
Eligible Fund Program:	Both
VTRANS Need:	Regional Network (click here for details)

0.4
SMART SCALE SCORE

#373 OF 433 STATEWIDE

#27 OF 39 DISTRICTWIDE

SMART SCALE Requested Funds.......	$127,000,000
Total Project Cost..............................	$127,000,000
Project Benefit...................................	4.7
Project Benefit / Total Cost..................	0.4

SMART SCALE Area Type A

Factor	Congestion Mitigation		Safety		Accessibility			Economic Development			Environment		Land Use	
Measure	Increase in Peak Period Person Throughput	Reduction in Peak Period Delay	Reduction in Fatal and Injury Crashes	Reduction in Fatal and Injury Crash Rate	Increase in Access to Jobs	Increase in Access to Jobs for Disadvantaged Populations	Increase in Access to Multimodal Travel Choices	Square Feet of Commercial/Industrial Development Supported	Tons of Goods Impacted	Improvement to Travel Time Reliability	Potential to Improve Air Quality	Other Factor Values Scaled by Potential Acreage Impacted	Support of Transportation-Efficient Land Use	Increase Transportation-Efficient Land Use
Measure Value	1,548.3 persons	529.0 person hrs.	79.2 EPDO	107.1 EPDO / 100M VMT	121.6 jobs per resident	26.9 jobs per resident	0.0 adjusted users	0.0 thousand adj sq. ft.	379,804.5 thousand adj daily tons	339,592,760.3 adj. buffer time index	0.0 adjusted points	3.5 scaled points	8,501.0 access * pop/emp density.h	2,746.9 access * pop/emp density change.
Normalized Measure Value (0-100)	5.5	8.2	22.7	0.2	2.1	0.5	0.0	0.0	8.0	5.5	0.0	10.5	0.6	0.8
Measure Weight (% of Factor)	0.5	0.5	0.5	0.5	0.6	0.2	0.2	0.6	0.2	0.2	0.5	0.5	0.7	0.3
Factor Value	6.9		11.5		1.4			2.7			5.2		0.7	
Factor Weight (% of Project Score)	45%		5%		15%			5%			10%		20%	
Weighted Factor Value	3.1		0.6		0.2			0.1			0.5		0.1	
Project Benefit	4.7													
SMART SCALE Cost	$127,000,000													
SMART SCALE Score (Project Benefit per $10M SMART SCALE Cost)	0.4													

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06-30

A Smart Scale like tool could be a critical improvement for New Jersey's own process which remains largely opaque. New Jersey's process may take advantage of similar methodologies as Smart Scale, but, if so, it is not made clear publicly: According to the NJDOT website[5], "NJDOT's Project Delivery Process begins with an evaluation of potential transportation problems in the Problem Screening Phase. During evaluation, NJDOT researches the problem statement to have a clear understanding of the problem and its impact. It determines how important that problem is relative to other transportation problems. These problems are then ranked by priority and importance. A primary goal of NJDOT is to make the best use of limited resources by investing in solutions that provide the greatest benefits to the transportation system on which New Jersey residents, businesses and visitors rely. Other considerations in the selection of potential projects include the type of work required and the geographical location. Taking into consideration the priority, type and location, NJDOT makes the best decision for the state and its taxpayers." Here, NJDOT is determining what is important relative to a standard set of factors; but how? For such a limited and important set of funds, adding transparency would increase the public's faith in the process.

Conclusion: Maximizing New Jersey's Transportation Investments

New Jersey has the opportunity to achieve meaningful savings in the planning, budgeting and operations of our transportation projects.

This report documents that New Jersey is a substantial outlier within our own peer states in the cost of core transportation services. Citing our population density and cost of doing business as explanations do not stand the scrutiny of a model that takes those factors into account.

As with any large enterprise, but even more so with government, the greatest obstacle is bureaucratic inertia and clinging to "That's the way we've always done things."

The case studies of best practices from other states included in this report identify areas where significant efficiencies can drive savings. All that is needed are Leader who are willing to act.

New Jersey is now presented with a historic opportunity. $16 Billion of transportation spending was authorized in 2016 to fund the state's Transportation Trust Fund (TTF) for 8 years through the 14-cent increase in New Jersey's Gas Tax. In 2018, the current Administration increased our gas tax another 4.3 cents to ensure that funding source remained stable.

New Jersey now has the opportunity to lead the nation in improving our infrastructure at a more competitive cost structure by leveraging the knowledge and experiences of what's already been proven in other states.

What are we waiting for?

[5] https://www.state.nj.us/transportation/capital/pd/phase.shtm

Methodology

As with our other work in this series, the initial approach to this study was to isolate key differences between states and see where New Jersey really is an outlier, in an attempt to further define which areas need to be the focus of cost-saving solutions. To that end, we sought to develop a multi-state database of transportation improvement project data by common cost reporting categories (e.g., construction, right-of-way, design/engineering, utility relocation) while focusing on bridge projects due to the unique availability of standardized bridge data through the Federal Highway Administration's National Bridge Inventory. This approach would allow a breakdown of the costs which we have control over--e.g., a policy decision to pay utilities to relocate, inefficient designs, or outdated work rules--versus those we don't--e.g., the cost of land or right of way acquisition.

But that goal could not be achieved. After reviewing the project-level data available on various New Jersey government websites, we determined a far greater degree of detail would be necessary to conduct this analysis. We filed three separate Open Public Records Act requests to obtain detailed information on project expense data. The first request was denied. The State then asked for an extension on the other two. After the extension, those too were denied. In fact, all three were denied on account of the fact that the data "did not exist".

Highway Statistics Data

Data regarding disbursements and lane miles were compiled from the United States Department of Transportation's Highway Statistics 2017 portal.[6] Specifically, the SF-4 "Disbursements by States for State-administered highways" was downloaded for state-by-state disbursement data across the various categories collected by USDOT. All states prepare their own submissions to this database and it is the only reliable uniform system of national highway statistics.

HM-10 "Public Road Length – 2017" was acquired for state-by-state road mileage by ownership. State Highway Agency and Other Jurisdiction were added together to determine a "State Controlled" mileage amount.[7] These centerline miles were then multiplied by a road mile to lane mile ratio derived from HM-81 "Estimated lane-miles" to determine an estimated state-controlled lane mileage figure in order to adjust for the higher greater number of lanes typical of New Jersey's roads when compared to other states.

Accounting for Regional Price Differences

While state-level regional price parity figures exist and are published by the Bureau of Economic Analysis (BEA), our goal was to develop a state-level "transportation price parity" by weighting

[6] https://www.fhwa.dot.gov/policyinformation/statistics/2017/

[7] Footnotes to the HM-10 data note that "Other Jurisdiction" miles include "…State park, State toll, other State agency, other local agency and other roadways not identified by ownership." For example, this would include the New Jersey Turnpike and the Garden State Parkway. https://www.fhwa.dot.gov/policyinformation/statistics/2017/hm10.cfm

the metro area price parity within each state by the number of bridges within each MSA as the best means available to account for the density of transportation infrastructure. Metro area price parity figures were downloaded from the BEA[8] and US Census Tract and MSA shapefiles were acquired from the US Census TIGER/Line® shapefile web interface.[9] Bridge shapefiles for the eight states used in the analysis were acquired by using the GeoService API[10] provided by the US Department of Homeland Security's Homeland Infrastructure Foundation-Level Data (HIFLD) portal. Bridges were geocoded to MSA with QGIS software, and subsequent weighting was calculated in RStudio.

While the weighting above accounted for the relative number of state bridges *between* metropolitan areas, a second weighting was performed to account for the spatial distribution of those bridges *within* those MSAs. This was performed to account for the assumption that a bridge or road project, all other things equal, would cost more in the City of Newark than a rural section of Ocean County (both of which fall in the New York-Newark-Jersey City MSA). Bridges were geocoded to census tracts, and these census tracts were ranked by population density. For our calculations, bridges were weighted up to 50% more if they were located in the highest population tract percentile, and weighted as much as 50 percent less if they were in the lowest population tract percentile. The table below provides an illustration of the impact of this weighting on the top and bottom 10 Census tracts in the New York-Newark-Jersey City MSA by population density (tracts with zero bridges omitted).

Top 10 NJ Tracts in the New York-Newark-Jersey City MSA by Density							
Census Tract	County	2017 Population Estimate	Land Area (sq mi)	Population Density	# of Bridges	Density Weight	Bridges Weighted
34017015001	Hudson	2,212	0.028	79,000.0	1	0.498	1.498
34017017000	Hudson	5,175	0.079	65,506.0	1	0.490	1.490
34017016500	Hudson	4,689	0.079	59,354.0	3	0.485	4.455
34017016800	Hudson	3,642	0.064	56,906.0	2	0.484	2.968
34017018302	Hudson	3,936	0.075	52,480.0	2	0.478	2.956
34017001800	Hudson	4,227	0.082	51,549.0	1	0.475	1.475
34017003100	Hudson	4,983	0.101	49,337.0	1	0.470	1.470
34017014900	Hudson	3,551	0.078	45,526.0	1	0.464	1.464
34013011100	Essex	4,129	0.097	42,567.0	9	0.459	13.131
34031175301	Passaic	3,373	0.084	40,155.0	4	0.453	5.812

* Census Tracts with 0 bridges omitted

8 https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area
9 https://www.census.gov/cgi-bin/geo/shapefiles/index.php
10 https://hifld-geoplatform.opendata.arcgis.com/datasets/national-bridge-inventory-nbi-bridges

Bottom 10 NJ Tracts in the New York-Newark-Jersey City MSA by Density							
Census Tract	County	2017 Population Estimate	Land Area (sq mi)	Population Density	# of Bridges	Density Weight	Bridges Weighted
34017980100	Hudson	0	1.13	0.0	2	-0.499	1.002
34029980100	Ocean	0	8.12	0.0	5	-0.499	2.505
34037371900	Sussex	1,860	66.6	27.9	23	-0.497	11.569
34029739100	Ocean	1,610	54.7	29.4	3	-0.496	1.512
34025809903	Monmouth	264	7.26	36.3	2	-0.495	1.010
34017006900	Hudson	66	1.38	47.9	15	-0.494	7.590
34037371000	Sussex	3,753	44.00	85.3	9	-0.494	4.554
34035052904	Somerset	2,228	24.6	90.4	41	-0.493	20.787
34029732001	Ocean	6,375	70.5	90.4	10	-0.492	5.080
34029736002	Ocean	1,605	16.1	99.9	9	-0.492	4.572

* Census Tracts with 0 bridges omitted

Ideally, our weighting methodology would have incorporated state-controlled lane miles in addition to bridge counts by metropolitan area. However, the availability of road data that includes lane data and ownership categories similar or identical to the Federal Highway Administration s were not found, unlike the nationally uniform reporting for the National Bridge Inventory.