



The Road to Equitable Transportation Policy in New Jersey:

An Assessment of Cost Burdens, Gaps in Mobility and Recommendations for Reform



A REPORT FOR THE GARDEN STATE INITIATIVE
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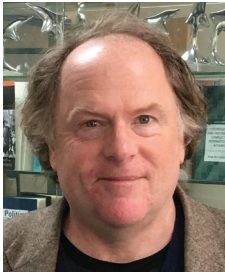
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Our Mission

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.

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Executive Summary

This report seeks to examine the various issues that impact the cost of travelling in New Jersey, and some of the future items that may impact the state as technologies change. A multi-modal analysis is conducted to understand how the costs of owning and driving a vehicle, and the availability of transit (or lack thereof) in New Jersey impact household and business behaviour, now and in the future.

The costs of driving in New Jersey are driven by policy decisions made in the past: about automobile infrastructure, transit alternatives, development patterns, tolling, and taxation and finance. While many of these decisions were good for their times, they are not serving New Jerseyans so well now. Many residents, even those living near the two major metropolitan areas of New York and Philadelphia, still have to rely at least partially on cars for travel, and their operating costs are generally higher than national and regional averages. Tolls are a major source of this difference, and there are good reasons to believe that this burden is even higher than the official data suggest. Insurance is also more expensive than in many other places and congestion leads to very high commute times for some.

New Jersey itself also runs a considerable bus and rail operation. But the differences between northern and southern sections of the state, and the differences in costs between these and the surrounding metropolitan areas indicate that the portfolio of transportation options is different for New Jerseyans. There are also very different cost burdens across different socioeconomic groups within the state.

These factors taken together reveal that New Jersey is something of a tale of two – or three or more – states when it comes to transportation. Costs of driving are lower in the north than in the south. Transit availability and cost also differs across those two regions. Large parts of the state of significant population and size are in transit “deserts” with few alternatives to car travel, should they want such an option. This is compounded by significant differences in cost burden and travel alternatives structured according to income and socioeconomic class.

Many have high hopes that technology can correct the deficiencies of the current situation, especially with regard to environmental impact, but also ease and cost of travel. Electric vehicles (EVs) have been seen as an advance that will lead to clean, green, cheap and convenient travel for all, especially when combined with current ride-sharing schemes, such as Uber and Lyft, and with future innovations like driverless vehicles.

But as this report demonstrates, the cost of building the necessary infrastructure for an EV fleet is substantial, even for a 10% fleet transition, and there are many other unresolved issues as well, such as

cost of electricity, load capacity of the existing power network, equity impacts, and other challenges. New technology is certainly part of any future solution to making driving and transportation by any mode more efficient, effective and affordable in the state, but it will come at a substantial financial cost and take a significant amount of time to implement, with many winners and losers long the way.

Given all this we make the following *key* recommendations:

1. Split New Jersey Transit (NJT) into two parts: North New Jersey Transit and South New Jersey Transit.

No other state in the nation organizes mass transit operations on a statewide basis, and for good reason. The state's two regions face very different realities. No matter what mass transit improvements there may be for South Jersey in the decades ahead that section of the state will always be dependent on cars for basic travel. Since South Jersey is often an afterthought in state mass transit planning and finance, the region deserves independent standing with its own dedicated state mass transit agency.

2. Provide mass transit with a dedicated revenue stream

Whether NJ Transit stays as one unit or is split in two, mass transit in the state needs a reliable and dedicated revenue stream – most effectively from dedicated taxes. NJT's budget has been subject to swings in allocation according to the whims of Trenton politicians thus making long-term planning and operational improvements challenging.

3. Policymakers in the state would do well to hedge their bets as to what technology will win the future—battery charges or hydrogen fill-ups.

A carbon zero future will depend on more subsidies and investment of which the current Clean Energy Program is just a start. It very well may be the case that different regions in the state will have different EV mixes. Furthermore, in light of the infrastructure challenges, it is likely that the traditional combustible engine will continue to be used into the near future, and well established engine/battery hybrids will see us through a long period of transition.

4. A deregulated auto insurance market works best. Keep it that way.

One of the great bipartisan success stories in the state has been the taming of auto insurance rates in the past twenty years. There are over thirty major players in this market competing for consumers. Deregulation is a success story, and efforts to re-regulate this market by micromanaging risk assessment models of firms is a step in the wrong direction.

If these recommendations are implemented, the people of New Jersey will be able to look forward to a state transportation system that is tailored to meet the needs of all its diverse population, tailored to the unique locally prevailing circumstances that occur in different parts of the state, especially the north versus the south. Financing and funding would be more efficient, allowing for lower fiscal burdens to deliver better improvements without getting locked into unsuitable or unsustainable technologies.

5. The state legislature should eliminate the revenue target for the fuel tax, and set a statutory limit on the percentage of tax revenue the governor can divert

If current trends hold, the future is not bright for New Jersey's drivers. Over the past few

years, New Jersey jumped from the almost bottom to nearly the top among the states in taxes collected at the pump. Trenton is siphoning off tolls and fuel taxes to help NJT. While federal stimulus aid may put off a day of reckoning for a time, this reallocation of monies is a long-term threat to road capital plans. It is time to pump the brakes on road tax and toll siphoning.

6. Explore innovative alternative revenue mechanisms.

There are a number of innovative options that one can consider in terms of funding sources for transportation systems. Possibilities include privatizing street parking spaces, to taxing box deliveries from online shopping retailers. Using multiple sources of revenue to support New Jersey's transportation system provides a mix of revenue sources that would be most equitable in a state and efficient with diverse transportation systems and regional variation in services.

7. Use a portfolio approach to financing the State transportation system

There are unexplored opportunities to tax landowners in urban areas that benefit from mass transit investments and tax activity that occurs in congested regions such as urban freight delivery. This portfolio approach would provide a number of funding sources for transportation and would also be more equitable in terms of regional burden.

1. Introduction

Using a vehicle is a vital component of daily life in most communities in the United States and thus driving is a ubiquitous activity. People drive for all sorts of reasons – getting to a job, taking children to school, visiting friends and family, shopping for goods, and hundreds of other reasons. In New Jersey, the most densely populated state in the United States, these challenges are more profound than in many other states. Things such as congestion, mass transit needs, land use and housing density, port commerce and regional and national travel and goods movements all converge in New Jersey. These issues also create significant public policy and public finance needs that continue to evolve. New technologies and uses such as telework, electric and hybrid vehicles, micromobility (scooters and e-bikes), ride sharing companies such as LYFT and Uber and other factors are changing the face of mobility needs in the Garden State. Additionally, as much as the rise of automobile and truck use have shaped New Jersey’s development, the state’s land-use and economic development patterns have shaped mobility and travel outcomes (see Box 1.1).

This report seeks to examine the various issues that impact the cost of driving in New Jersey and some of the future items that may impact the state as technologies change. Further, we look to understand how the costs of owning a vehicle and driving in New Jersey impact household and business behavior.

BOX 1.1: NEW JERSEY’S LONG HISTORY OF DRIVING

The challenges that New Jersey currently faces around automobile use, and the demands that household and business mobility use places on our transportation network, have been a cause for concern for decades. The New Jersey State Legislature sponsored a study of automobile use in 1918 entitled “The Administration of County and Township Highways in New Jersey” to examine how much stress this new model of travel was placing on the existing road network, and consider plans to address the need for additional roads and road funding.

In 1906, New Jersey had 13,759 registered motor vehicles. By 1918, that number had rocketed to 155,513 motor vehicles – a 1,030% increase! At the same time, the 20,445 miles of highway network was largely unpaved – consisting of mostly gravel and dirt roads – with only 23.26% of roads having what we would now consider some form of pavement (the bar here was quite low, as it included stone and wood block as “pavement”).

New Jersey's population exploded after World War II zooming from 4,160,165 in 1940 to 7,171,122 in 1970, a 72.4% increase. This was a time of massive suburbanization. Much of this suburban growth occurred in areas that were formerly rural farming communities, many of which had very limited mass transit services and were places of relatively light density. This placed intense pressure on government to improve roads and transit services in these new places of growth, and the spending to support it.

Fast forward to today. Technologies and circumstances are changing, but the challenges remain the same, namely, how to provide affordable and efficient means of transportation to get people where they need and want to go.

2. Review of the Literature—what has been written about NJ Travel and Costs

The cost an individual traveling from one point to another incurs on a journey divide into components.

Mode Choice (car, public transit, etc.)

Operating Cost of Mode (fuel, wear-and-tear, maintenance, insurance, parking, etc.)

Journey Travel Time (multiplied by personal value of time per unit)

Operator Fees (tolls, transit fares, taxes, etc.)

There are many relationships between these different cost components, mode choice being the key one. A choice to travel by car attaches to the trip additional operating costs for the individual that generally exceed the costs of public transit. But transit trips often take a lot more time than auto trips and require payment of fares. Of course, in some areas the choices of mode may be limited, as many locations offer little or no public transit options.¹

Two other inputs into this cost equation are the traveler's socioeconomic status and the locations of their most frequent trips. There is also a relationship between socioeconomic status and location. Low income households generally have fewer financially feasible transport alternatives when compared to wealthier people, and low income people are not always able to afford to live in areas with good transit. Some locations have higher transport costs than others, sometimes directly in the form of higher tolls or fuel prices, and sometimes indirectly because of greater congestion, and hence longer travel times, in lower cost neighborhoods.

The most important journey for many people is the commute to work. This does not include all trips, of course. Sometimes non-work travel, e.g., to take children to and from school, are very time-consuming, and some people don't work or work at home. Work commuting, however, remains one of the major trip purposes and there is a great deal of data collected about this journey.

For 2019, the US Census Bureau reported that those living in New Jersey had a mean (average) travel time to work of 33.1 minutes, about 20% higher than the mean national figure of 27.6 minutes. Table 2.1 shows a mode share comparison between New Jersey and the US. What stands out is that New

¹ What is the average cost of commuting in the us?, Learn how to calculate the cost of your daily trip to work, *The balance*, Rebecca Lake (Erika Rasure reviewer) Updated May 26, 2021, <https://www.thebalance.com/how-much-does-commuting-cost-the-average-american-4175825>; The True Cost of Commuting . <https://www.listwithclever.com/research/true-cost-of-commuting/> Governing. Riding Transit Takes Almost Twice as Long as Driving. <https://www.governing.com/archive/gov-transit-driving-times.html>.

Jerseyans drove to work in lower numbers than Americans generally (71.0% versus 75.9%) and took proportionately more public transit (11.6% to 5.0%).

TABLE 2.1. MODES OF TRAVEL TO WORK – NEW JERSEY V US 2019

	New Jersey		United States	
Drove alone	71.0%	3,137,002	75.9%	119,153,349
Carpooled	7.9%	348,602	8.9%	13,900,979
Public transit	11.6%	510,746	5.0%	7,778,444
Bicycle	0.2%	10,796	0.5%	805,722
Walked	2.7%	118,774	2.7%	4,153,050
Other	1.8%	77,724	1.4%	2,179,002
Worked at home	4.9%	217,410	5.7%	8,970,800

U.S. Census Bureau (2019). American Community Survey 1-year estimates. Retrieved from Census Reporter Profile page for New Jersey <http://censusreporter.org/profiles/04000US34-new-jersey/>

New Jersey sits in two major metropolitan statistical areas: New York-Newark-Jersey City and Philadelphia-Camden-Wilmington. Where a New Jersey resident lives likely structures their mode choice and commute time. The metropolitan area of New York-Newark-Jersey City, encompassing the northern half of the state, had an average commute time of 37.6 minutes in 2017. Only 50.3% of trips were taken by auto, and 30.9% were taken by public transit. In the southern part of the state, dominated by the Philadelphia-Camden-Wilmington metro area, the average commute time was 30.5 minutes. Car trips accounted for 72.3% of the total and public transit 9.8% (US Census, American Community Survey 2018).

3. Cost of Travel: Comparison to NJ, other States and the Rest of USA

As for how these characteristics translate into actual travel costs, the US Bureau of Labor Statistics (BLS) expenditure survey sheds some light. Table 3.1. shows the comparison between NJ transportation expenditures and US averages for 2018-2019.

TABLE 3.1. CONSUMER EXPENDITURES ON TRANSPORTATION NJ VERSUS US 2018–19

Category	NJ	USA	NJ as % US
Transportation – TOTAL	\$10,671	\$10,742	99.3%
Vehicle purchases (net outlay)	\$2,683	\$4,394	61.1%
Gasoline, other fuels, and motor oil	\$2,027	\$2,094	96.8%
Other vehicle expenses	\$4,607	\$3,474	132.6%
- Vehicle finance charges	\$141	\$252	56.0%
- Maintenance and repairs	\$967	\$887	109.0%
- Vehicle insurance	\$2,038	\$1,545	131.9%
- Vehicle rental, leases, licenses, and other charges	\$1,460	\$790	184.9%
Public and other transportation	\$1,355	\$781	173.5%

Source: US Bureau of Labor Statistics (BLS) 2019. Figures above are means.
 U.S. Bureau of Labor Statistics. Consumer Expenditures—2019. <https://www.bls.gov/news.release/cesan.nr0.htm>

These figures would appear to indicate that overall transportation expenditures for New Jerseyans were like those of most Americans, on average, during 2018-19. The third column shows New Jersey expenditures by category as a percentage of the US average indicating that the two figures were almost identical. The major differences were in net outlays for vehicle purchases, which in New Jersey were only around 61% of the US average; and in public and other transportation, which for New Jersey represented 173.5% of the US average. Vehicle insurance and other miscellaneous vehicle fees were also significantly above the US levels.

This, however, is an incomplete picture for several reasons. First, averages disguise significant cost differences between local regions and users. The differences between North and South Jersey require deeper examination.

Second, two major categories of cost are not included in the BLS data. The first measurement gap, which is the value of travel time spent making trips, is not a direct cash expenditure but simply the opportunity cost of lost time. It is easy to overlook this expenditure since it has no direct cash value.

But that doesn't mean that it is not important. This issue is considered in more detail later. Some of this time factor appears to be captured in the average fuel economy of New Jersey vehicles – where the implied fuel usage rate per mile appears to be somewhat higher (about 16 mpg) than the national averages of 22.2 miles per gallon based upon reported fuel use and Vehicle Miles traveled in New Jersey. Further exploration of this issue may be warranted but is outside the scope of this report.

The second gap is around the collection and analysis of data for road tolls and other road use charges. These costs are actually surveyed for and notionally included in vehicle operating expenses (the many fine subcategories of this line item are not included in the broad table above). However, earlier research by the report authors on the BLS data indicated that road tolls and road use charges are seriously underreported. We found that the total road tolls and road use charges (BLS consumption item 520541) indicated by households was roughly 42-56% below the reported amount of road toll revenue as indicated by the toll agencies. New Jersey is a highly tolled state both in terms of mileage and outlay. This underreporting by BLS significantly understates the cost of road tolls and thus the cost of driving overall on New Jersey households. One credible estimate is that for the New York-New Jersey region, these tolls may amount to an average 5% to 10% addition to the average expenditure on transportation.²

Table 3.2 provides more detailed data on quarterly household expenditures within New Jersey, separating the state into its northern and southern halves and comparing them to their respective metropolitan regions of New York and Philadelphia (and also northern Delaware). The data are for the June 2019 quarter. The highest number in each column is boxed for emphasis.

Among the striking patterns are the differences in spending between the northern and southern parts of the state, the former having a total transport spend (\$1,484.84) almost 40% higher than the latter (\$1,085.56). Northern New Jerseyans spent considerably more on transport than the average across the New York City metro area (\$1,099.22), although southern New Jerseyans spent considerably less than their metro Philadelphia counterparts (\$1,681.21). Overall transportation is generally the fourth highest category of state household spending, below housing, food, and personal insurance.

TABLE 3.2. DETAILS ON THE HOUSEHOLD SPENDING ON TRANSPORTATION ITEMS – JUNE 2019

Region	State	Avg. Vehicles	Avg. Age	Food	Alcohol	Housing	Apparel	Transport	Health Care	Entertain.
Northern	Delaware	1.88	54.00	\$2,243.96	\$167.25	\$5,234.75	\$175.21	\$2,332.83	\$1,077.17	\$321.75
North Jersey	New Jersey	1.30	55.53	\$1,643.98	\$63.40	\$4,283.10	\$268.55	\$1,484.84	\$895.98	\$351.72
South Jersey	New Jersey	1.75	48.42	\$1,494.17	\$191.25	\$3,889.81	\$110.00	\$1,085.56	\$678.36	\$421.83
NYC Metro	New York	0.84	54.96	\$1,596.44	\$82.46	\$4,220.45	\$202.53	\$1,099.22	\$736.64	\$325.43
Philadelphia	Pennsylvania	1.49	59.11	\$1,406.98	\$107.97	\$4,233.91	\$185.77	\$1,681.21	\$1,026.45	\$696.00

Region	State	Pers. Care	Reading	Education	Tobacco	Misc.	Cash Contr.	Pers. Insuran.	Total Spending
Northern	Delaware	\$22.96	\$14.38	\$-	\$113.21	\$13.13	\$-	\$2,446.52	\$14,163.11
North Jersey	New Jersey	\$59.34	\$5.06	\$47.65	\$6.69	\$42.28	\$744.65	\$1,860.55	\$11,757.80
South Jersey	New Jersey	\$84.33	\$18.58	\$23.33	\$34.67	\$59.33	\$100.42	\$1,566.15	\$9,757.79
NYC Metro	New York	\$66.22	\$10.70	\$198.46	\$31.30	\$274.69	\$316.27	\$1,275.41	\$10,436.21
Philadelphia	Pennsylvania	\$94.52	\$8.14	\$28.43	\$14.61	\$94.47	\$289.37	\$1,124.17	\$10,992.00

² Peters, J., King, D.A., Gordon, C., Santiago, N.T. (2015). For Whom the Consumer Price Index Tolls: Reporting of Road Pricing in the consumer expenditure survey. *Transportation Research Record* 2530 (1), 55-64.

Table 3.3. shows detailed expenditure components of transportation spending. The big differences between North and South Jersey are in the North’s considerably higher maintenance and repair and public transportation costs, and the South’s higher vehicle insurance (See Box 3.1). What also stands out is the higher local tolls totals New Jerseyans shoulder as compared to the residents of the two major metropolitan areas on either end of the state.

Table 3.3. Transportation expenditure components – July 2019

Region	State	Gasoline & Oil	Veh. Finance Char.	Maint & Repair	Veh. Insurance	Other Veh. Charg.	Pub. Transp.	Local Tolls
Northern	Delaware	\$425.94	\$36.13	\$368.48	\$500.50	\$172.21	\$829.58	\$11.92
North Jersey	New Jersey	\$298.69	\$20.64	\$233.42	\$282.64	\$171.79	\$199.87	\$17.58
South Jersey	New Jersey	\$337.56	\$58.25	\$91.27	\$384.08	\$214.39	\$-	\$20.17
NYC Metro	New York	\$231.12	\$15.25	\$59.53	\$218.16	\$230.56	\$237.40	\$10.79
Philadelphia	Pennsylvania	\$322.40	\$34.46	\$119.36	\$251.37	\$178.58	\$32.18	\$7.98

One key issue to consider is the massive increase in New Jersey state fuel tax rates that occurred in 2020. These changes are apparently not captured in the 2019 data on household expenditures from the Bureau of Labor Statistics and this issue will be examined in detail in the next section of this report. The authors have also contacted the Federal Highway Administration (FHWA) to discuss reporting issues in the state level fuel taxation data at the FHWA – as current data at the FHWA does not appear to reflect the radical increase in fuel tax rates in New Jersey.

BOX 3.1. AUTO INSURANCE IN NEW JERSEY: PROBLEMS ON THE HORIZON?

There was a time in New Jersey when automobile insurance affordability was a lightning-rod issue in state politics. It was the major policy dispute in the 2001 gubernatorial campaign when both candidates, Democrat James E. McGreevey and Republican Bret Schundler, promised big reforms to lower what had for many years been among the highest rates in the nation. Ironically, although he campaigned on a plank that called for a more incremental reform, once elected, McGreevey adopted Schundler’s market approach.

McGreevey eased market regulations by allowing for more price discrimination in the risk assessment of drivers, and new insurers entered the marketplace. The resulting competition lowered average insurance prices, dropping New Jersey to the middle of the pack among the states. Efforts were made to reduce fraud, and the Insurance Research Council estimates that only 3.1% of drivers on the road in New Jersey are uninsured now, the lowest rate in the nation.³

There are two potential issues now down the road facing policymakers and consumers from the perspective of affordability.

The first is that the state legislature is considering legislation that would prevent insurers from using credit scores and occupation as a factor in the determination of rates. This move toward re-regulation threatens hard-won gains in making this marketplace competitive and efficient.

³ Insurance Research Council, “One in Eight Drivers Uninsured,” March 22, 2021; Holly Bakke, “This Change Would Hike Care Insurance in New Jersey”, June 7, 2021 nj.com.

The second is that even with the decrease in average insurance rates from previous decades, working-class New Jerseyans feel the pinch from insurance rates. A 2017 federal study found that in 143 of the state's 595 zip codes, the majority of policyholders in 82 of them paid more than 2% of their personal income on mandatory insurance policies.⁴ The hardest hit counties by this measure are Camden, Essex, Atlantic, Passaic, and Mercer.⁵

New Jersey State Recent Fuel Tax Increases

Given the recent increase in fuel tax rates moving New Jersey from the second lowest state fuel tax at 14.5 cents per gallon in 2016 to the 4th highest at 50.7 cents per gallon in 2021, the existing data sources have not yet captured the full impact of these tax increases on household expenditures. Utilizing data on fuel tax rates from the Tax Foundation⁶ and data on county population from the NJ Department of Labor and Vehicle Miles Travelled from the NJ Department of Transportation, we provide below, in Table 3.4, an estimate of the impact of the increase in New Jersey fuel taxes on a per capita basis and for a household of 4 people if fuel usage was similar to 2019 rates. Under that scenario, the average New Jersey household is paying an additional \$763.02 in fuel taxes each year under the new 50.7 cent per gallon fuel tax rate. This burden varies significantly by county based upon the amount of driving in the households and the number of zero car households. The household burden varies from a low of \$303.33 in Hudson County to a high of \$1,302.07 in Hunterdon County. Overall, this fuel tax increase raised about 1.7 billion additional dollars for the New Jersey Transportation Trust Fund.

TABLE 3.4. ESTIMATED NEW JERSEY FUEL TAX REVENUE BY COUNTY, 2016 AND 2021

County	County Population	Fuel Used Gallons	2021	2016	Annual Change in Fuel Taxes	2021	2016	Change in Fuel Taxes Per Capital	Additional Cost Family of 4
			Fuel Tax Revenue at 50.7 Cents	Fuel Tax Revenue at 14.5 Cents		Fuel Taxes Per Capital	Fuel Taxes Per Capital		
Atlantic	266,105	172,449,657	\$87,431,976	\$25,005,200	\$62,426,776	\$328.56	\$93.97	\$234.59	\$938.38
Bergen	930,390	456,373,051	\$231,381,137	\$66,174,092	\$165,207,044	\$248.69	\$71.13	\$177.57	\$710.27
Burlington	445,702	292,766,546	\$148,432,639	\$42,451,149	\$105,981,490	\$333.03	\$95.25	\$237.79	\$951.14
Camden	506,738	244,556,296	\$123,990,042	\$35,460,663	\$88,529,379	\$244.68	\$69.98	\$174.70	\$698.82
Cape May	93,086	62,241,808	\$31,556,596	\$9,025,062	\$22,531,534	\$339.00	\$96.95	\$242.05	\$968.20
Cumberland	151,906	72,646,908	\$36,831,982	\$10,533,802	\$26,298,181	\$242.47	\$69.34	\$173.12	\$692.49
Essex	795,404	309,469,927	\$156,901,253	\$44,873,139	\$112,028,113	\$197.26	\$56.42	\$140.84	\$563.38
Gloucester	291,165	179,461,170	\$90,986,813	\$26,021,870	\$64,964,943	\$312.49	\$89.37	\$223.12	\$892.48
Hudson	670,046	140,360,590	\$71,162,819	\$20,352,286	\$50,810,534	\$106.21	\$30.37	\$75.83	\$303.33
Hunterdon	124,823	112,243,180	\$56,907,292	\$16,275,261	\$40,632,031	\$455.90	\$130.39	\$325.52	\$1,302.07
Mercer	367,922	225,032,811	\$114,091,635	\$32,629,758	\$81,461,878	\$310.10	\$88.69	\$221.41	\$885.64
Middlesex	825,920	500,978,674	\$253,996,188	\$72,641,908	\$181,354,280	\$307.53	\$87.95	\$219.58	\$878.31
Monmouth	621,659	405,580,335	\$205,629,230	\$58,809,149	\$146,820,081	\$330.77	\$94.60	\$236.17	\$944.70
Morris	493,379	325,278,966	\$164,916,436	\$47,165,450	\$117,750,986	\$334.26	\$95.60	\$238.66	\$954.65

⁴ Federal Insurance Office, U.S. Department of Treasury, "Study of the Affordability of Personal Automobile Insurance," January 2017.

⁵ Consumer Federation of America, New Treasury Dept. Report Reveals that 8 Million Americans in NY-NJ-CT Live in Zip Codes Where Auto Insurance is Unaffordable," January 23, 2017.

⁶ <https://taxfoundation.org>

County	County Population	Fuel Used Gallons	2021	2016	Annual Change in Fuel Taxes	2021	2016	Change in Fuel Taxes Per Capital	Additional Cost Family of 4
			Fuel Tax Revenue at 50.7 Cents	Fuel Tax Revenue at 14.5 Cents		Fuel Taxes Per Capital	Fuel Taxes Per Capital		
Ocean	596,415	301,662,326	\$152,942,799	\$43,741,037	\$109,201,762	\$256.44	\$73.34	\$183.10	\$732.39
Passaic	503,637	177,815,271	\$90,152,342	\$25,783,214	\$64,369,128	\$179.00	\$51.19	\$127.81	\$511.23
Salem	62,990	49,146,406	\$24,917,228	\$7,126,229	\$17,790,999	\$395.57	\$113.13	\$282.44	\$1,129.77
Somerset	329,838	209,813,703	\$106,375,547	\$30,422,987	\$75,952,560	\$322.51	\$92.24	\$230.27	\$921.09
Sussex	141,483	79,231,896	\$40,170,571	\$11,488,625	\$28,681,946	\$283.93	\$81.20	\$202.72	\$810.89
Union	554,033	274,168,404	\$139,003,381	\$39,754,419	\$99,248,962	\$250.89	\$71.75	\$179.14	\$716.56
Warren	105,862	87,246,110	\$44,233,778	\$12,650,686	\$31,583,092	\$417.84	\$119.50	\$298.34	\$1,193.37
New Jersey	8,878,503	4,678,524,033	2,372,011,685	678,385,985	\$,693,625,700	\$267.16	\$76.41	\$190.76	\$763.02

In addition, households and businesses in New Jersey also contribute to the U.S. Federal Fuel taxes at a rate of 18.4 cents per gallon for gasoline and 24.4 cents per gallon for diesel fuel. These funds are contributed to the Federal Highway Trust Fund and a good portion of that money is returned to New Jersey in the form of federal highway and transit aid. Table 3.5 provides an estimate of the fuel tax funds contributed by drivers in 2021 to the New Jersey Transportation Trust Fund and the Federal Highway Trust Fund (roads and transit).

TABLE 3.5. ESTIMATED NEW JERSEY AND FEDERAL FUEL TAX REVENUE BY NJ COUNTY - 2021

County	NJ Fuel Tax Revenue at 50.7 Cents	U.S. Fuel Tax Revenue at 18.4 Cents	Total Fuel Taxes New Jersey - 2021
Atlantic	\$87,431,976	\$31,730,737	\$119,162,713
Bergen	\$231,381,137	\$83,972,641	\$315,353,778
Burlington	\$148,432,639	\$53,869,044	\$202,301,683
Camden	\$123,990,042	\$44,998,359	\$168,988,401
Cape May	\$31,556,596	\$11,452,493	\$43,009,089
Cumberland	\$36,831,982	\$13,367,031	\$50,199,014
Essex	\$156,901,253	\$56,942,466	\$213,843,719
Gloucester	\$90,986,813	\$33,020,855	\$124,007,668
Hudson	\$71,162,819	\$25,826,349	\$96,989,168
Hunterdon	\$56,907,292	\$20,652,745	\$77,560,038
Mercer	\$114,091,635	\$41,406,037	\$155,497,673
Middlesex	\$253,996,188	\$92,180,076	\$346,176,264
Monmouth	\$205,629,230	\$74,626,782	\$280,256,011
Morris	\$164,916,436	\$59,851,330	\$224,767,766
Ocean	\$152,942,799	\$55,505,868	\$208,448,667
Passaic	\$90,152,342	\$32,718,010	\$122,870,352
Salem	\$24,917,228	\$9,042,939	\$33,960,167
Somerset	\$106,375,547	\$38,605,721	\$144,981,269
Sussex	\$40,170,571	\$14,578,669	\$54,749,240
Union	\$139,003,381	\$50,446,986	\$189,450,367
Warren	\$44,233,778	\$16,053,284	\$60,287,062
Total	\$2,372,011,685	\$860,848,422	\$3,232,860,107

Overall, in 2021, we estimate that New Jersey drivers contribute 3.2 billion in funds to the federal and state transportation trust funds via fuel taxation. This represents a roughly 100% increase over these costs in 2013 – or 1.7 billion dollars each year that New Jersey households have to fund from their take home pay or businesses have to pay as an additional expense to their operations.

In August 2021, based upon the rebounding in the use of motor fuel as the COVID19 Pandemic became more manageable, New Jersey announced that the New Jersey fuel tax rate would be reduced starting in October 2021 by 8.4 cents per gallon. This impact would yield an overall reduction in fuel taxes of 388 million dollars in costs – but that would be offset by the expected rebound in overall household and business driving – thus the NJ Transportation Trust Fund in 2022 would have a similar funding pattern as compared to 2021. County level burdens are expected to be only changed in minor ways.

4. Alternatives to conventional driving in New Jersey

As the analysis thus far shows, New Jersey is a densely populated, highly urbanized state, surrounded by large metropolitan areas with significant public transit. New Jersey itself also runs a considerable bus and rail operation. But the differences between northern and southern sections of the state, and the differences in costs between these and the surrounding metropolitan areas indicate that the portfolio of transportation options is different for New Jerseyans.

Let's begin with public transit – in this case NJ Transit Bus Routes. In Figure 4.1, we see route concentrations and hubs in the New York City and Philadelphia regions, as well as the state capital in Trenton, and a “microhub” in Philipsburg. While these lines accommodate commutes that accord with traditional pre-1970s travel patterns, there has been apparently no significant bus network development to reflect the New Jersey reality of the last two generations, namely, the rise of suburban/exurban sprawl communities where people live, and the rise of edge cities, low-density cityscapes where people work and shop. A robust and modern state bus system would maintain its current commitment to serving central city/suburban communities while expanding service to connect the state's edge cities. Edge cities – new urban development with low density office space and retail – includes places like Bridgewater, Morristown, and Princeton/Route 1 corridor.

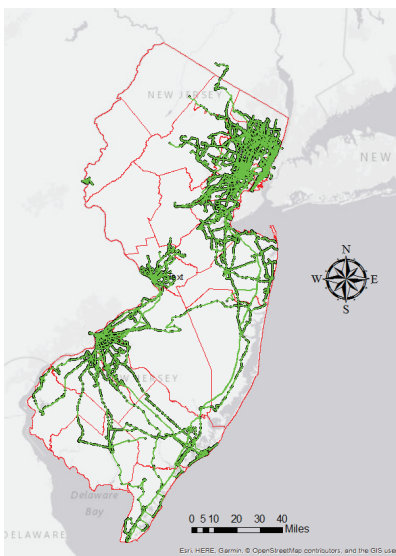


Figure 4.1. New Jersey Bus Stops and Bus Lines

We note with some interest the large gaps in service in areas in Ocean County that have large concentrations of seniors, yet little to no fixed route mass transit options for mobility limited people. There is apparently some county level service in these areas, but the services are limited in terms of geographic scale, service frequency, and days of operation.⁷

The disjointed and regional nature of the bus system as well as the very long travel times suggest to us that in terms of a regional and state mass transportation system, we should focus our analysis on the fixed rail systems and their stations. Using existing data on commuter rail and light rail routes and stations, we then looked at the availability of rail transit within a 5-mile radius of the existing rail transit stations.

⁷ See for example Ocean County's Ocean Ride service - <https://www.co.ocean.nj.us/OC/Transportation/frmOceanRideBusRoutes.aspx>

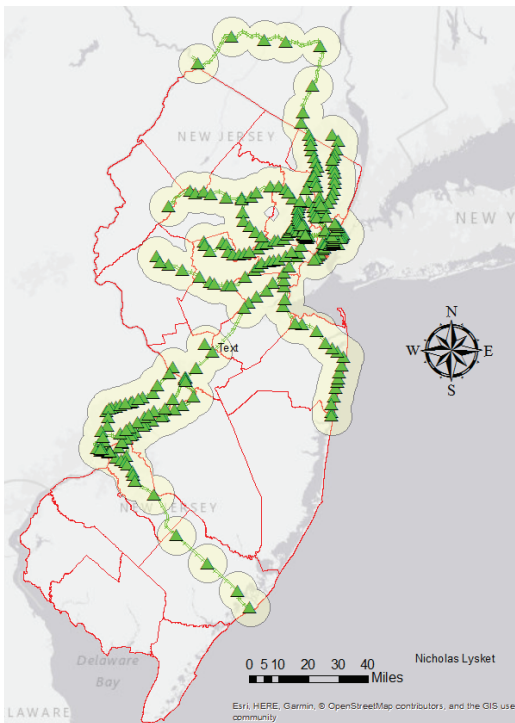


Figure 4.2. New Jersey Transit Railroad Stations with 5 mile buffer

Figure 4.2. shows the New Jersey Transit railroad stations and lines, with a 5-mile buffer around each station. In the map we delineate those geographies of the state that are within a reasonable feeder distance of a ride on New Jersey Transit rail services. The lines follow the historical development of the central city/suburbs of New York City with extensions down the Jersey Shore and to Trenton.

With respect to rail, New Jersey, which was home to the first railroad line in the United States, has a network of commuter rail lines and stations that were consolidated in the 1980's into the New Jersey Transit (NJT) commuter rail system. These legacy systems were developed in some cases over 130 years ago and were reflective of travel patterns during the periods in which they were first built. Thus, the state struggles with funding a large, disjointed, gap-ridden statewide rail system.

The bus and rail in the state clearly follow the traditional model of serving the New York and Philadelphia suburbs and linking traditional industrial cities of Newark and Trenton.

While this may have been appropriate in 1960, one must wonder if these same patterns of service are consistent with land use patterns and development over the 60 years since then. Although New Jersey is the only state to have a statewide transit operator in the form of NJT, it does not have a truly statewide transit network (See Box 4.1)

In summation, the New Jersey bus network largely provides additional local circulation around the train network, especially for the densest urban areas, but provides limited usefulness as an overall mass transit option for New Jersey residents. We note the lack of any statewide map of bus services at New Jersey Transit, thus apparently validating the argument that buses in New Jersey are best evaluated on a route-by-route basis for local travel, not as an overall integrated regional or state system.

BOX 4.1. A SHORT HISTORY OF NEW JERSEY TRANSIT (NJT)

The state legislature created New Jersey Transit (NJT) in 1979 as a clean-up operation of the failing private companies that ran bus and rail lines in the state. NJT purchased for its portfolio the largest bus carrier, Transport of New Jersey, the Newark City Subway, and other lines approaching bankruptcy. In so much as the agency's bus and rail lines were pickups from around the region to alleviate the mass transit crisis that dated to the 1950s, it has been difficult for planners to integrate the lines and modes into a truly unified state mass transit system. The early decades of the agency were tumultuous with frequent labor unrest, service, and headline-making breakdowns.⁸

⁸ Gerald Benjamin and Richard Nathan, *Regionalism and Realism: A Study of Governments in the New York Metropolitan Area* (Washington, DC: Brookings Institution, 2001), 137–152.

Things are somewhat more stable in the last twenty years with the development of significant capital projects like the Hudson-Bergen and River (Trenton to Camden) light rail lines, as well as the Newark city subway extension. There have been improvements in connectivity for commuters to New York City with the opening of junction stations and Newark Airport service.

But it is ironic that the nation's only state-wide mass transit agency does not offer integrated mass transit service. The counties in South Jersey have not been well served by this deficiency. NJT operates historical/legacy commuter lines that feed into New York City, and a hodgepodge of bus lines that fail to operate as a seamless bus operation for the state.

While things might not be as dire as there were in the 1980s and 1990s, the agency still struggles. The newest chapter of the agency's history opened on September 29, 2016 when a train ran through the bumper block at the Hoboken terminus killing one woman on the platform and injuring over 100 others. The tragedy was a focusing event for the safety, financial, and management problems at NJT. Governor Christie underfunded the capital budget to patch holes in the operating budget and as a result the rail and bus fleets are aging quickly out of productive service.

For mass transit advocates the problem is that NJT has no dedicated tax stream to support the capital and operating budget (in contrast to New York mass transit operations which enjoy dedicated tax revenues that account for about 35% of spending). Instead, NJT revenue streams have been quite erratic. With a base of about 43% of revenue generated at the fare-box, the remaining funds have been generated by a mix of intergovernmental funds. The state has been an unsteady partner with support varying greatly from the year to year, and gubernatorial administration.⁹

Governor Murphy made improvement of NJT performance a big campaign promise when he won office in 2017. To that end, he increased state budget support from \$132 million at the start of his term to \$800 million for fiscal year 2021. While it is a fine idea to strengthen this key component of the state's transportation network, the money comes from a diversion of funds from the Turnpike Authority, a habit his predecessor, Governor Christie, developed that Murphy has reduced but not quite abandoned.

While NJ Transit cannot depend on year over year increases in incremental state aid, one consistent element has been the raiding of funds dedicated to other purposes to patch a budget together. Governor Murphy has been playing a shell game, grabbing funds from the capital budget to support the operating budget, and shifting money from other sources, including the dedicated Clean Energy Fund and Turnpike tolls.¹⁰ The recently inked deal of up to \$2 billion in payments from the Authority to NJT for cash raids on the Turnpike's tolls are jeopardizing the needed investments in the state roadways.

⁹ State of New Jersey Department of Transportation, "Comprehensive Strategic, Financial & Operational Assessment of New Jersey Transit," October 5, 2018, Chapter 5, "Funding Sources," 88-102.

¹⁰ Brent Johnson, "'Absolutely Mind-Blowing' NJ Transit Funding not Boosted in New State Budget," *NJ.com*, June 21, 2021.

5. Transit Deserts in New Jersey

For about thirty years, social scientists have employed the general concept of a “desert” to describe places where the supply of a public good or amenity does not match its demand. The notion informs analysis across many policy domains, including food access, medical care, public libraries, and educational institutions. Thus transit deserts are places where the supply of public transportation options does not match demand.

Figure 5.1. shows the “New Jersey Rail Transit Deserts”, shading those areas of the state outside of the five-mile rail station buffer. We constructed this map based upon the existing commuter rail network and stations as provided by New Jersey’s Geographic Information Services. We then estimated a buffer of 5 miles on each station and allowed for overlaps between stations. This is intended to be reflective of the idea that passengers that seek to use a commuter rail station would have some form of vehicle or transit feeder service to access the commuter rail station. We then selected the tracts from the 2010 Census that had no part of the tract within 5 miles of a rail station. The desert map is reflective of those Census tracts.

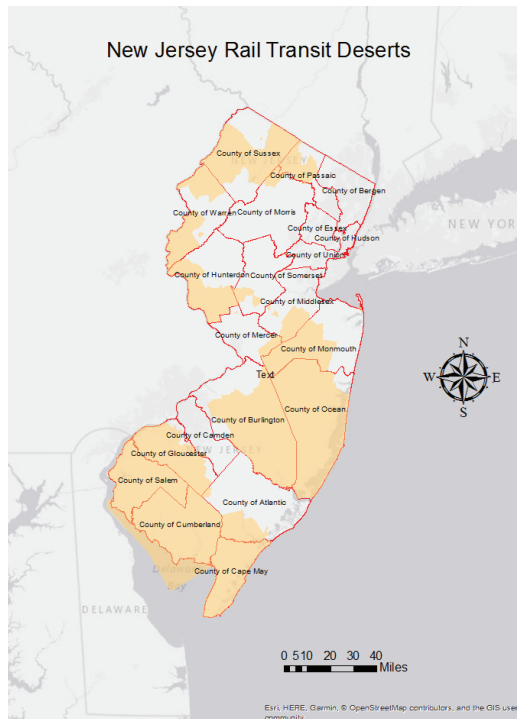


Figure 5.1. New Jersey Rail Transit Deserts

A 5-mile station buffer is a very broad standard to use in terms of transit access and thus our measure of the transit deserts in New Jersey is a very conservative assessment. In reality, in many of the fringe areas near the deserts, we would expect it to be very challenging to attempt to live without a private automobile, especially with a transit station several miles away. One could use a more restrictive buffer on the transit rail stations – say a one-mile walk distance, such as is used by Monmouth County for their bus services analysis - that would yield a much greater percentage of Census tracts that would fall into the transit desert category.

In terms of the location of the deserts, the northern counties on the New York and Pennsylvania border and much of South Jersey are included in these deserts. While there are a few undeveloped and very rural areas within these deserts, such as the Pinelands in Southern Jersey that has a large amount of state park land, many of these areas are

actually fairly densely populated, and in some cases are relatively close to metropolitan Philadelphia. The vast bulk of the four most southern counties – Salem, Gloucester, Cumberland, Cape May and a small portion of Atlantic County -- fall within one massive transit desert. Towns such as Glassboro, Woodstown and Vineland are all relatively close to Philadelphia, but none are served by rail transit and, as such, in spite of their relatively close proximity (35-50 miles) to one of the top ten urban areas in the United States, these communities must rely heavily on private automobile use as their primary model of travel.

Based on data from the 2010 Census, we can then explore the demographics of the population that lives within five miles of a rail station and the population that lives in transit deserts in New Jersey. Table 5.1 provides an overview of the demographics and gender breakdown in the rail served areas of New Jersey and the transit deserts in New Jersey. In total, 1.8 million people, 21.2% of the New Jersey population, lives in transit deserts. In general, the unserved population tends to be more white (Anglo) and less Hispanic as compared to the rail served population. We also examined the impact of age on transit access for Age 50+ year old residents and Age 65+ residents. Seniors 50+ (AARP Eligible) had a percentage of rail transit served at 76.7%. Seniors 65+ (Social Security Eligible) had a percent of rail transit served of 74.8%. These percentages were slightly below the New Jersey rail transit served rates – and warrant continued monitoring.

TABLE 5.1. TRANSIT DESERTS IN NEW JERSEY – SOCIOECONOMIC CHARACTERISTICS

Group	Total Pop.	White Pop.	Black Pop.	AIAN	Asian Pop.	NHOPI	OTHER	Multi Race	Hispanic Pop.	Male Pop.	Female Pop.
Total Population	8,791,894	6,029,248	1,204,826	29,026	725,726	3,043	559,722	240,303	1,555,144	4,279,600	4,512,294
Percent of Population		68.6%	13.7%	0.3%	8.3%	0.0%	6.4%	2.7%	17.7%	48.7%	51.3%
Served By Rail	6,930,159	4,466,203	1,069,678	23,941	659,969	2,483	505,391	202,494	1,385,835	3,369,136	3,561,023
Percent of Population Served		64.4%	15.4%	0.3%	9.5%	0.0%	7.3%	2.9%	20.0%	48.6%	51.4%
Not Served By Rail	1,861,735	1,563,045	135,148	5,085	65,757	560	54,331	37,809	169,309	910,464	951,271
Percent of Pop. Not Served		84.0%	7.3%	0.3%	3.5%	0.0%	2.9%	2.0%	9.1%	48.9%	51.1%
Percent Served By Rail	78.8%	74.1%	88.8%	82.5%	90.9%	81.6%	90.3%	84.3%	89.1%	78.7%	78.9%
Percent Not Served By Rail	21.2%	25.9%	11.2%	17.5%	9.1%	18.4%	9.7%	15.7%	10.9%	21.3%	21.1%

6. Electric vehicles

Perhaps, though, traditional transit is a thing of the past. Maybe the future lies with “green” vehicles, especially Electric Vehicles (EVs). These are said to be efficient and carbon-friendly and many argue that EVs, combined with driverless and other advanced directional technologies may transform the automobile into a flexible and environmentally friendly mode of travel that will make transit and conventional driving a thing of the past.

Similar arguments have been made for ride-sharing, and decentralized travel platforms like Uber, though as of now these forms have mainly supplemented rather than supplanted traditional transit and automobile networks. Of course, transit networks are already in place. But EVs require a whole new infrastructure needed to support it, especially charging stations.

The Argonne National Laboratory in 2012 provided a model of electric vehicle charging diffusion which would make it possible to replace the current gasoline-based car network with an electric one. Their model is reproduced in Figure 6.1.



Source: Argonne National Laboratory, 2012

Figure 6.1. EV charging station hierarchy

Essentially, this pyramid visualizes an ideal with ubiquitous single-family home chargers serving as a foundation, with decreasing numbers of units from that base for workplaces, public spaces, and commercial use (such as bus fleets). Our estimates of the required number of charging stations in New Jersey to support an initial transition to a fully electric automobile fleet were developed from this conceptual pyramid, combined with current charging time requirements and maximum distances of travel from one charge.

The estimate assumes a requirement that home charging stations for all electric vehicles will be in place for single and multi-family dwellings. This yields 605,000 stations for 10% of the New Jersey fleet of vehicles. Stations also need to be deployed in public settings as well as fleet operations, bringing up the total to approximately 750,000

charging stations to accommodate a 10% vehicle transition in New Jersey. Average cost data was utilized to estimate the total cost of supplying the necessary number of stations to reach this 10% target. The calculations are provided in Tables 6.1 and 6.2.

TABLE 6.1. ESTIMATES OF EV CHARGING STATION COSTS AND USER UNIT PROPORTIONS

Type of Units	Percent of Costs	Percent of Units	Potential Payer
Inter Metro	2.73%	0.23%	Fee Based or Municipal
Public in Metro Areas	21.85%	1.81%	Fee Based or Municipal
Fleets	10.53%	6.12%	Fleet Owners
Employees at Work	24.97%	14.51%	Employers or Fee
Multi-Family Home	14.63%	28.34%	Property Owners or Fee
Single Family Home	25.28%	48.98%	Households
Total	\$2,372,011,685	\$860,848,422	

TABLE 6.2. ESTIMATED EV COSTS

Electric Vehicle Charging Units and Costs at 10% of New Jersey Fleet
Based on FHWA Table MV-1 and Argonne National Laboratory Model

Current NJ Vehicle Fleet 6,057,711
10% of NJ Vehicle Fleet 605,771

Type of Units	Number of Units	Percent of Units	Price Per Unit	Total Costs
Inter Metro	1,776.5	0.23%	\$35,000	\$62,175,919
Public in Metro Areas	14,211.6	1.81%	\$35,000	\$497,407,355
Fleets	47,964.3	6.12%	\$5,000	\$239,821,403
Employees at Work	113,693.1	14.51%	\$5,000	\$568,465,548
Multi-Family Home	222,056.9	28.34%	\$1,500	\$333,085,282
Single Family Home	383,714.2	48.98%	\$1,500	\$575,571,368
Total Chargers	783,417	=	=	\$2,276,526,876
Home Based Chargers	605,771			\$908,656,650

These figures reveal the very substantial charging infrastructure costs involved in moving to an electric vehicle future. The maps below in figures 6.2 through 6.5. visualize the significant challenges ahead for New Jersey. Figure 6.2 maps the incredible penetration of infrastructure to support combustible engine travel in the state already in place, built over many decades. The daunting challenge is that there must be the same, if not more, infrastructure penetration with EV stations for the transition to succeed. Recharging time takes at least five times longer than filling up with gasoline (30 minutes for a fast charge versus 5 minutes for a fuel stop) so there would have to be many more EV electric vehicle recharging units available than there are gasoline pumps today. Since vehicle recharging time is far longer than gassing up, stations will have to significantly expand their parking storage and queuing spaces for vehicles. This problem will be particularly acute on the New Jersey Turnpike and Parkway since many of these travelers are on long-distance trips.

Presently, there are few places to recharge outside of the New York City and Philadelphia area. In large parts of the state, including the Highlands and much of the Coastal Plain, one can drive for miles and miles without seeing an EV station at all. Even in those areas where there are stations, the numbers are insufficient for scaling up EVs in these densely populated places.

Figure 6.2 provides an overview of the relationship between traditional fuel stations and the New Jersey road network. In the case of conventional vehicle fuel services, most segments of road in New Jersey are in close proximity to conventional fuel stations.

Figure 6.3 provides an analysis of the proximity of public/private/government charging stations as compared to the known transit deserts in New Jersey. Unfortunately, most of the public/private/

government EV charging stations are located in areas that are served by mass transit – a situation that appears to not be very helpful to residents of transit deserts. In Figure 6.4, we provided a 5-mile buffer on the existing public/private/government electric vehicle charging stations. Even examining the data on EV charging stations and assuming a five-mile journey to get to charging station, many areas that are transit deserts remain poorly served by EV charging stations.

Figure 6.5 provides a 5-mile buffer analysis on traditional fuel stations. The results indicate that almost all of New Jersey – including the transit deserts are within 5 miles of vehicle fuel stations. An 8-10 mile buffer would provide almost complete coverage with significant overlap in most areas.

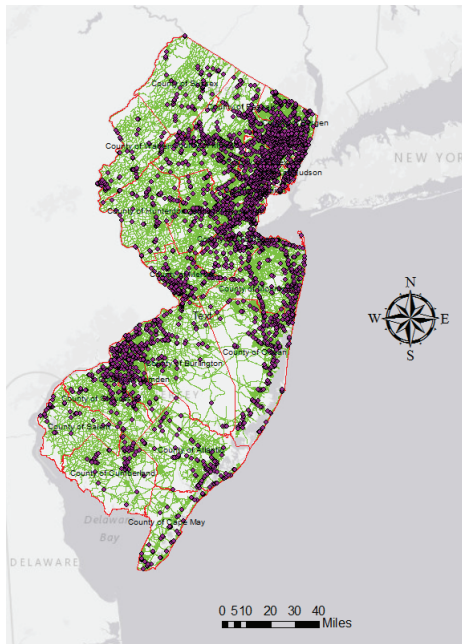


Figure 6.2. New Jersey Gasoline Stations

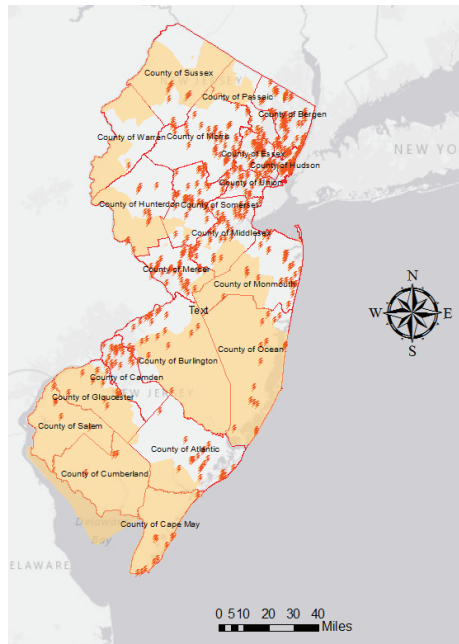


Figure 6.3. Electric Vehicle Charging Stations and Rail Transit Desert

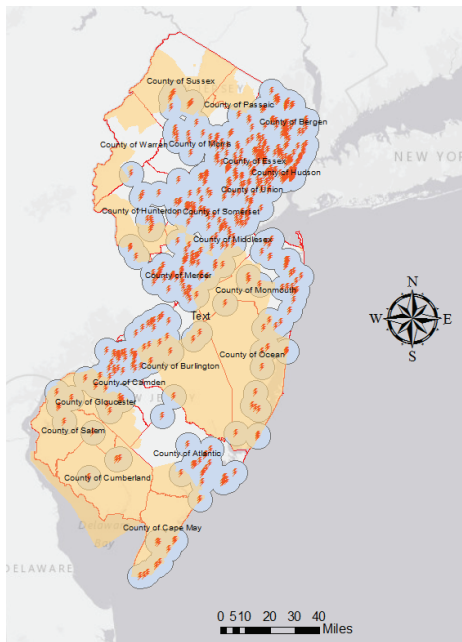


Figure 6.4. Electric Vehicle Charging Stations – 5 Mile Buffer and Rail Transit Deserts

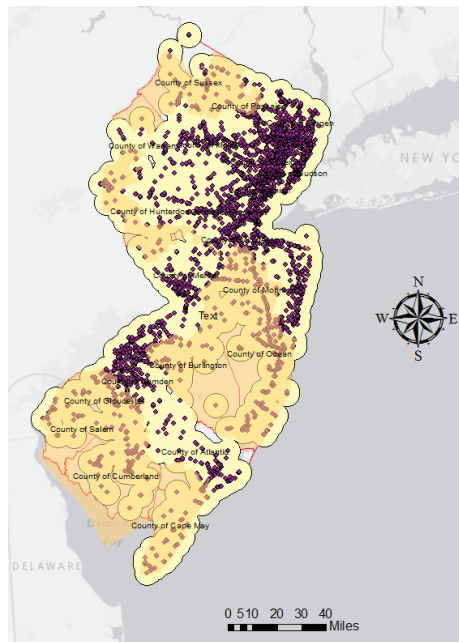


Figure 6.5. Gasoline Service Stations – 5 Mile Buffer and Rail Transit Deserts

There are challenges beyond these. One must consider both the cost to construct and operate public/commercial charging stations as well as the capacity of the electric grid to provide the power needed to charge vehicles on demand during peak loading periods.

Gasoline and diesel fuel can be created and shipped to stations prior to use. Electricity is typically generated in real time in response to demand. Whereas storage of gasoline and diesel is quite simple, there is little to no storage capacity on the grid for electricity. A matter meriting significant attention is the relationship between the state's electric grid capacity and a scale-up toward an EV future.

There are some silver linings here. Home charging generally would typically occur during the evening and late-night hours when electric demand is low. It is also possible that electric vehicles in conjunction with smart electric meters could provide some amount of storage capacity on the grid wherein vehicles plugged in during low demand periods could absorb additional generated energy (such as wind turbine power) to store for later use during peak load periods. Using a smart meter would thus assure the owner of the vehicle of at least an 80% or so charge, with a corresponding credit or payment for the use of the vehicle battery capacity as a grid storage element. This could reduce the cost of power for EVs and facilitate a greener grid in general.

As to our present circumstances, Figure 6.3 maps out current EV Charging Stations, showing the locations of the currently 693 public/private/government charging stations across New Jersey along with their 1839 chargers. As already noted, these stations are concentrated in areas outside of the transit deserts. Thus, we have charging capacity in areas that have public transit access options, and very limited charging capacity in transit deserts. As the deserts are expected to remain automobile dependent for the foreseeable future, one will need to consider how and where we deploy public EV charging stations to serve New Jerseyans most equitably. At the current rate of public deployment, we have about 1% of the public charging facilities that we ultimately will need to address the needs of an electric vehicle fleet that represents only 10% of our current overall vehicle fleet.

In a recent article in *The Wall Street Journal*, "Gas Stations Weigh the Benefit of EV Chargers," the point is made that the unfortunate reality is that major fuel distributors are having trouble developing a model that makes economic sense in terms of EV Charging facilities. They cite the cost of installing the chargers (up to \$100,000 each) as well as the impact of the installation process on their facilities (particularly the massive cost of installing electrical conduit into their existing parking lots). The reality is that these key operators cannot find a viable financial model for EV charging. As A.J. Siccardi, an executive at Race Car Petroleum noted, "We don't see an investable marketplace". This situation speaks to a real need to discuss how we can develop a viable model that will create a market for EV charging that works economically without massive infusions of public money (see Box 6.1).

Finally, there is also the matter of what technology New Jersey state and local governments should invest in. Battery EVs are a more well-developed technology with relatively low costs per mile. Hydrogen fuel cell EV technology has fuel up times comparable to combustible engines but the cost per mile for fuelling is at least five times more expensive than EV battery.

BOX 6.1. THE PROBLEM OF TAXATION AND EVS

Each EV charge is going to use grid electricity. That electricity has a cost. An EV currently costs about \$15.27 to charge. Based on a charge per kilowatt of \$0.28, that would imply an energy use of 54.54 kilowatts. If this charge yields a 410-mile range (as claimed by one prominent EV manufacturer) this yields a 4 cent per mile cost as compared to a 16 cent per mile cost for a conventional vehicle.

A considerable gap is that an EV under the current system would not pay into a major source of transportation funding, the fuel tax fund. Using a conventionally fueled (gas or diesel) vehicle as our guide, we would see a need to charge EVs about \$14.17 in road use tax (federal and state fuel taxes) above and beyond the cost of the electricity used in the charge. Clearly, this is of considerable concern if we see a significant transition to EVs as their proliferation would undermine the revenue from the fuel tax. Imposing vehicle registration fees on EVs that are reflective of the fuel tax burden could be a potential solution to the problem of an underfunded Transportation Trust Fund. Further, public EV charging stations could have a road use tax built into the fee structure of charging station use. These are solvable – but considerable – problems under the existing EV fee structures. They will need to be addressed as the EV fleet grows or we will have significant losses to existing tax revenue

TABLE 6.1. COST FOR AN EV VERSUS CONVENTIONAL CAR – 410 MILE TRIP

Item	Gasoline Vehicle	EV Charge
Price per Gallon	\$3.25	
Price per Kilowatt		\$0.28
MPG	20.00	
Gallons	20.50	
Kilowatts		54.54
Cost for Fuel	\$66.63	\$15.27
Fuel Tax Per Gallon	\$0.691	
Transportation Taxes	\$14.17	\$-
Total User Cost	\$66.63	\$15.27
Total Fuel Costs	\$52.46	\$15.27
Cost per mile	\$0.16	\$0.04

In conclusion, the road to an EV future is not without significant obstacles. The Natural Resources Defense Council’s plan for the Garden State’s transportation future delineates the benefits but pays little attention to the costs outlined here.¹¹ NRDC’s general idea – of incentivizing and accelerating the transition to an EV future through conventional cap and trade architecture on carbon-emitting fuel suppliers with a credit auction system among suppliers that would incrementally draw down the number of available carbon units – ignores many of the issues discussed here. Even NRDC ac-

¹¹ There findings about New Jersey can be found in two documents: Natural Resources Defense Council, “NDRC Factsheet: Modernizing New Jersey’s Transportation,” March 2018, <https://www.nrdc.org/sites/default/files/modernizing-newjersey-transportation-fs.pdf> and Bruce Ho and Uchenna Bright, *Transportation Reimagined: A Roadmap for Clean and Modern Transportation in the Northeast and Mid-Atlantic Region*, Natural Resources Defense Council, July 2018, <https://www.nrdc.org/sites/default/files/transportation-reimagined-roadmap-ne-midatlantic-report.pdf>.

knowledges that the transition will create winners and losers, and without government subsidies, rural and exurban New Jerseyans will be left in the lurch.

It is true, as NRDC points out, that the status quo is no friend of the average household budget, with transportation costs second only to housing in the rank list of costs in rural areas. NRDC also highlights the hidden benefits related to public health, congestion reduction, and job growth related to the green transportation revolution which are indisputable. But NRDC ignores the costs and barriers involved in the green transportation transition. For working-class people in New Jersey's exurban and rural areas, the cost of EV technology is well out of reach for the short term.¹² (See Box 6.2). To go all in on electric vehicles instead of hedging bets with the further development of hydrogen cell and hybrid engine technologies, NDRC ignores the substantial barriers to EV infrastructure development in urbanized, renter-dominated cities in places like Hudson and Essex counties.

As the Toyota Corporation has argued, the transition to green transportation will likely take far longer than climate champions would care to acknowledge, so mitigation strategies need to be pursued, such as sticking with hybrid combustible engine/battery technology like the Toyota Prius longer than environmentalists would like, and fully embracing the fact that alternative versions of EV like hydrogen cell power need additional research and development support. Battery EV will not likely work in the densest parts of the state when there are relatively few single-family homes to allow for overnight charging of vehicles.¹³

BOX 6.2. EVS AND THE LOW INCOME HOUSEHOLDS

Electric vehicles (EVs) are today largely the provenance of the wealthy and upper middle class. EVs are more expensive than gasoline or diesel-powered vehicles and the used vehicle market is small. Furthermore, those with more money are more likely to have a location at home to recharge. Policymakers should be considering how EV technology will impact lower middle- and low-income groups in New Jersey. Lower income households typically have a vehicle for basic transportation – and this vehicle is likely much older and require maintenance.

When we consider how EVs will transfer from the wealthier classes to lower income households one must consider how vehicles age. Traditional fossil fuel vehicles, in many cases, can often be maintained and have their useful lives extended through relatively affordable and simple repairs, sometimes done by the owner. While EVs are touted as having minimal maintenance needs due to their simple mechanicals, they do have a few weaknesses to consider. The key one is battery life. Batteries in EVs typically are rated with an 8-10 year lifespan and/or something like a 200,000 mile lifespan. Once the battery fails it can cost between \$6,000-\$10,000 for battery replacement, a price that very well may exceed the cost of the vehicle. One wonders how good and reliable EVs will get to lower income households without a reliable used-car market, and how less well-off New Jerseyans will be able to shoulder the significant cost of battery failure.

¹² Ivan Penn and Niraj Chokshi, "Electric Cars for Everyone? Not Unless They Get Cheaper," *New York Times*, August 9, 2021, <https://www.nytimes.com/2021/08/09/business/energy-environment/biden-electric-cars-cost.html>

¹³ Hiroko Tabuchi, "Toyota Led on Clean Cars. Now Critics Say It Works to Delay Them," *New York Times*, July 25, 2021, <https://www.nytimes.com/2021/07/25/climate/toyota-electric-hydrogen.html>.

7. New Jersey transportation legislation and policy context

EVs are – potentially – transport for the future. The New Jersey transportation system is, in many ways, still a product of its past. Home of the first divided highway and cloverleaf, New Jersey was a leader in highway development in the early 20th century. The modern state highway system dates to 1917, when the legislature created fifteen state routes, and a state highway department with an eight-member governing commission. Over the decades, governance of highways and transportation evolved toward a model of gubernatorial control with transportation policy reoriented toward multimodal (mass transit) solutions in reaction to the environmental and smart growth movements of later decades.

New Jersey was an early “highway state.” In 1949, the legislature created the New Jersey Turnpike Authority to finance and toll two major highways, the Turnpike and the Garden State Parkway. By 1960, anchored by these two major thoroughfares as well as other secondary routes, there was a total of 1,900 miles of state roads. As Rutgers University regional economists Hughes and Seneca noted, the state “had a pre-war [highway] infrastructure that was one of the finest state highway systems in the country.”¹⁴

Since the 1960s, investment has not paced with demand. It was not until the early 1990s when the final pieces of state’s Interstate Highway System were completed, a notable delay for the nation’s most urbanized state. While the state government took a leading role in developing the roadway network in the early years of motorization, the state now owns only 9% of the total network. This is roughly half the average percentage of ownership of other state governments.¹⁵ This localism is characteristic of New Jersey. But the ownership issue conceals what makes the system move, namely, gubernatorial initiative, with the state legislature playing an important but secondary role with veto power over the moves a governor may want to make. The major flow of money from state transportation trust funds to municipal roadways comes from the state trust fund. Yet this funding is very uneven, with municipalities receiving from state and federal sources only a fraction of the funding needed to address their actual infrastructure needs.

In the 1980s, Governor Tom Kean and the state legislature created the Transportation Trust Fund to add some stability to transportation policymaking by moving it out of the state General Fund.

¹⁴ Hughes, J. W., & Seneca, J. J. (2005). A Transportation-Driven World-Class Economy: New Jersey at Risk. Rutgers Regional Report, 23, 1–20. <https://doi.org/10.7282/T35Q4XPJ>

¹⁵ State of New Jersey, “Transportation Choices 2030: Assessing New Jersey’s Transportation System,” N.D., <https://www.state.nj.us/transportation/works/njchoices/pdf/assessment.pdf>.

A portion of the fuel tax and gross receipts tax for petroleum products was dedicated to the Fund. A Transportation Trust Fund (TTF) Authority was created too to sidestep referendum approval of capital projects. The governor makes the key appointments to the executive branch on transportation matters, some subject to state senate approval. One of the most critical is the Commissioner of the state Department of Transportation. The New Jersey TTF Authority is essentially under gubernatorial control as the body is chaired by the DOT commissioner. The state treasurer sits on the board as well and a majority of the public members of the body are appointed by the governor.

On October 14, 2016, Governor Chris Christie signed legislation raising the state gasoline tax by 23 cents a gallon for a total charge of 37.5 cents propelling New Jersey from the second-lowest state gas tax in the nation toward the top of the list. With subsequent increases in 2018 and 2020 the state tax per gallon stands at 50.7 cents, ranking New Jersey's pull fourth among the fifty states.¹⁶

The deal created the framework for an eight-year, \$16 billion spending program for transportation improvements with the annual appropriations process specifying outlays in any given fiscal year. The package included some offset tax reductions including the elimination of the estate tax and reduction in the sales tax.

The 2016 tax deal was a significant shift in transportation finance in New Jersey. The legislation requires that the gas tax be raised annually by the executive branch if the state's Transportation Trust Fund does not hit yearly revenue targets from gas tax collections. The hike in 2016 was the first time the gasoline tax had been raised since 1988. It changed the dynamics of state road funding by off-loading from the state legislature a difficult political vote to the establishment of a more automatic process that the governor's bureaucracy was responsible for implementing. The state legislature established the architecture of blame avoidance.

The governor has used it to his advantage too. As State Treasurer Elizabeth Maher Muoio reminded those unhappy with the last hike, "any changes in the gas tax rate are dictated by several factors that are beyond the control of the administration."¹⁷ If this pattern holds, the state gasoline tax is likely to increase in future iterations of multiyear transportation plans. Robust revenue estimates will likely move higher than the \$2 billion a year mark currently in place. With aggressive federal and state efforts to increase fuel efficiency, and the planned move toward electric vehicles, it is likely that demand for gasoline will decline. Taxes will rise to cover the revenue shortfall from declining consumption.

This is likely all good policy if paired with subsidies for transportation alternatives in the state's transit deserts. The 2016 deal turned gasoline into a sin tax like alcohol and cigarettes. Unlike the aforementioned vices however, New Jerseyans in car-dependent transit deserts are in no position to "go and sin no more" without rapid development of alternative transportation options.

¹⁶ Janelle Cammenga, "State Gasoline Tax Rates as of July 2020," *Tax Foundation*, July 29, 2020, <https://taxfoundation.org/state-gas-tax-rates-2020>.

¹⁷ New Jersey Department of Treasury, "Treasury Announces Change in Gas Tax Rate Effective October 1," August 28, 2020, <https://www.state.nj.us/treasury/news/2020/08282020.shtml>.

8. The Burden of Who Will Pay for All of This

Recent legislation put forward a model that will continue to burden road users to provide the bulk of funding for transportation infrastructure in the State of New Jersey. The heavy reliance on fuel taxation as well as revenue from toll roads (above and beyond the cost of operating these facilities) will place an uneven burden on New Jersey households based on their location. As highlighted above, New Jersey residents do not have equal access to mass transit services, so it is interesting to consider how much revenue will be generated from the various counties and how much is appropriate given a number of metrics of costs and resources.

Drawing from previous analysis by Peters and Gordon¹⁸, we have data on toll road usage by New Jersey E-ZPass users by Zip Code from 2008 that can be summarized at the county level. While it is the case that tolling rates have increased since 2008, it is very unlikely patterns of toll use by county have varied significantly since then. Further, the general policy of the New Jersey Turnpike Authority to increase tolls uniformly across the system makes these cost patterns stable and inferences reliable. With these reasonable assumptions, we can then estimate fuel consumption and fuel tax revenue based upon county level Vehicle Miles Travelled from New Jersey DOT data. We also used information on income and population from the New Jersey Department of Labor. This allowed us to create metrics of income, population and road user fees and taxes for the counties of New Jersey.

Assuming a 10% contribution to the TTF from tolling dollars and a 90% contribution to the TTF from fuel taxes, we thus can create an approximation of the contribution of each county to the NJ TTF. Table 8.1 provides a composite view of transportation funding to the TTF and potential metrics of income and geographic fairness.

What quickly becomes apparent is that there are great inequities between the counties of New Jersey. Some are paying less than their fair share and others more to the state's Transportation Trust Fund through either the prism of per capita contribution (population) or percentage of income of county residents. Increases in toll and fuel taxes only magnifies the impact of these inequities across counties. We would expect that these burdens will remain the same over the foreseeable future, and perhaps worsen with some of the transit desert counties dependent on automobiles being donor counties that will not share as much in the benefits of transportation infrastructure investment in proportion to their contribution to the TTF.

¹⁸ Peters, J., & Gordon, C. (2008). Measuring the equity burden in public service provision: The case of New Jersey Toll Roads. *Economic Papers: A journal of applied economics and policy*, 27(4), 381-392.

TABLE 8.1. RELATIVE SHARES OF INCOME, POPULATION AND TTF CONTRIBUTION BY COUNTY

County	Toll Burden GSP & NJTP	Percent of Fuel Taxes	Percent of Income	Population Percent	TTF Funding Mix 10% Tolls 90% Fuel
Atlantic	1.40%	3.69%	2.15%	3.00%	3.46%
Bergen	11.50%	9.75%	13.30%	10.48%	9.93%
Burlington	3.80%	6.26%	4.53%	5.02%	6.01%
Camden	2.00%	5.23%	4.52%	5.71%	4.90%
Cape May	1.20%	1.33%	0.93%	1.05%	1.32%
Cumberland	0.50%	1.55%	1.00%	1.71%	1.45%
Essex	10.10%	6.61%	8.60%	8.96%	6.96%
Gloucester	1.60%	3.84%	2.63%	3.28%	3.61%
Hudson	9.60%	3.00%	7.43%	7.55%	3.66%
Hunterdon	0.50%	2.40%	1.84%	1.41%	2.21%
Mercer	2.60%	4.81%	4.22%	4.14%	4.59%
Middlesex	16.00%	10.71%	8.38%	9.30%	11.24%
Monmouth	13.20%	8.67%	8.20%	7.00%	9.12%
Morris	2.70%	6.95%	8.01%	5.56%	6.53%
Ocean	10.30%	6.45%	5.06%	6.72%	6.83%
Passaic	3.90%	3.80%	4.20%	5.67%	3.81%
Salem	0.20%	1.05%	0.51%	0.71%	0.97%
Somerset	1.50%	4.48%	5.79%	3.72%	4.19%
Sussex	0.30%	1.69%	1.44%	1.59%	1.55%
Union	7.10%	5.86%	6.27%	6.24%	5.98%
Warren	0.20%	1.86%	0.98%	1.19%	1.70%
Total		100.0%	100.0%	100.0%	100.0%

- Income and Population Higher than TTF Share
- Population Higher than TTF Share
- Income Higher than TTF Share

The counties that under-contribute to the TTF often have higher incomes than over-contributors. The under-contributors are concentrated in North Jersey. Using the income tax to fund transportation – particularly mass transit in New Jersey – would create a more regionally and income equitable funding base.

Given that a large amount of the TTF has been redirected to mass transit, one has to consider the regional and income equity issues in funding programs that rely on user fees and taxes that are not providing access to the same level of public services and amenities. We also have to consider how these escalating costs will impact the affordability of areas that are not well served by mass transit and/or are economically frail. The current funding legislation provides for automatic adjustments in the fuel tax whenever financial expectations of the TTF revenue generation are not met. This will create additional burdens on residents of counties that have little to no expectation of significant mass transit investments.

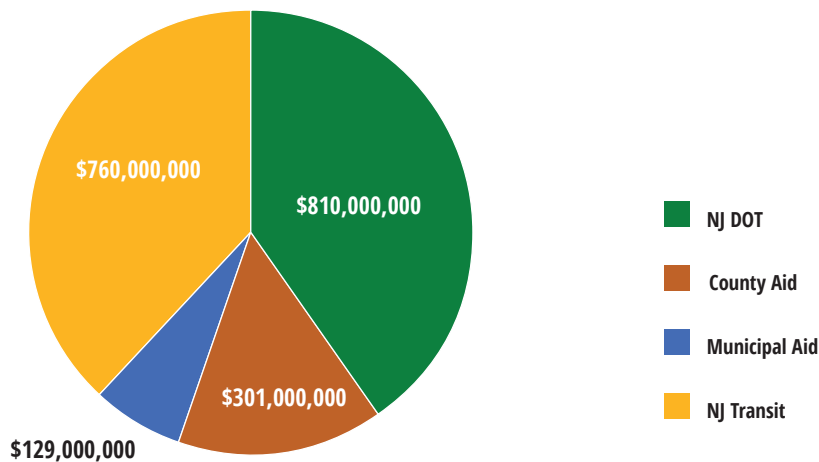
DOT Commissioner Diane Gutierrez-Scaccetti, in her September 14, 2020 testimony to the New Jersey Assembly Budget Committee, outlined the recent 2-billion-dollar capital plan and the share

of investments by agency. Table 8.2 and Graph 8.1 provides a breakdown of the spending by agency. New Jersey Transit stands to receive 38.0% of the funding from the TTF Capital Program – and those funds are largely targeted for the areas served by rail transit. We will leave it to the reader to consider if this capital plan serves all counties in New Jersey in an equitable manner and if the redistribution of resources from the south of the state to the north is in the best interest of all New Jerseyans.

TABLE 8.2. NEW JERSEY TRANSPORTATION SPENDING BY AGENCY (2020)¹⁹

Program	Funding	Percent
NJ DOT	\$810,000,000	40.5%
County Aid	\$301,000,000	15.1%
Municipal Aid	\$129,000,000	6.5%
NJ Transit	\$760,000,000	38.0%
Total	2,000,000,000	100.0%

FIGURE 8.1 NEW JERSEY'S 2 BILLION DOLLAR TRANSPORTATION CAPITAL PROGRAM



¹⁹ The authors have separated the spending category of Local Aid as provided in the testimony of DOT Commissioner Diane Gutierrez-Scaccetti into county and municipal aid based upon the long established New Jersey local aid funding split of 70% of state revenue to the counties and 30% provided to municipalities. This funding share is apparently not reflective of the actual amount and costs of transportation infrastructure as explored by Peters, Peters and Gordon (2017) who found that state and federal aid only addressed about 3% of the total municipal road infrastructure funding in New Jersey. This is in part due to the large amount of curbs, sidewalks and cross walks that are located on municipal roads as opposed to county or state jurisdiction roads and a state funding formula that provides relatively little aid to municipalities.

9. General conclusions

The costs of driving in New Jersey are driven by policy decisions made well in the past: about automobile infrastructure, transit alternatives, development patterns, tolling, and taxation and finance. While many of these decisions have served the state well in the past, they are not serving New Jerseyans so well now. Many residents, even those living near the two major metropolitan areas of New York and Philadelphia, still have to rely at least partially on cars for travel, and their operating costs are generally higher than national and regional averages. Tolls are a major source of this difference, as BLS data show, and there are good reasons to believe that this burden is even higher than the official data suggest. Insurance is also more expensive than in many other places and congestion leads to very high commute times for some.

New Jersey is also something of a tale of two – or three or more – states when it comes to transportation. Costs of driving are lower in the north than in the south. Transit availability and cost also differs across those two regions. Large parts of the state of significant population and size are in transit “deserts” with few alternatives to car travel, should they want such an option. This is compounded by significant differences in cost burden and travel alternatives structured according to income and socioeconomic class.

Many have high hopes that technology can correct the deficiencies of the current situation, especially with regard to environmental impact, but also ease and cost of travel. Electric vehicles (EVs) have been seen as an advance that will lead to clean, green, cheap and convenient travel for all, especially when combined with current ride-sharing schemes, such as Uber and Lyft, and with future innovations like driverless vehicles. The NRDC has specifically called for the wide roll-out of EVs in New Jersey.

But as this report demonstrates, the cost of building the necessary infrastructure for an EV fleet is substantial, even for a 10% fleet transition, and there are many other unresolved issues as well, such as the cost of electricity, load capacity of the existing power network, equity impacts, and other challenges. New technology is certainly part of any future solution to making driving and transportation by any mode more efficient, effective and affordable in the state, but it will come at a substantial financial cost and take a significant amount of time to implement, with many winners and losers long the way.

10. Policy Recommendations

1. Split New Jersey Transit (NJT) into two parts: North New Jersey Transit and South New Jersey Transit.

No other state in the nation organizes mass transit operations on a statewide basis, and for good reason. Mass transit operations are best conducted on a metropolitan level. The state's two regions face very different realities. North Jersey has more economic activity, heavy rail stock and is focused on questions related to system integration and performance. No matter what mass transit improvements there may be for South Jersey in the decades ahead that section of the state will always be dependent on cars for basic travel. Innovations are likely to be in the categories of bus rapid transit and light rail systems, not the heavy rail of the North Jersey system. Because of the nature of NJ Transit's portfolio, agency policymakers focus on New York City commuters. Since South Jersey is often an afterthought in state mass transit planning and finance, the region deserves independent standing with its own dedicated state mass transit agency.

2. Provide mass transit with a dedicated revenue stream

Whether NJ Transit stays as one unit or is split in two, mass transit in the state needs a reliable and dedicated revenue stream – most effectively from dedicated taxes. NJT's budget has been subject to swings in allocation according to the whims of Trenton politicians thus making long-term planning and operational improvements challenging. A model for this might be to adopt New York's payroll tax in counties served by the Metropolitan Transportation Authority. No one likes new taxes, but state mass transit needs a reliable source of funding. Dedicated revenue would relieve pressure on other functions within the state budget and lower the temptation to raid toll and pump tax revenues that should go toward roads. If NJ Transit were split in two, North and South regions could adopt different rates and conditions. The case for higher rates in the North is more sustainable because of the stronger and more ubiquitous mass transit options found there, and the South agency could show taxpayers more mercy.

3. The state legislature should eliminate the revenue target for the fuel tax, and set a statutory limit on the percentage of tax revenue the governor or state authorities can shift to mass transit or other purposes.

If current trends hold, the future is not bright for New Jersey's drivers. Over the past few years, New Jersey jumped from the almost bottom to nearly the top among the states in taxes collected at the

pump. Trenton is siphoning off tolls and fuel taxes to help NJT. While federal stimulus aid may put off a day of reckoning for a time, this reallocation of monies is a long-term threat to road capital plans. It is time to pump the brakes on road tax and toll siphoning. One of the more outrageous elements of the 2016 deal that raised the fuel tax was the establishment of revenue targets. Fuel taxes will go up to hit the aggregate yearly target. This form of indexing is inherently inflationary and sets up perverse incentives in that there will be less money for road upgrades as vehicle fuel economy improves and the state transitions toward EVs.

4. Policymakers in the state would do well to hedge their bets as to what technology will win the future—battery charges or hydrogen fill-ups.

The state Clean Energy Program, funded by a surcharge on utility bills, has been a frequent target of fund raids. This should stop as well. A carbon zero future will depend on more subsidies and investment of which the Clean Energy Program is just a start. In so much as planning transportation policy and subsidizing EVs is within the purview of this fund, it very well may be the case that different regions in the state will have different EV mixes. Furthermore, in light of the infrastructure challenges we outlined, it is likely that the traditional combustible engine will continue to be used into the near future, and well established engine/battery hybrids will see us through a long period of transition.

5. A deregulated auto insurance market works best. Keep it that way.

This is a hard learned lesson for New Jerseyans. As one analyst put it in 1991, the Garden State was “the most tangled auto insurance mess in history. Even the Soviet Union would be hard pressed to match this economic disaster.”²⁰ For decades, New Jersey was an overregulated auto insurance state with few firms willing to do business here. Things are quite different now. One of the great bipartisan success stories in the state has been the taming of auto insurance rates in the past twenty years. There are over thirty major players in this market competing for consumers. Deregulation is a success story, and the problem with auto insurance is the rear-view mirror. Efforts to re-regulate this market by micromanaging risk assessment models of firms is a step in the wrong direction. Competitors are better positioned to wring out inefficiencies in pricing than the state legislature and government regulators.

6. Explore innovative alternative revenue mechanisms.

There are a number of options that one can consider in terms of funding sources for transportation systems. The authors in their prior work for the New York State Department of Transportation provided 69 alternative sources of transportation funding – from privatizing street parking spaces, to taxing box deliveries from online shopping retailers. Using multiple sources of revenue to support New Jersey’s transportation system seems to be most equitable and efficient in a state with diverse transportation systems and regional variation in services. One funding stream to consider is income taxation for mass transportation funding. Our analysis suggests taxing income places the

²⁰ Marjorie Bertie, quoted in John D. Worrall, “Private Passenger Auto Insurance in New Jersey: A Three-Decade Advertisement for Reform,” in T. David Cummin, ed., *Deregulating Property-Liability Insurance: Restoring Competition and Increasing Market Efficiency* (Washington, DC: 2002), 81.

burden of mass transportation costs onto the areas of New Jersey with the most income and the best mass transit access.

7. Use a portfolio approach to financing the State transportation system

Our general recommendation is to apply a portfolio of taxes and fees to best calibrate the complexity of the Garden State's transportation system. User taxes on vehicles as captured in tolls and fuel tax revenue is the foundation but this revenue should not be redirected away from highways and roads to any great degree, nor should drivers be seen as a bottomless piggybank. There are unexplored opportunities to tax landowners in urban areas that benefit from mass transit investments and tax activity that occurs in congested regions such as urban freight delivery. This portfolio approach would provide a number of funding sources for transportation and would also be more equitable in terms of regional burden. New Jersey seems to have already burdened the driving public with the 2016 plan – it appears we have a lot more work to do to fairly and judiciously tax the users that will benefit from the various components of the Transportation Capital Plan.